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The 2013 Program Committee

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**Dr. Bill Wright**  
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USC Upstate Department of Biomedical Sciences  
USC School of Medicine Greenville

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**Dr. Terence Farrell**, Professor of Biology, Brown Endowed Natural Science Chair. Dr. Terence Farrell was born in Morristown, New Jersey in 1958 and caught ring necked snakes and red backed salamanders in his backyard four years later. He received a Biology degree from Bucknell University in Pennsylvania and then earned a Ph.D., from Oregon State University studying the ecology of the Pacific coast. After conducting research at Stanford University for several years he joined the faculty at Stetson University in DeLand, Florida. At Stetson, he teaches Ecology, Biostatistics, Invertebrate Zoology and Environmental Biology.

For the last two decades he has studied the field biology of pigmy rattlesnakes and box turtles with Dr. Peter May and a dedicated group of Stetson students. Twenty of these undergraduate students have published their research in scientific journals. Working with his colleagues, he has also written grants that have brought in over $3.5 million dollars in funding for Stetson’s science facilities and undergraduate research efforts. Most recently he received the McEniry Award, Stetson’s highest award for excellence in teaching.
## PROGRAM SCHEDULE

**Ninth Annual SC Upstate Research Symposium**

April 19, 2013 – hosted by Milliken & Company

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Monitoring a South Carolina Population of the Endangered Salamander, *Plethodon websteri*

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**Abstract** — Webster’s salamander, *Plethodon websteri* (Highton 1979), has a disjunct distribution across the Southeastern United States, including South Carolina, where the species is classified as endangered. The purpose of this effort is to identify trends in relative abundance of *P. websteri* at Stevens Creek Heritage Preserve in the Lower Piedmont. Two 1-ha grids (designated BLH and Pine) of cover boards were established in different plant communities: native basic-mesic hardwood forest and successional pine forest. Each grid contains 36 square cover boards of identical size made from untreated lumber. Survey period was October 2009 through mid-February 2013. Number of *P. websteri* per survey was 1.185 for BLH and for Pine was 0.12. Mean number of *P. websteri* found per board was 1.143 for BLH and 1.0 for Pine. On BLH, dispersion of individuals located under boards was uniform. Maximum *P. websteri* located simultaneously under a board was 2, which occurred on 4 occasions. At each study site, I am currently quantifying coarse woody debris (CWD), measurement of depth of leaf litter, determination of relative moisture content of litter, and canopy closure as percent cover to determine the relative importance of these factors in explaining differences in relative abundance between grids.

**Keywords** — Webster’s salamander, *Plethodon websteri*, population, monitoring

1. Introduction

The Webster’s Salamander, *Plethodon websteri* Highton, is a terrestrial, lungless salamander (Order Caudata, Family Plethodontidae) that occupies a disjunct distribution across the Southeastern United States (Petranka 1998). In South Carolina, *P. websteri* occurs in a highly restricted geographic range and is designated a species of “highest priority” by the Comprehensive Wildlife Conservation Strategy (South Carolina Department of Natural Resources 2005). This species’ local rarity, along with the worldwide decline and extinction of amphibian populations due to varied reasons (Collins and Storfer 2003), merits continued efforts to monitor trends in its populations using non-invasive techniques. As a plethodontid, *P. websteri* would be expected to exhibit a combination of life-history and physiological characteristics that confer sensitivity to disturbance as well as the potential to be an indicator taxon for biodiversity and ecosystem integrity of its native forested landscape (Welsh and Droge 2001). Semlitsch and West's (1983) paper is the only published study of *P. websteri*’s ecology at the eastern edge of its range (but see Robinson et al. 1995). This project, which began in 2009, relies on visual searches for *P. websteri* on the forest floor beneath cover objects (DeGraaf & Yamasaki 1992). The immediate goal of the present study is to observe *P. websteri* in sufficient numbers to observe a trend in relative abundance between 2 different grids of contrasting habitat. The long-range objective of this study is to explain differences in abundance according to habitat-related variables.

2. Materials and Methods

2.1 Study Area

Stevens Creek Heritage Preserve (SCHP) is located in McCormick County, South Carolina (N33°41.122',W082°09.756') along the eastern side of the Savannah River Valley within the Piedmont Ecoregion (Griffith et al. 2002). SCHP’s vegetation includes a relict mesophytic community (Radford 1959), considered one of the best remaining examples of basic-mesic forest in the Piedmont (Porcher and Rayner 2001). Other native plant communities found at SCHP include bottomland hardwood forest with canebreaks consisting of *Arundinaria gigantea* along Stevens Creek and dry-mesic oak-hickory forest at the highest elevations. Within SCHP, I designated two discrete, sampling grids on which to detect and monitor *P. websteri*; these grids are located approximately 1.6 km apart. The grid designated, “BLH,” was located primarily within optimal habitat for this salamander, i.e., north-facing slopes with native hardwood vegetation largely intact, exposed rocks present, and coarse woody debris relatively abundant (Petranka 1998, Wilson 1995). However, BLH included a well-drained area in which elevation and solar exposure were comparatively high, and the vegetation was...
dominated by shortleaf pine, *Pinus echinata*, and huckleberry, *Vaccinium arboreum*. One-sixth of the grid (six board locations distributed among 5 different lines) fell within this habitat type. The second grid, designated “Pine,” contained primarily marginal habitat: south-facing slope covered by successional pine (*Pinus taeda*) forest in the canopy, exposed rocks scarce or absent, and coarse woody debris relatively rare. However, Pine included a riparian area with hardwood canopy and rocky streamed; one-sixth of the grid (2 board locations on each of 3 different lines) falls within this habitat type. Thus, each grid incorporated the heterogeneity characteristic of SCHP while primarily containing one distinct plant association.

### 2.2 Sampling Design and Data Analysis

Each grid was a 6 × 6 arrangement of cover objects, untreated plywood sheets of 1.6-cm thickness cut into 0.6 m × 0.6 m squares. Each grid covered 1 hectare in area with boards spaced 20 m apart in rows designated A-F. Boards were deployed during May through July 2009. Surveys were conducted during fall, winter, and spring months beginning in October 2009 through mid-February 2013; specific dates of surveys are available from the author. A survey consisted of ≥ 1 investigators systematically walking the rows of a grid during daylight hours, stopping at each board’s location, carefully lifting each board, identifying and recording all herps present underneath it, then slowly returning the board to its original position. I relied on Petranka (1998) for identifying all salamanders to species, while Conant and Collins (1998) served as the reference to identify all other herps.

For each grid, I calculated number of board checks (surveys × # boards checked per survey), number of *P. websteri* per survey (total # salamanders seen ÷ # surveys), and daily mean # *P. websteri* found (number of individuals found on a single day/36 boards checked per survey day). I calculated mean # *P. websteri* (i.e., “hits”) seen per board location for each grid. For BLH, I determined pattern of dispersion of hits using the ratio of variance to mean; if variance/mean = 1, dispersion was random, if < 1 uniform (regular), and if > 1 clumped. (For this calculation, I used the mean of mean hits per location for all boards and the variance of these data.) As mean # *P. websteri* located per board location was < 1 for all locations and the mode for number of individuals recorded per survey was 0 for each grid, I also calculated mean # individuals found per board (# individuals recorded per instance under occupied board ÷ Σ, individuals recorded) only for instances in *P. websteri* was present.

### 3. Results to date

I surveyed BLH 27 times and Pine 24 times. Number of board-checks for BLH was 972 (=27 × 36) and 864 (=24 × 36) for Pine. Number of *P. websteri* per survey for BLH was 1.185 (=32/27) and for Pine daily mean # *P. websteri* ranged from 0 to 0.306 on BLH; the mean of these means, i.e., covering the entire set of surveys, was 0.0329. Daily mean # *P. websteri* ranged from 0 to 0.0278 on Pine; the mean of these means, i.e., covering the entire set of surveys, was 0.00347. Mean # *P. websteri* found (averaged per board over the entire survey) ranged from 0 to 0.185 per board on BLH and from 0 to 0.0417 per board on Pine. On BLH, dispersion of individuals located under boards was uniform (variance/mean < 1; 0.00256/0.0329 = 0.0778), whereas dispersion was not determined for Pine due to low # hits. Mean # *P. websteri* found per board for instances in which *P. websteri* was present was 1.143 (SD = 0.356) for BLH and 1.0 (SD = 0) for Pine. Co-occupancy by *P. websteri*, defined as two individuals being located simultaneously under the same board, occurred 4 times on BLH. In contrast, I never observed co-occupancy on Pine. On BLH, 17 of 36 (0.472) boards accounted for all sightings of *P. websteri*; of this group, 5 locations had ≥ 3 sightings during the surveying period. At Pine, 3 of 36 (0.083) boards accounted for all sightings, and no location had > 1 incidence of use by *P. websteri*.

Other herps found under the boards were the slimy salamander, *Plethodon glutinosus*, on 5 occasions, the smooth earth snake, *Virginia valeriae*, four times, and the ground skink, *Scincella lateralis*, once.

### 4. Conclusions

Temporal and spatial trends in relative abundance of *P. websteri* were evident. I successfully located *P. websteri* only during November through March, a trend consistent with that reported by Semlitsch and West (1983). The regular dispersion of *P. websteri* on BLH was somewhat surprising, considering that hits were concentrated in the proximity of two low-order streams, that this grid contained an apparent gradient of moisture instead of homogenous habitat, and that several board locations were used repeatedly while others were never occupied during surveys. (Given these circumstances, I had expected a clumped pattern.) Regular dispersion within a population is evidence of agonistic interactions among individuals (Smith 1996), and several plethodontids exhibit such behavior (Thurow 1975). Although co-occupancy (noted above) would seem to contradict the agonist
argument, plethodontids exhibit flexibility in territoriality within and among populations (Jaeger and Forester 1993).

Daily mean # \( P.\) websteri located on BLH was close to the value (0.08) reported by Robinson et al. (1995) working in the same general area > 15 years’ previous. While the species appears to be holding its own at SCHP, it remains vulnerable to stochastic factors due to its restricted local distribution and potentially narrow habitat requirements. Although protected locally within SCHP’s boundaries, not all of the preserve may contain habitat suitable for supporting \( P.\) websteri. At the landscape level, the species is taken into consideration in the management decisions of the nearby Sumter National Forest (USDA Forest Service 2004), but \( P.\) websteri has likely lost ground across its range due to conversion of its habitat to plant associations markedly different from the native composition, age, and structure (Petranka 1998).

Low overall success in locating \( P.\) websteri, along with lack of replication of treatments (Hurlbert 1984) has thus far prevented me from testing the hypothesis that the species shows higher relative abundance at BLH than Pine. I am currently undertaking an effort to statistically relate abundance and quality of habitat, concentrating on key factors identified by Welsh and Droge (2001), including amount of coarse woody debris (following Marshall et al. 2003), leaf litter depth and percent moisture content of leaf litter (Ash 1995), and canopy closure as percentage cover. These factors will be entered into a regression model to predict \( P.\) websteri abundance. Other potentially important sources of variation for relative abundance of \( P.\) websteri may be meteorological, e.g., rainfall and the previous night’s air temperature (Semlitsch and West 1983). Abundance of potential prey, i.e., detritivorous invertebrates, present within the litter on each grid would also likely repay investigation.

**Acknowledgments**

Mary Bunch, SC DNR, Lander University’s College of Science and Mathematics, Kirk Gibson, Kyle Baumis, Ceara Austin, Tyler Rogers, Cameron Bentley, Vincent Walde, Richard Fox

**References**


The Effect of Survey Protocol on Anuran Detection in the Piedmont Region of South Carolina

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Abstract — Our research investigates the North American Amphibian Monitoring Program’s minimal survey requirements and sequential route structure on anuran detection probabilities in the Piedmont of South Carolina. We used automated recording systems (ARS) during one NAAMP sampling window to assess the amount of sampling effort necessary to detect each species once and evaluate the effect of survey time on anuran detection probabilities. We detected the occurrence of seven anurans during our study and observed interspecific variation in detection probabilities, with 4 of the 7 species having detection probabilities under 0.5. In addition, survey time impacted the detectability of our species. Specifically, Anaxyrus fowliei, Hyla chrysoscelis, and Hyla cinerea tended to call closer to sunset, while Acris crepitans, Lithobates catesbeianus, and Lithobates clamitans tended to call further from sunset.

Keywords — Anurans, calling chronology, automated recording systems, call surveys

1. Introduction

The North American Amphibian Monitoring Program (NAAMP) is a large scale anuran (frog and toad) inventory and monitoring program developed by the United States Geological Survey (USGS) in response to global amphibian decline. The program capitalizes on the breeding behavior of anurans, as male anurans form leks or breeding choruses in order to attract females for reproductive purposes (Knopp & Merila 2009). In a breeding chorus male anurans emit species-specific vocalizations (Weir, Royle, Nanjappa, & Jung 2005), which makes species identification during the breeding season easy (Weir et al. 2005). The NAAMP program uses a standardized call survey protocol to evaluate the presence and persistence of anurans in a region (Weir et al. 2005).

The NAAMP protocol specifies when a volunteer can complete a survey, where call surveys are to be completed in a region, and what data will be collected during a call survey. In the Piedmont of South Carolina, surveys must be completed during each of three sampling windows. Within these sampling windows, surveys must be completed between 30 minutes after sunset and 01:00. The USGS assigns each NAAMP participant a route along which call surveys are to be completed; each route is a 15 mile stretch of highway with 10 stops separated by at least 0.5 miles. The stops along a route are numbered one through ten, and must be completed in sequential order. Thus, the survey protocol introduces a potential temporal bias into data collection.

While the NAAMP offers several benefits to the scientific community (e.g., the ability to track aspects of anuran occurrence in a region through time), the protocol has received some criticism. Most previous research evaluating biases associated with NAAMP protocol has focused on variation in inter-observer abilities (Pierce and Gutzwiller 2007), the temporal scale of a sampling window (Cook, Tupper, Paton, & Timm 2011) and the use of strictly nocturnal surveys (Cook et al. 2011). The goal of our study is to expand this research by evaluating how the NAAMP’s requirements of (1) conducting a minimum of one survey per sample window and (2) conducting call surveys along a route in sequential order impact anuran detection in the Piedmont of South Carolina. Our hypotheses were that one survey per sample window would not be sufficient to detect each species and that conducting call surveys along a route in sequential order would impact anuran detection, as we suspect that there will be interspecific temporal variability in calling activity.

2. Materials & Methods

We programmed four automated recording systems (ARSs; Song Meter SM2+ Platforms) to record five minutes at the 30 minute mark of every hour of each day. Once programmed, we installed the ARSs at four wetlands in Spartanburg County, South Carolina (Figure 1). In order to generate a data set for testing our hypotheses, we completed call surveys by listening to the ARS sound files recorded at the 21:30, 22:30, 23:30 and 0:30 time periods from May 13th to June 17th, 2012. Specifically, we listened to each sound file and scored species calling as present and species not calling as absent.

Primary Sponsors: Milliken & Company, Metropolitan Studies Institute
To determine the probability of detecting ($P_d$) of each species we used the following equation: $P_d = ns$ (number of surveys a species was detected) / $t$ (total number of surveys). To determine the number of surveys ($n$) that would be required to have a 95% or 90% probability of detecting a species once during our sampling period we used the following equations: $0.95 = 1 - (1 - P_d)^n$ and $0.90 = 1 - (1 - P_d)^n$, respectively.

To evaluate the effect of survey time on anuran detection probabilities we calculated the overall detection probability for each species during each time period at each wetland. In addition, we used the ARS files to build two artificial routes where each of our four wetlands represented a stop along the route. For artificial route 1, we completed a call survey at each stop in a pattern from West to East, which resulted in completing call surveys at Scotsgrove at 21:30, Patterson at 22:30, Ludwick at 23:30 and Cleveland at 00:30. For artificial route 2, we simply reversed the pattern and completed a call survey at each stop in a pattern from East to West.

### 3. Results

In total we completed 560 5-minute call surveys (46.67 hours of listening to sound files). We detected seven anuran species calling at our wetlands; however, we observed among-wetland variation in anuran breeding assemblages and calling activity (Table 1). Anuran detection probabilities ranged from 0.0125 to 0.7357 (Figure 2). We determined that one call survey was not enough sampling effort to have a 90% or 95% probability of detection for the seven species (Figure 3). In addition, we found that survey time impacted species detection probabilities (Figure 4); some species were more likely to occur early in the evenings, while others were more likely to call later in the evenings. The interspecific variation in calling activity through a night caused the detectability of species along the artificial routes to vary depending on the temporal sequence of call survey completion (Figure 5).

### 4. Conclusions

Data we collected supported our hypotheses. One survey did not represent adequate sampling effort for any of our detected species. In addition, survey time and sequence did impact anuran detectability in the Piedmont region of South Carolina. Specifically, *A. fowleri*, *H. chrysoscelis*, and *H. cinerea* tended to call closer to sunset, while *A. crepitans*, *L. catesbeianus*, and *L. clamitans* tended to call further from sunset. The influence of time on anuran detectability was most pronounced for *A. fowleri* and *H. cinerea*, where simply reversing the sequence of a route at least doubled the sampling effort necessary to detect the species. In closing, our study revealed biases associated with the NAAMP protocol that could impact its effectiveness as an anuran inventory and monitoring program. We caution researchers that documenting the occurrence of species with low detection probabilities may require completion of more than one survey per route during NAAMP sampling windows. In addition, the sampling effort required to detect the occurrence of a species will vary depending on the effect of time on its calling activity.

### Acknowledgements

We would like to thank Jennifer Holleman and Peter Lembke, for assistance in the field and Dr. Ben Montgomery for statistical advice. We greatly appreciate the Spartanburg Area Land Conservancy for granting us land use. We are grateful for financial support received from the Magellan Scholars Program, and USC Upstate’s Office of Sponsored Awards and Research Support and Division of Natural Sciences and Engineering.

### References


Table 1. Number of nights each anuran species was detected in our study. nd = not detected.

<table>
<thead>
<tr>
<th>Species</th>
<th>Wetland</th>
<th>Cleveland</th>
<th>Ludwick</th>
<th>Patterson</th>
<th>Scotsgrove</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. crepitans</td>
<td></td>
<td>35</td>
<td>-nd-</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>A. fowleri</td>
<td></td>
<td>20</td>
<td>-nd-</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>H. chrysocephalus</td>
<td></td>
<td>-nd-</td>
<td>23</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>H. cinerea</td>
<td></td>
<td>35</td>
<td>1</td>
<td>-nd-</td>
<td>24</td>
</tr>
<tr>
<td>L. catesbeianus</td>
<td></td>
<td>35</td>
<td>14</td>
<td>31</td>
<td>35</td>
</tr>
<tr>
<td>L. clamitans</td>
<td></td>
<td>33</td>
<td>3</td>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td>P. crucifer</td>
<td></td>
<td>-nd-</td>
<td>2</td>
<td>-nd-</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 1. Four study wetlands in the Piedmont of South Carolina.

Figure 2. Interspecific variation in anuran detection probabilities during our study.

Figure 3. Interspecific variation in sampling effort required to have a 90% and 95% probability of detecting anurans during our study. The numbers on each bar represent the number of call surveys necessary for detection.

Figure 4. The effect of time on anuran detection probabilities during our study.

Figure 5. The effect of route sequence on the number of routes required to have a 95% probability of detecting anurans in our study. S→C is an artificial route starting at Scotsgrove at 21:30 and ending at Cleveland at 0:30. C→S is an artificial route starting at Cleveland at 21:30 and ending at Scotsgrove at 0:30.
Evaluating the Effectiveness of an Automated Computer Recognizer in Isolating *Hyla cinerea* Breeding Calls from Sound Files

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**Abstract** – Two common techniques for monitoring anurans that take advantage of male breeding behavior are call surveys and Automated Recording Systems (ARSs). In an effort to reduce the time necessary to manually listen to ARS recordings for species of interest, we worked on developing an automated computer recognizer for anuran call detection. Specifically, our study objective was to build a recognizer for *Hyla cinerea* (Green Treefrog) that improved on the accuracy of the recognizer developed for *H. cinerea* by Waddle et al. 2009. We used individual treefrog recordings and ARS breeding chorus recordings to build and test an automated recognizer in Sound Scope. Sound Scope identified 42 files as containing *H. cinerea* calls. We visually inspected the spectrograms of the 42 files, identifying 36 as true positives and 6 as false positives. Overall, Sound Scope missed 14 files with calling *H. cinerea*, resulting in a false negative rate of 33%. Our true positive rate and false positive rates were similar to those of Waddle et al. 2009; however, our false negative rate was 13% lower than Waddle et al. (2009), which indicated that our recognizer was more effective at detecting *H. cinerea* calls from ARS sound files.

**Keywords** – anuran, automated recording system, call survey, automated computer recognizer

1. Introduction

Two common techniques for monitoring anurans (i.e., frogs and toads) that take advantage of male breeding behavior are call surveys and Automated Recording Systems (ARSs). Call surveys involve a researcher scoring breeding vocalizations at wetland sites, and are often seen as advantageous due to low material costs and ease of data collection (Dorcas, Price, Walls & Barichivich, 2009; Mcclintock, Bailey, Pollock & Simons, 2010). However, call surveys have been criticized for being closely tied to roadways, underestimating population abundance, and failing to detect some species altogether (Dorcas et al. 2009). In contrast, ARSs are simple to install and can intensively monitor anuran activity over long temporal periods at designated wetlands (Dorcas et al. 2009). However, the volume of recordings from ARSs that must be reviewed in the lab presents logistical difficulties for researchers.

In an effort to reduce the time necessary to manually listen to ARS recordings for species of interest, we worked on developing an automated computer recognizer for anuran call detection. While computer recognizers have been used to identify calls of birds, bats and anurans with some relative success (e.g., Anderson, Dave & Margoliash, 1996; Waddle, Thigpen & Glorioso, 2009), many recognizers have high error rates in call detection. We suspect that these high error rates may be due to the traditional method used to develop recognizers. Typically, recognizers are built using call samples isolated from a breeding chorus recording (e.g., Waddle et al. 2009). Breeding chorus recordings are accompanied by a large amount of background noise, which could potentially interfere with the accuracy of recognizers. In this study we modified this approach by parameterizing a recognizer using high quality individual call recordings from our target species, *Hyla cinerea* (Green Treefrog). Specifically, our study objective was to build a recognizer for *Hyla cinerea* using individual calls that improved on the accuracy of the recognizer developed for *H. cinerea* by Waddle et al. 2009 using the traditional approach.

2. Materials and Methods

When choosing a target species for the recognizer, a primary concern was using a species pertinent to ongoing research. *Hyla cinerea* are currently experiencing a range expansion and in order to monitor their occurrence in the piedmont, we installed 4 ARSs in wetlands across Spartanburg County. We programmed the ARSs to record in stereo at a 48k sample rate and 128 kbps for one minute at the 0:15 and 0:45 of every hour, and 5 minutes at the 0:30 of every hour. Thus, we collected 2.8 hours of audio per day per ARS from May 7th – 27th, 2013. In addition to the ARS recordings, we collected 189 individual calls of *H. cinerea* at 5 wetlands. We recorded individual calls using solid-state recorders (Marantz PMD661) with a 460mm shotgun microphone (Audio-Technica AT8015) at a distance of ~0.3m from the calling frog. We programed the solid-state recorders to...
record in mono at a 48K sample rate and 1536 kbps in WAV format. We used a subset of the individual recordings and ARS recordings to build and test an automated recognizer (described in the results section below).

3. Results

We visually inspected the spectrograms generated by 17 individual *H. cinerea*. Each recording had multiple calls per individual, thus we made approximately 50 annotations per recording. Our visual inspection of individual calls revealed two key focal ranges within *H. cinerea* calls, the first from 2500Hz – 4000Hz and the second from 6000Hz – 8000Hz (Figure 1). We used these distinct call attributes to parameterize a recognizer. Specifically, we integrated the call data into the Song Scope (Wildlife Acoustics Inc., Version 4.1) 2.0 algorithm for developing recognizers. We first ran the recognizer without any limitations to build quality training data. Our review of the quality training data identified the score result of 72 points and the quality result of 30 points to be adequate for capturing *H. cinerea* calls. Thus, we used these values as model parameters. To test this recognizer, we used 100 breeding chorus recordings. We confirmed (using auditory call surveys of each file) that 50 of the breeding chorus files had *H. cinerea* vocalizations, while the remaining 50 had no *H. cinerea* calls. Sound Scope was able to process the files in 5 hours and 23 minutes. Sound Scope identified 42 files as containing *H. cinerea* calls. We visually inspected the 42 files and identified 36 as true positives, and 6 as false positives (Table 1). Overall, Sound Scope missed 14 files with calling *H. cinerea*, resulting in a false negative rate of 33% (Table 1).

![Figure 1. Spectrogram of calling Green treefrogs (*Hyla cinerea*). Arrows point to dense frequency ranges within a single call that served as focal ranges for setting recognizer parameters.](image)

<table>
<thead>
<tr>
<th>Table 1. Summary of Recognizer Performance.</th>
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<tr>
<td>Recognizer</td>
</tr>
<tr>
<td>This Study</td>
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<td>Waddle et al. 2009</td>
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</tbody>
</table>
4. Conclusions

The automated computer recognizer we built successfully identified *H. cinerea* calls from anuran breeding assemblage recordings. Our true positive rate and false positive rate were similar to those for the recognizer published by Waddle et al. 2009; however, our false negative rate was 13% lower than Waddle et al. 2009, which indicates that our recognizer was more effective at detecting *H. cinerea* calls from ARS sound files. Typically, the false positive and false negative error rates associated with recognizers are inversely proportional. For our recognizer, we were able to keep a relatively low false positive rate, while decreasing the false negative rate. Although our recognizer showed improvement in call recognition relative to Waddle et al. 2009, we are currently expanding the study to include larger sample sizes with the ultimate goal of building a recognizer with a 90% true positive rate and a 5% false negative rate. Our recognizer performed poorly when *H. cinerea* were calling in the distance and we suspect that building in an additional filter in the recognizer parameterization will further improve its performance. Our hope is that the final version of our recognizer will facilitate more efficient analysis of sound files from our long-term ARSs in Spartanburg County. In addition, our new approach to recognizer development has broad applications for improving the design and effectiveness of automated computer recognizers.

Acknowledgements

We would like to thank Jennifer Holleman, Peter Lembke, Joel Price and Terry Farrell for assistance in the field. We are grateful to the Spartanburg Area Conservancy for granting us permission to use their properties as study sites. We would like to thank the USC Columbia’s Magellan Scholar Program, USC Upstate’s Office of Sponsored Awards and Research Support and USC Upstate’s Division of Natural Sciences and Engineering for financial support.

References


Abstract — Snakes have traditionally been viewed as being asocial. Recent observations, however, suggest that snakes may be far more social than previously thought, including the ability to recognize and group with kin, and provide parental care (defense) for young. Inclusive fitness theory predicts that benefits of such groupings should be greater when groups are composed of related individuals. Although the ability required to recognize kin under this theory has been observed in a wide range of vertebrates, it has only recently been reported in snakes. We tested two competing hypotheses regarding grouping (aggregation) behavior in female neonate copperhead snakes (female aggregations are common in nature; male aggregations have not been observed): (1) aggregation is mediated by genetic relatedness, and (2) aggregation is mediated by familiarity (i.e. learned). We found no effect of learning on neonate aggregation. With regard to relatedness, contrary to our expectation we found that unrelated individuals tended to aggregate more than related individuals. We propose that the lack of aggregation behavior in related individuals may be due to selection for dispersal and/or reduced effects of predation or disease.

Keywords — Kin selection, snake, social, Agkistrodon behavior

1. Introduction

Snakes have traditionally been viewed as perhaps one of the least social of all vertebrate groups (Brattstrom, 1974; Wilson, 1975). Even so, aggregations of these animals are routinely found in the nature (Graves & Duvall, 1995). One explanation for such aggregations is that individuals are mutually drawn to an especially suitable microhabitat, and that no sociality per se exists between individuals. However, recent observations suggest that snakes may be far more social than previously thought. For example, pregnant females often aggregate during and after gestation, both sexes are often found in groups when shedding their skins (Graves & Duvall, 1995, Gillingham, 1987), and individuals sometimes follow the scent trail of conspecifics to den sites (Brown & Maclean, 1983; Reinert & Zappalorti, 1988). Among snakes, pitvipers may be the most social (Clark, 2012; Greene, May, Hardy, Sciturro, & Farrell, 2002) with females observed providing putative parental care for their young (Greene et al., 2002), including behaviors interpreted as defense of young (Graves, 1989; Greene et al. 2002).

While benefits accrued to individual snakes in aggregations are equivocal, possible benefits may include increase efficiency of thermoregulation (Graves and Duvall, 1987; Aubret & Shine, 2009; Reiserer, Schuett, & Earley, 2008) and increased predator defense [i.e. increased vigilance and the “dilution effect” (Hamilton, 1971)]. With regard to defense, inclusive fitness theory predicts that benefits should be greater when groups are composed of related individuals (Hamilton, 1964). Although the ability required to recognize kin under this theory has been observed in a wide range of vertebrates, it has only recently been reported in snakes (Clark, 2012; Clark, Brown, Stechert, & Greene, 2012).

Using a well-studied species of North American pitviper —the copperhead snake (Agkistrodon contortrix)— at the northeastern extreme of its extensive geographic range (Gloyd & Conant, 1990; Campbell & Lamar, 2004; Douglas, Douglas, Schuett, & Porras; 2009; Smith, 2007; Smith, Schuett, Earley, & Schwenk, 2009; Smith, Schuett, & Schwenk, 2010), we tested two competing hypotheses: (1) aggregation behavior in female neonate copperhead snake (female aggregations are common in nature; male aggregations have not been observed) is mediated by genetic relatedness, and (2) aggregation behavior is mediated by familiarity (i.e. learned).

2. Methods

Neonates were obtained by collecting pregnant females from our study site located in a 485 ha parcel of basalt trap rock ridge ecosystem situated 4.75 km NW of Meriden, Connecticut. Topography is consistent with trap rock systems found throughout the Central Connecticut River Valley. Details of the topography of this area are presented elsewhere (Smith et al., 2009, 2010).
Pregnant females were located in the field by periodically visiting known gestating sites (Smith et al., 2009). Females suspected of being pregnant (n = 24) were immediately brought to the laboratory, processed, and provided private enclosures. Measurements for each female were taken at the time of capture (21 July 2011), and included body mass (BM: ± 0.5 gm) and snout-vent length and tail length (SVL: ± 0.2 cm; TL: ± 0.2 cm). Artificial lighting (eight 40 W fluorescent tubes) positioned 3 m above the cages were timer-controlled to simulate natural (Connecticut time) photoperiod. Laboratory rodents (mice) were offered as food every 10 days until parturition. However, none were consumed. Water was available in a glass bowl ad libitum. Two females were not pregnant, and two litters were unusual in having a single neonate and a number of infertile ova (two and five infertile ova respectively), thus female offspring from twenty litters were used in the analysis.

Immediately following parturition (<1 hr post-parturition), neonates from single litters were randomly divided into one of two equal treatment groups: (1) neonates that remained with their birth mother, (2) neonates that were removed to be cross-fostered with another mother. As a result, each post-birth female was housed with half of her own litter and half of another females’ litter. After 3 weeks of cohabitation, the neonates were removed and housed individually for six months until we could perform a test of behavioral aggregation.

To quantify aggregation, random pairs of female neonates were placed into 30x30cm cardboard arenas and allowed to acclimate for 24 hrs. The floor of each arena was covered by a 2.5 X 2.5cm grid and a digital infrared video camera, attached to a DVR recorder, was mounted 85cm above the arena floor. The balanced, random pairings consisted of four different test groups: 1) siblings raised together, 2) siblings raised apart, 3) non-siblings raised together, and 4) non-siblings raised apart. A total of twenty-seven pairings were tested. Pairs were videotaped continuously on a 12:12 Light-Dark cycle through the acclimation period and for an additional 72 hrs. Still images (JPG) were captured every three hours following the acclimation period and imported into ImageJ (http://rsb.info.nih.gov/ij/index.html). Minimum distance between the closest body segments (in mm) was measured for each image. Researchers monitoring the video tape recordings and collecting measurements were blind to the pairings. Data were analyzed using ANOVA (JMP 10.0, SAS Institute, 2012. Cary, North Carolina, USA). Alpha levels for all analyses were set at 0.05.

3. Results

Results for an overall ANOVA using all treatment groups together showed an effect of treatment (p = 0.0006, F_{519} = 5.8206, n = 520). We found no effect of rearing environment on the tendency of females to aggregate [meaning that distances between snakes raised apart snakes raised together were not significantly different (p = 0.3, F_{519} = 1.3294, n = 520)]. We did, however, find an effect of relatedness in that siblings tended to have greater distances between them than non-siblings (p = 0.0007, F_{519} = 11.6326, n = 519) (mean sibling distance = 60.8380mm +/- 4.0164SE; mean non-sibling distance 40.5274mm +/- 4.3967SE).

4. Conclusions

Contrary to our expectations, we found that unrelated individuals tend to spend the most time in close proximity to one another, regardless of rearing environment (raised together or raised apart). Our results suggest that aggregation patterns among neonate copperheads are more complicated and cannot be explained by our simple experimental model. Our observations are also counter to recent literature suggesting juvenile snakes, as well as pregnant females, preferentially aggregate with kin (Clark et al., 2012). One plausible hypothesis that was not originally considered, but accounts for our unexpected results, relies on the benefits of dispersal. Lack of a tendency for related individuals to aggregate may serve to promote dispersal of siblings shortly after birth. Such dispersal may ultimately decrease inbreeding and/or competition among siblings for similar resources (Motro, 1991). Dispersal of neonates may also help reduce the chances that a single predatory event, or rapid spread of infectious disease, will cause catastrophic loss of a litter and loss of annual adult female fitness.

Clearly, a robust understanding of the factors driving aggregation behavior of snakes requires rigorous study of the costs and benefits of arising from such behavior. While our study suggests that relatedness does not have an effect on aggregation in neonate copperhead, more study is warranted. However, our finding that unrelated individuals prefer to aggregate provides additional support for a cryptic social in snakes and that snake social behavior may be more common than previously believed (Pernetta, Reading, & Allen, 2009).

Acknowledgements

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providing the necessary permits. C. Annicelli, P. Eskridge, W. Ryerson and S. Horwitz provided valuable assistance in the field. The Wofford College Animal Behavior class, Spring 2012, was instrumental in conducting the experiment. The Copperhead Institute and the Wofford College Faculty Summer Research Fund provided funding. This research was conducted under the supervision of the Wofford College Institutional Animal Care and Use Committee (IACUC), protocol number 802.

References


Urban Greenways Support Communities of Native Small Mammals

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Abstract — Loss of species diversity is greatly influenced by the loss of natural habitat, including habitat loss resulting from the spread of urban development. Some urban areas attempt to conserve biodiversity by preserving urban greenways, parklands maintained in a more natural state than a typical urban park. In this study we sought to determine if urban greenways in Spartanburg, South Carolina provide suitable habitat for native small mammals. We compared the small mammal communities within three urban greenways to that of three rural forest sites. We capture-mark-recaptured small mammals during May and August of 2012. All of the small mammals we captured were native species. At each site, the white-footed mouse (Peromyscus leucopus) was the most abundant species, representing 91.3% of all captures at urban greenways and 70.2% of captures at rural forests. The golden mouse (Ochrotomys nuttalii) was the second most abundant species at rural sites, but nearly all individuals were captured at a single site. During May of 2012, the density of white-footed mice was greatest at Chinquapin and Cottonwood, most likely due to the greater density of vegetation at these urban greenways. Our results suggest that urban greenways provide effective habitat for native small mammals.

Keywords — capture-mark-recapture, density, Ochrotomys, Peromyscus, Schnabel

1. Introduction

Due to the spread of urban development, wildlife habitat has turned into small pockets of habitat surrounded by a human-dominated landscape (Barko et al., 2003). As a result of urban sprawl, some biologists have suggested that the most effective way to protect wildlife is to design urban areas to co-function as wildlife reserves (Rosenzweig, 2003). One example of this philosophy is an urban greenway, an area of parkland maintained in a more natural condition than a typical urban park. Urban greenways are commonly retained along urban streams and rivers and often contain trails for recreation (Schafer, 2000). During urban planning, greenway retention plans often contain goals for wildlife conservation; however, the actual contribution of urban greenways to wildlife conservation remains unclear (Fabos, 2004).

Most research on wildlife in urban greenways has focused on birds. For example, Mason et al. (2007) found that birds well-adapted to urban environments are common in greenways less than 50 m wide, but that forest-interior species need greenways that are 300 m or wider for effective habitat. Although several studies have been done on birds, very little is known regarding small mammals in urban greenways. For example, it is not known whether urban greenways provide habitat for native small mammals, or if they are dominated by non-native species such as the European house mouse (Mus musculus). Mahan and O’Connell (2005) performed the only study done in North America on small mammal diversity in urban greenways. However, most of their study sites were typical urban parks, and only one site was an urban greenway. They found that urban parks supported a small mammal community similar to that of rural forests; however, this was a short study (only 4 days of sampling per site) and they did not examine demographic parameters such as abundance and density. In this study we sought to determine whether urban greenways in Spartanburg, South Carolina provide effective habitat for native small mammals.

2. Materials and Methods

We capture-mark-recaptured small mammals at three urban greenways (Chinquapin, Cottonwood, and Palmetto Trails) within the city of Spartanburg, and three riparian forests (Peter’s Creek Heritage Preserve and two sites at the Pacolet River Heritage Preserve) in rural Spartanburg County. Each site was trapped for 7 continuous days during May and August, 2012. At each site we set out a 5 x 25 grid of H. B. Sherman live traps baited with a mixture of oatmeal, sunflower seeds, and bacon bits. Traps were checked each morning before 0900. Captured individuals were given a unique metal ear tag (National Band and Tag Company) and immediately released at their site of capture. We also recorded the gender, mass, reproductive status (male: scrotal or non-scrotal; female: lactating, pregnant, or non-reproductive), and age class
(adult or juvenile) for each captured individual. Southeastern shrews (*Blarina carolinensis*) and pine voles (*Microtus pinetorum*) were not ear tagged given their low number of captures and the inability to effectively ear tag these species.

We estimated the abundance of white-footed mice (*Peromyscus leucopus*) using a Schnabel index, and then calculated the density of white-footed mice at each site. To calculate density, we first calculated the mean maximum distance moved (MMDM) for each white-footed mouse captured at least twice during a 7-day trapping period. We calculated the MMDM in order to determine the effective trapping area given that the home range of some white-footed mice was likely on the edge of our trapping grid and would bias the density estimate. We added the MMDM distance to each side of our trapping grid to calculate the effective trapping grid area. We then calculated density by dividing the Schnabel index of abundance by the effective trapping grid area. All procedures were approved by the University of South Carolina Animal Care and Use Committee.

### 3. Conclusions

Our research suggests that urban greenways provide effective habitat for native small mammals. The species richness for small mammals captured at urban greenways was similar to that of rural forests (Table 1). In both urban greenways and rural forests, the white-footed mouse was the most common species, representing 91.3% of all captures at urban greenways and 70.2% of captures at rural forests. The golden mouse (*Ochrotomys nuttali*) was the second most abundant species at rural forests; however, nearly all of the golden mice were captured at one site, Pacolet North. The golden mouse is often sympatric with the white-footed mouse and they are not strong resource competitors. We captured golden mice within areas of dense understory vegetation. Golden mice are arboreal and prefer to live in areas containing dense vegetation that will allow it to easily climb from the forest floor to the canopy (Christopher *et al.*, 2006).

White-footed mouse density was higher at urban greenways than within rural forests (Table 2). White-footed mice are often most abundant in forest edge habitat and within fragmented forest landscapes (Barko *et al.*, 2003). The density of white-footed mice was greatest at the Chinquapin site, likely due to the dense vegetation found at this site. Our previous work has shown that white-footed mice are most abundant in areas of dense vegetation at our study sites (Barzee *et al.*, in press). Our results also match previous work which has found that, relative to rural forests, white-footed mice are most dense in woodlands surrounded by urban habitat (Barko *et al.*, 2003) or within small forest patches containing dense vegetation (Anderson *et al.*, 2003).

### Acknowledgments

We thank the USC Upstate Center for Research and Scholarship Support for providing a mini-grant to D. Kunda, J. Morrissey, and J. Storm to fund this research. We also thank the USC Upstate for a Teaching and Productive Scholarship grant to J. Storm.

### References


Table 1. Number of individuals captured at each study site during May and August, 2012 in Spartanburg County, South Carolina.

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<tr>
<td>Species</td>
<td>Chinquapin</td>
<td>Cottonwood</td>
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<tr>
<td>Southern shrew Blarina carolinensis</td>
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<tr>
<td>White-footed mouse Peromyscus leucopus</td>
<td>51</td>
<td>36</td>
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<td>Golden mouse Ochrotomys nuttali</td>
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<td>Pine vole Microtus pinetorum</td>
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Table 2. Density of white-footed mice (Peromyscus leucopus) at each study site during May or August, 2012 in Spartanburg County, South Carolina. Density was calculated at the estimated abundance from the Schnabel index divided by the effective trapping grid size determined by the mean maximum distance moved.

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Why Native Leadership Matters: An Imperative for BIE Schools

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Abstract — The paucity of American Indians elementary and secondary school principals and the potential implications of this dearth are well documented. Recent data from the National Center for Education Statistics indicate that just over half of the elementary and secondary school principals at Bureau of Indian Affairs (BIA) schools are Native American. Principals of BIE schools also exhibit the highest professional attrition rates, are significantly older, earn lower predominately white, are less well-educated, and paid lower salaries than their peers administering non-BIE schools. The authors examine the current characteristics of principals at BIE schools and discuss the implications of the lack of native leadership.

Keywords — Educational leadership; diversity; American Indian; educational administration

1. Introduction

From 1970 to the present, American Indians have had further opportunities to implement what has been their will and wish for more than 200 years: to take leadership roles in educational systems and institutions, to guide and design policy, and to implement innovative and locally responsive curricula and pedagogies. American Indian community-controlled schools present an ideal case to examine contemporary developments in education. As is suggested by their name, these schools are prime arenas for the exercise of Indigenous leadership and education control. (Lomawaima & McCarty, 2002, p. 289)

2. American Indian Education and the Leadership Imperative

Charleston (1994), Boloz and Foster (1980), and Cleary and Peacock (1998) posit that American Indian students have unique needs which must be met if they are to be successful in schools. For such success to be reached, the leadership in schools must be viewed through a Native paradigm, that is, leadership as fluid and dynamic (Charleston, 1994) and as a practice that can only be defined in context (Boloz & Foster, 1980). As well, leadership is seen as a service responsibility performed by those who are willing and able to provide it (Charleston, 1994). Thus, Native leaders must earn the trust and support not only of school personnel and students, but also of the community. Mills and Amiotte (1996) suggest that graduates of effective preparation programs have the academic background, preliminary field experience, and professional demeanor necessary to succeed anywhere in instructional leadership positions and to dramatically improve the quality of education for American Indian children.

Throughout the 1990’s, few schools attended by Native American students were led by Native American administrators and Native American school leaders received substantially less training than their non-native public school peers. Data from the 1990–91 Schools and Staffing Survey (SASS) showed that 47% of Bureau of Indian Education (BIE) and tribal school principals identified themselves Native American (Pavel, 1999). The Native American student population of these schools was 98% in 1993-94 (Pavel et al., 1998). Thirteen percent of principals in schools with high Indian enrollment (HIE), defined as 25% or more Indian student enrollment but with an average of 57.4% Native American student population, identified themselves as Native American (Pavel, 1999). Furthermore, only 25% of BIE/tribal schools and public schools serving large numbers of Native American students are led by principals with master’s degrees, compared to 63% of all public school principals who hold Master’s degrees (NCES, 1997). These and other statistics reveal a need for training of Native American educators to assume leadership of schools serving Native American students and communities.

3. Challenges to Native Leadership in Schools

In addition to society’s changing expectations, the demographics of U.S. schools have changed. The percentage of students in public schools who belong to a racial or ethnic minority group increased from 22 percent in 1972 to 43 percent in 2006, with a corresponding decrease from 78 percent to 57 percent in the percentage of white students enrolled (Planty et al., 2008). Unfortunately, the demographics of school principals have not changed. In the 2007–08 school year, only 17.6 percent of principals of all U.S. schools were from minority backgrounds (Battle & Gruber, 2009). In rural areas, 9 from
55.1% in 1999-2000 to 59.9% during 2007-08. Women also made significant strides in representation among secondary school principals, increasing from 23.1% in 1999-2000 to 29.4% in 2007-08. However, the overall proportion of women remain much lower than their male counterparts. Battle also found that women held 48.5% of the principalships at BIE schools.

According to Battle’s (2010) study of principal attrition at public, private, and BIE elementary and secondary schools, principals of BIE schools had the lowest retention rate (71.8%). Twenty of the 170 principals of BIE schools during the 2007-08 academic year, left their posts before the beginning of the 2008-09 academic year. BIE principals also exhibited the highest mobility rate among elementary and secondary chief administrators. Nearly one in ten (8.9%) transferred to another school (BIE and non-BIE) before the start of the 2008-09 academic year. The data in Battle’s study was not sufficiently disaggregated to ascertain accurately the ethnicity or race of the individual principals. However, Strizek (et al) study of principals during the 2003-04 year revealed that 50.1% of BIE school principals were American Indian/Alaskan Native, with two-fifths (40.4%) women.

It is also important to note that the proportion of American Indian/Alaskan Native elementary and secondary school teachers declined from .8% to .5% from 1999-00 to 2007-08. (Condition of Education, 2011). AI/AN elementary teachers saw the greatest overall decline (.8% to .4%). AI/AN secondary school teachers declined from .9% to .5%.

According to Battle’s (2010) study of principal attrition at public, private, and BIE elementary and secondary schools, principals of BIE schools had the lowest retention rate (71.8%). Twenty of the 170 principals of BIE schools during the 2007-08 academic year, left their posts before the beginning of the 2008-09 academic year. BIE principals also exhibited the highest mobility rate among elementary and secondary chief administrators. Nearly one in ten (8.9%) transferred to another school (BIE and non-BIE) before the start of the 2008-09 academic year. The data in Battle’s study was not sufficiently disaggregated to ascertain accurately the ethnicity or race of the individual principals. However, Strizek (et al) study of principals during the 2003-04 year revealed that 50.1% of BIE school principals were American Indian/Alaskan Native.

4. The Implication of Current Trends and Recommendations for Action

In their paper and presentation, the authors will discuss the implications of these national data and offer a number of possible remedies to address this issue. Recommendations will include but not be limited to - best practices models for preparing, training, recruiting and retaining Native principals; the need for further research is warranted to study the reasons for the inability to attract and retain qualified American Indians to serve as principals of BIE schools; a national imperative to develop and implement administrator training programs specifically to prepare American Indians for BIE school administration; the need to address sustainable leadership issue, and the call for continued advocacy on behalf of Native students.

5. Conclusion

The paucity of information on the effects and educational benefits of American Indian leadership in school systems with predominant numbers of Indian children and under the local control of tribes and Indian people is regrettable. There is a need for greater Indian leadership and control in School leadership, particularly BIE schools, if Indian education is to improve. Data from the U.S. Department of Education, the Bureau of Indian Education and other statistics continue to highlight a critical need for the training and hiring of Native American educators to assume leadership of schools serving Native American students and communities.

References


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Rand Research Brief (2009). *Are Schools Facing a Shortage of Qualified Administrators?*


Entrepreneurship Education: New International Research at USC Upstate

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Abstract — We summarize a stream of research on entrepreneurship education begun during a recent five-month sabbatical at USC Upstate by Harun Şeşen of the Turkish Military Academy, working with Mark Pruett of the Johnson College of Business and Economics. We have completed three papers using data collected from multiple countries. Each has implications for entrepreneurship education. In the first paper, we conclude that intrinsic (psychological) motives, not extrinsic ones like money, are the major triggers for would-be entrepreneurs and that educational programs need to heighten students’ awareness of those intrinsic benefits. The second paper compares faculty and student perceptions about entrepreneurship. We find that faculty and student perceptions frequently diverge and that faculty may underestimate the importance of student self-confidence. The third paper compares men and women. We find significant gender differences and discuss the implications for research and for education.

Keywords — entrepreneurship, education, international, gender

1. Introduction

In the spring and summer of 2012, Dr. Harun Şeşen of the Turkish Military Academy spent a five-month sabbatical in Spartanburg working at USC Upstate with Dr. Mark Pruett, who has published a number of papers on entrepreneurship education. We used survey data to write several new papers. One was presented at a national conference and three are in review at academic journals. This summary describes these recent papers.

2. Şeşen and Pruett: The impact of education, economy, and culture on entrepreneurial motives, barriers, and intentions: A comparative study of the United States and Turkey

We use three primary perspectives used in international comparisons of entrepreneurial intentions—culture, economic conditions, and education—in a study of attitudes toward entrepreneurship. Using samples drawn from two countries with distinctly different cultures, economies, and education—Turkey and the United States—we develop and test hypotheses regarding the impact of these factors on entrepreneurial intentions and on perceptions of motives and barriers regarding entrepreneurship.

The findings for both countries reinforce our conclusion that intrinsic motives are major triggers for would-be entrepreneurs. This has an important implication for education—we believe that the single most effective way for education in either country to stimulate entrepreneurship in terms of motives is to heighten students’ awareness of the intrinsic benefits of entrepreneurship.

3. Şeşen and Pruett: Faculty-student perceptions about entrepreneurship in six countries

This study may be the first of its kind in business and entrepreneurship. Despite decades of research on business education, there is little data on whether faculty and students have a common understanding of students’ career intentions and motivations, or shared beliefs about entrepreneurship motives and barriers.

To study the possible gap in faculty-student perceptions, we survey 3,037 students and faculty in the United States, China, India, Turkey, Belgium, and Spain. We find that the gap is substantial. Faculty and students across six countries frequently have misaligned views about their university environments, whether students are entrepreneurial, students’ workplace aspirations, and perceptions of entrepreneurship motives and barriers. The results suggest two particularly important conclusions.

First, student-faculty misalignment merits attention. Student and faculty beliefs and perceptions do not square well. Across countries, whether the subject is the university itself,
students’ interests and aspirations, or entrepreneurship motives and barriers, misaligned perceptions are common. Students and faculty disagree—and frequently.

Second, in a related vein, student self-confidence deserves attention. Remarkably, in our study faculty do not make a connection between self-confidence and students’ entrepreneurial disposition, even though analysis suggests that the two are strongly related.

In summary, this study of the differences in faculty and student beliefs and perceptions found wide areas of divergence. We believe that further work is need, not only to understand the issue, but to transform higher education to better support the entrepreneurial intentions of students. Current educational norms and methods may not be the most effective way to create more entrepreneurs.

4. Şesen and Pruett: Gender and entrepreneurship: Perceptions, attitudes, and intentions

There is substantial entrepreneurship literature on the roles of gender, culture, and education, but less work exists on the intersection of those dimensions—there is not much gender-oriented, cross-cultural research on nascent entrepreneurs.

In this study of the intersection of gender, culture, and education, we look at differences in men and women across multiple countries regarding beliefs about education, aspirations and intentions, and entrepreneurship motives and barriers. We survey 1526 university students in the United States, China, Turkey, and Spain. We study people who may be at the beginning of entrepreneurial careers, in contrast to research on surviving entrepreneurs.

We find significant differences between men and women in views of education, entrepreneurial intentions, perceptions of motives and barriers, and in the relationship of motive and barrier perceptions to entrepreneurial intentions. The results raise two particularly important topics.

First, we show that intrinsic and psychological factors are important in forming university student views about entrepreneurship. However, higher education focuses mostly on knowledge and skills specific to fields. Is higher education in general, and entrepreneurship education in particular, missing an extremely important element—a focus on developing students’ psychological understanding and confidence?

Second, the results from China provide an interesting exception in a number of the analyses. They suggest directions for future research in the social construction/innate differences debate over gender differences.
Motivating Semantic Reasoning in a Mathematical Proofs Course

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Abstract — The interaction in mathematics between syntactic reasoning and semantic reasoning has been a subject of study in the philosophy of mathematics and in pedagogy in mathematics. This paper discusses motivating, through exercises, students’ semantic reasoning in the effort to improve their abilities to write mathematical proofs and to understand the meaning of the mathematics they are studying. Ideas for further study, including undergraduate research projects, are given.

Keywords — Syntax, Semantics, Proof, Mathematics

1. Introduction

Syntactic reasoning refers to steps in a proof that are justified simply by the form of the propositions. In a proof, steps that are justified by an axiom, rule of logic, the rules of the algebra of the theoretic system, a previously proved theorem, or a previous step in a proof all involve syntactic reasoning. So long as the language of the step is written in the correct syntax (follows the rules of the system), the step is correct regardless of the meaning of the terms being used. Semantic reasoning, on the other hand, refers to steps in a proof for which the correctness of the steps relies on the proper use of the defining condition of some term in the language. Hence, if you change the meaning of the term in the step, then the step may no longer be correct.

The author has used a variety of texts to teach introduction to proofs as well as first courses in Modern Algebra, Modern Geometries, and Real Analysis, all excellent textbooks for their intended purposes [1-3]. Such texts vary in approach from listing strategies for doing certain types of proofs (including strategies that involve the use of definitions that have been fully given and illustrated), to listing justifications (including definitions) of steps in a proof, to telling students to be aware of the importance of using definitions. Some students can be given careful and clear presentation of such material and still not be able to write proofs using it. This author believes that such students tend to want to think only in terms of procedures (syntactic reasoning) and therefore are psychologically unprepared to think deeply about the meaning of the terms being used in mathematics. Thus, even excellent presentations of definitions and examples of proofs do not improve such students’ proof-writing abilities, beyond having them imitate proof-making strategies already given them with only slight variations (which is again just syntactic reasoning combined with imitation.) What this author has found helpful is to present the student with illustrations that distinguish between syntactic and semantic reasoning so that the student becomes aware of and motivated to employ the different types of reasoning that he or she will need in doing mathematics. The importance of this topic is explored in [4]. The purpose of this paper is to provide further support for the importance of the topic.

2. Examples Promoting Awareness and Motivation of Semantic Reasoning

Consider the following situation. A mathematics professor assigns an exercise, say Exercise 4.35, to prove that if the sum of two real numbers is irrational, then at least one of the numbers added must have been irrational. It is course policy that any result in a previous exercise, whether covered in class or not, can be used in subsequent exercises. Student A notices that an uncovered exercise, say Exercise 4.2, on the previous page of the course textbook states that the sum of two rational numbers is rational. Student A writes the following proof:

The contrapositive of the statement in this exercise is found in Exercise 4.2 to be a correct result. Since the contrapositive of a conditional is logically equivalent to the conditional, the statement in Exercise 4.35 immediately follows.

Student A’s proof is logically flawless. It is also entirely syntactic reasoning. The proof would have been just as correct if the term “irrational number” had been replaced by “non-integer” in the exercises and the proof. Thus, the student’s work exhibits no understanding of the meaning of a rational number or why the result holds.

On the other hand, Student B does not see Exercise 4.2 on the previous page and writes a proof that roughly conveys the same reasoning as the following proof. Let each of $x$ and $y$ be a
rational number. Then there exist \( p, q, w, v \in \mathbb{Z} \) with \( q \neq 0 \neq v \) and \( x = \frac{p}{q}, y = \frac{w}{v} \). Therefore, 
\[ x + y = \frac{pv + qw}{qv} \]
which is a rational number by the closure of the integers under addition and multiplication and the zero factor property of the real numbers. The result follows by the logical equivalency of a conditional and its contrapositive.

Student B’s proof is also logically flawless. Additionally, Student B’s proof exhibits evidence of semantic reasoning in the use of the definition of a rational number. One could not replace the term “rational number” with the term “integer” and still have a correct proof. (The result would be correct, but not the proof.) Hopefully, the student has thought about the meaning of the term “rational” number and not thoughtlessly imitated the procedure of a previously displayed proof.

Student A has gained no mathematical insight from the exercise; the exercise has been purely in logic, not mathematics. Student B, however, demonstrates evidence of mathematical understanding. The instructor needs to point out the differences between these proofs to the class. The example should motivate a discussion of a mathematically enlightening proof verses an unenlightening proof. A difference lies in whether there is semantic reasoning.

This leads to our next example from [3]. Theorem: For every \( \varepsilon > 0 \) there exists a \( \delta > 0 \) such that
\[ (1 - \delta < x < 1 + \delta) \rightarrow (5 - \varepsilon < 2x + 3 < 5 + \varepsilon) \]
After an algebraic explanation (purely syntactic reasoning) of how we get the \( \delta \) for a given \( \varepsilon \), the following proof is given. Let \( \varepsilon > 0 \) be arbitrarily chosen. Let \( \delta = \frac{\varepsilon}{2} \). Then \( \delta > 0 \) and
\[ (1 - \delta < x < 1 + \delta) \iff (1 - \frac{\varepsilon}{2} < x < 1 + \frac{\varepsilon}{2}) \iff (2 - \varepsilon < 2x < 2 + \varepsilon) \]      

Again, this is purely syntactic reasoning. The student can learn to flawlessly imitate such proofs and still be perplexed (unless again shown examples to imitate) when later in the text he or she is confronted with a limit definition and told to prove certain theorems on limits. This is because doing the above exercise, as an exercise in syntactic reasoning, does not by itself move the student to absorb the semantic meaning of \( (1 - \delta < x < 1 + \delta) \) as “\( x \) is within \( \delta \) units of distance of 1”. The instructor needs to help students gain from the exercise the association of the mathematical symbolism with the semantic meaning of the terms. In most of their mathematical experience, \( (1 - \delta < x < 1 + \delta) \) may have never meant to some students anything more than syntax for “solving” for \( x \). That is, such students have been able to get reasonably good grades and made it to the proofs course without having to apply semantic meaning to such an expression.

Helping students to be self-conscious of their semantic verses syntactic reasoning has produced good results for this author’s students. For example, a class was recently presented with a version of Student B’s proof of the sum of two rational numbers being rational. The instructor mentioned the mathematical insight exhibited in the proof, as contrasted with Student A’s proof, and noted the use of the definition of the terms. The instructor then assigned to the students the task of proving or disproving that the sum of two irrational numbers must be irrational. A freshman who entered the program with a 5 score on AP-Calculus wrote the following “proof”: Suppose that \( x \) and \( y \) are both irrational. That is there exist \( x \in \mathbb{Z}, x \neq \frac{p_1}{q_1} \) when \( q_1 \neq 0 \) and \( y \in \mathbb{Z}, y \neq \frac{p_2}{q_2} \) when \( q_2 \neq 0 \). Hence \( x + y \neq \frac{p_1}{q_1} + \frac{p_2}{q_2} \). Therefore \( x + y \) is irrational.

Various errors are in the work, but this clearly is a case of a student who has been very successful at syntactic reasoning up to this point in her academic career still simply attempting to imitate the steps in Student B’s proof, but without any consideration of the semantics involved. The clear definition of the term rational that was given in class and the full example of a proof using that definition did not help the student because she was predisposed to view that information only syntactically. It appears likely that the “clear” presentation in class actually was a catalyst for the student’s failure on the problem to reason semantically. She went into syntactic “mode” when she saw in class “how to do that type of proof”.

Here is evidence of the latter claim. Later, in the same assignment, the student was asked to prove or disprove that the product of two irrational numbers is irrational. The student correctly gave a counterexample, namely \((\sqrt{2})^2\). Thus, on a very similar problem for which the student had not been shown a “clear” example of a proof to imitate, the
student correctly thought about the problem before answering. There is further evidence. Before the student’s paper was returned, the instructor discussed with that class the need to distinguish between syntactic verses semantic reasoning and asked them to examine themselves to see which they were doing. The instructor then wrote a variant of the student’s flawed proof on the board and asked for comments. The student who had written the incorrect proof lead the criticism of the proof by pointing out how it was syntactic reasoning gone awry. Thus, this instructor did not have to correct the student’s work, but to help her adjust the type of reasoning she was bringing to the problem.

3. Conclusions

It is the instructor’s task to try to help students absorb not only the syntax, but also the mathematical meaning of the terms and symbols used. Furthermore, as mathematics professors, we need to understand that good teaching of proof writing involves more than teaching logic and the meaning of the mathematical terms that we use, no matter how clearly we present such. We should teach students to be aware of semantic reasoning and to develop it. Students who quickly “get proofs” will be those who either beforehand have absorbed the semantic meaning of terms being used and the importance of reasoning from that meaning, or who pick up on that in class, by reading the text, or by working exercises until the “light comes on” for them. In other words, they now understand what the mathematics means and how to reason using that meaning, read for that meaning, and express that meaning in writing. For some students, that light does not seem to come on by doing exercises in which students imitate proof techniques. Therefore instructors should lead students through exercises designed to distinguish between syntactical reasoning and semantic reasoning and motivate self-conscious semantic reasoning.

Possibilities for further study (including undergraduate research) related to this subject include the following: 1) systematically study various textbooks to find which, if any, emphasize the distinction between syntactic and semantic reasoning; 2) study high school mathematics curricula to examine what emphasis is placed on syntactic reasoning and what emphasis is placed on semantic reasoning; 3) study the influence of the contemporary heavy emphasis on algebra, precalculus, and calculus in the high school curriculum (as contrasted with geometry) on the development of syntactic reasoning and semantic reasoning; 4) study the role of semantic reasoning in the wording of pre-modern mathematics versus modern symbolic notation; 5) develop exercises and measure their effectiveness in motivating semantic reasoning in mathematics.

References


Integrating Literacy into the Physical Education Classroom

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Abstract — The purpose of this paper is to examine how physical education teachers can integrate literacy into their curriculum without losing integrity of physical education standards and crucial physical activity time for students. Since the enactment of No Child Left Behind, public schools have been focusing on raising test scores in reading and math, while reducing time spent in physical education class and recess. It's also worthy to note that childhood obesity rates have increased and continue to contribute to many health, social, and academic problems for our children. Physical education programs within our schools promote physical activity and can teach skills, as well as healthy behaviors. This is an important key to influencing children to become productive, healthy adults who practice healthy behaviors for a lifetime. However, with the increasing academic demands to improve test scores and meet high-stakes testing standards, schools have lost sight of the whole child in a time when childhood obesity is prevalent. Physical education programs are being reduced and in some schools cut out completely, in order to make time for other academic areas. According to The Centers for Disease Control and Prevention (CDC) there is a growing body of research focused on the association between school-based physical activity, including physical education, and academic performance among school-aged youth (Centers for Disease Control & Prevention, 2010). If academics and increased levels of physical activity are linked, how can physical educators support academic initiatives, without losing integrity of a quality physical education program? Physical education teachers can collaborate with classroom teachers, other physical educators, administration, and outside agencies to integrate literacy into a quality physical education program.

Keywords — childhood obesity, integration, literacy, physical education

1. Introduction

Children today lead much more sedentary lifestyles than their predecessors, and with the ever increasing demands of academics and political persuasion in education, society is placing less value on movement and physical activity within our schools (Wechsler, McKenna, Lee, & Dietz, 2004). More than ninety-five percent of American children ages five through seventeen are enrolled in school. School can be a critical part of a child’s environment that can shape and influence physical activity and wellness for a lifetime (Kubik, Story, & Davey, 2007). Physical education programs within our schools promote physical activity and can teach skills, as well as healthy behaviors. This is an important key to influencing children to become productive, healthy adults who practice healthy behaviors for a lifetime.

Childhood obesity has increased at an alarming rate over the past twenty years. Overweight children have tripled since the 1980’s and twenty-five percent of children ages 5-10 have high blood pressure and/or cholesterol (Hammond, 2005). Childhood obesity increases the risks of developing high blood pressure, high cholesterol, orthopedic problems, depression, and type II diabetes (U.S. Department of Health & Human Services, 2010).

This decline in the health of our children can be blamed on many factors such as: the increased consumption of fast food; popularity of gaming systems; decline of the family unit; enactment of the No Child Left Behind law; and a removal of both funding and emphasis on physical education programs (Bynum, 2007). These lifestyle diseases are robbing our children of their childhoods and will have a direct impact on their academic achievement, quality of life, and success in life.

Many researchers agree that successful obesity prevention programs intervene at multiple levels...
including schools, families, and communities (Power, Bender, Goetz, & Daratha, 2010). Research based on conversations with teachers within various graduate programs found that most teachers indicated that they saw benefits in academic learning when their students were happy and healthy (Fingon, 2011). Schools cannot solve the obesity epidemic on their own, but it is unlikely to be halted without strong school-based policies and programs (Wechsler, McKenna, Lee, & Dietz, 2004).

Quality physical education programs can play a vital role in preventing childhood obesity, improving student achievement, and increasing physical activity in students.

3. Importance of Quality Physical Education Programs and Physical Activity

All children should be provided with a positive, challenging, inclusive, and rewarding physical education experience that not only develops motor skills, cognitive and social skills, but also improves fitness levels and gives children the knowledge to combat obesity and promote lifelong health and wellness. “As early childhood professionals we have the duty to educate the whole (thinking, feeling, and moving) child” (Pica, 2006). Physical education and activity help children construct knowledge they will use for a lifetime; allow children the opportunity to discover and explore their world; promote healthy socio-emotional development; and improve cognitive skills. Some research studies have shown that physical activity is related to improved cognitive performance in young children, especially free play and physical education (Stevens, To, Stevenson, & Lochbaum, 2008). Studies have also shown that school-aged children who have a higher level of aerobic fitness process information more efficiently and respond quicker to a battery of computerized flashcard test (Reynolds, 2007).

Educational policymakers need to understand and recognize that physical education is as much an academic discipline as anything else in school – a discipline that gives students some of the most critical life skills they need to be productive and happy citizens (Wechsler et al., 2004). The link between physical fitness and improved cognitive abilities are beginning to gain attention by researchers and have had compelling evidence that physical activity is a valuable component of the school curriculum, for academic as well as physical development (Hill et al., 2010). Therefore, physical educators can play a crucial, supportive role for student success in academics and improve fitness levels by integrating core subject areas into their physical education programs.

4. Integrating Literacy into Physical Education

Teaching across the curriculum is beneficial to students because it reinforces learning and helps children make connections in various subject areas and this makes learning relative to their daily life. In a position statement by (NASPE) National Association of Sport and Physical Education, one of the specific appropriate instructional practices in physical education was focusing on integrating physical education with other subject areas (NASPE, 2011). Integrating literacy into the physical education classroom can be very simple if the teacher is willing to collaborate with classroom teachers and other resources that focus on innovative strategies to engage active learners. Children’s books that relate to sports, nutrition, making friends, exercise, and informational text about the human body enhance and reinforce students’ interest and attitude about physical education (Fingon, 2011). These books can be shared in both the classroom and physical education. There are many other ways physical educators can integrate literacy in their classroom:

- morning messages;
- skill/activity cards with pictures,
- words or poems describing actions to perform;
- games that involve teamwork,
- physical activity and vocabulary building such as
  - Scramble for Scrabble;
  - letter drawing with colorful scarves;
  - jumping rope to rhymes;
  - interactive word walls; and
- a literate rich environment that supports the physical education content and celebrates students’ successes in P.E.

These literacy-rich strategies integrate into my physical education classroom beautifully and have enhanced learning for my students. Students, especially upper elementary students, are excited when they find out the lesson of the day is Scramble for Scrabble (see Chart #1). Scramble for Scrabble is a fitness based activity that integrates teamwork and the PE interactive word wall. Students earn letter tiles by doing fitness activities and create words (P.E. or core subject related) using Bananagram tiles. Students also love
to look at my favorite non-fiction book, See Inside your Body by Daynes & Colin King (2006). This book often elicits inquiry based discussions led by the students and allows for a deeper understanding of how the human body works. Kindergarten students love to write sentences and draw pictures about their favorite activity in PE and many young students enjoy the “yoga center” which has cards with various yoga poses and a poem describing each yoga move to perform on their very own mat. Integrating literacy into the physical education classroom can be accomplished through collaboration and support without losing integrity of physical education standards or loss of physical activity time.

<table>
<thead>
<tr>
<th>Chart #1</th>
<th>Scramble for Scrabble: Integrating Literacy into Physical Education</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equipment</strong></td>
<td><strong>Set Up:</strong></td>
</tr>
<tr>
<td>1. Bananagrams tile letters (can purchase at Barnes &amp; Noble, Target, etc)</td>
<td>• Students will be in teams of 3-4 and begin on one side of the gym with a scooter and hula hoop (this is where they will build their words)</td>
</tr>
<tr>
<td>2. Hula Hoops (2 per team)</td>
<td>• Letter tiles (45-50) will be on the opposite side of the gym inside the team’s second hula hoop.</td>
</tr>
<tr>
<td>3. Scooters (1 per team)</td>
<td>• Students will take turns using scooter and upper body only to move to the other side of gym where they collect 5 letters and bring these back to the starting hula hoop.</td>
</tr>
<tr>
<td>4. Music</td>
<td>• This continues relay style.</td>
</tr>
<tr>
<td><strong>Alternative Options</strong></td>
<td>• Students will quickly begin to build words. Letters can connect just like a scrabble game.</td>
</tr>
<tr>
<td>• Use vocabulary words from physical education class or other classroom content areas (science, language arts, etc.)</td>
<td>• This game can also be played utilizing locomotor skills. Students can run, skip, gallop, leap, etc. to opposite side and collect letters.</td>
</tr>
<tr>
<td>• This game can also be played using bean bags or other tossables and buckets</td>
<td>• “This game can also be played using bean bags or other tossables and buckets.”</td>
</tr>
<tr>
<td>o Place buckets on the perimeter of gym and place polyspots inside the perimeter.</td>
<td>o Students will work with a partner and take turns moving to a spot, tossing into the bucket.</td>
</tr>
<tr>
<td>o If student makes the shot, he/she takes the spot and collects 5 letters from the teacher.</td>
<td></td>
</tr>
</tbody>
</table>

### 5. Conclusion

Recognizing the importance of a quality physical education program is the key to instilling a love of movement; confidence in physical abilities; enhanced social and cognitive abilities; and improvement in fitness levels. All children should be physically educated early in life in order to achieve NASPE’s definition of a physically educated person: “demonstrates competence in many movement forms; apply movement concepts to learning and development of motor skills; exhibits a healthy lifestyle; achieves and maintains a health enhancing level of physical activity; understands and respects for differences among people in physical education settings; and understands the physical activity provides for opportunities for enjoyment, self-expression, and social interaction” (NASPE, 2005, p.6).

However, with the enactment of No Child Left Behind, academic demands have increased and physical education and physical activity within our schools have decreased, which directly affects student achievement (Bynum, 2007). A quality physical education program not only is the key to getting kids on the right track for a lifetime of wellness, but can also serve as a support for improving school initiatives such as: reading and writing, without losing integrity of physical education state standards or loss of physical activity time.

Physical educators often teach in isolation and without leading edge staff development or collaboration with their colleagues or other professionals. Physical educators of the 21st century must pursue innovative ways to inspire and educate children’s minds and bodies. Integrating literacy into the physical education classroom can be successful through collaboration with classroom teachers, administration, and other agencies that promote children’s health and fitness. It truly takes a village.

### References


Fingon, J.C., (2011). Integrating children’s books and literacy into the physical education


The “iGeneration”: The Revolutionary Transformation of Technology in Elementary Schools

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Abstract — Upon their first encounter with school, children are exposed to daily activities with various types of technology. The virtual world has become a necessary tool for teaching in today’s classrooms. In most states, Educational Boards approve entirely of the use of a digital curriculum in elementary schools, and many well-known educators agree with this policy. However, there are critics who cite excessive spending and unneeded distractions associated with technology and contend that pencils, paper, and chalkboards work fine. Children, teachers, and the producers of the digital technology all benefit from its use because it draws the children’s attention, motivating them to learn and making it easier for the teacher to instruct the class. As part of a booming business, tech companies are making millions getting their products inside classrooms. However there are possibly detrimental side-effects caused by unbridled or misguided technology use including those related to cost, the development of social skills, a diminishing attention span, and the time it takes for teachers to learn and integrate new equipment. Without considering the best possible methods for implementation, technology may do more harm than good.

Keywords — classroom technology, education, digital literacy

1. Introduction

Since the advent of the first computers during the “baby boomer” generation, technology has risen very quickly to become an integral part of our daily lives. From simple radio talk shows, to interactive boards and iPads, as technology is being invented, developers are finding more benefits for communities. According to Matt Richtel in his article “Grading the Digital School; In Classroom of Future, Stagnant Scores” from The New York Times, because of a science and technology committee assembled by President Clinton in 1997, technology is also now seen in almost every public school classroom in America, especially those in elementary schools. Because of this, children from four years old are able to embrace the world we live in through virtual spaces. In fact, the Clinton committee’s report cited, “the successes of individual schools that embraced computers in the rise of test scores or the fall of dropout rates.”

Derrick Mears, of The Journal of Physical Education, Recreation & Dance, characterizes children entering elementary schools over the past couple of years as the “iGeneration”. With these children being introduced to technology since birth, they are becoming self-proclaimed experts in its use. This generation is learning much more quickly and in very different ways than previous ones, and they seem to catch on easily to new forms of literacy into. Mears affirms that Children are becoming advanced multi-taskers who embrace every bit of technology and the information it provides. Children are motivated to learn through digital tools, which is beneficial in every school setting.

Upon their first encounter with school children are being exposed to daily activities with various types of technology. The virtual world has become a necessary tool for teaching in today’s classrooms. In most states, Educational Boards approve entirely of the use of a digital curriculum in elementary schools, and many well-known educators agree with this policy. However, there are critics who cite excessive spending and unneeded distractions associated with technology and contend that pencils, paper, and chalkboards work fine. Children, teachers, and the producers of the digital technology all benefit from its use because it draws the children’s attention, motivating them to learn and making it easier for the teacher to instruct the class. As part of a booming business, tech companies are making millions getting their products inside classrooms. However there are possibly detrimental side-effects caused by unbridled or misguided technology use including those related to cost, the development of social skills, a diminishing attention span, and the time it takes for teachers to learn and integrate new equipment. Without considering the best possible methods for implementation, technology may do more harm than good.

2. Learning Best Through Play: The Case for Tech in the Classroom

“Computer Integration into the Early Childhood Curriculum” by Mona and Heyam Mohammad
presents “Piaget’s theory, known also as the constructivist perspective, [which] says that learners benefit most from ‘concrete’ experiences or hands-on activities that allow the learner to manipulate his/her environment in order to construct knowledge based on interactions with the world.” In other words, children learn best through play. Children love to use their imagination to build, paint, and role play. In previous generations, if a kindergartener was asked what their favorite activity at school was, you would hear them say, “I love to build with blocks,” or “I love the kitchen center.” If asked the same question today, the majority of the answers would be, “I love to play on the computer or iPad.” The updated answers make sense considering the world’s present use for technology, and the kindergartener’s feelings towards this still follow Piaget’s theory. Because of how advanced digital components have become, Ipads and computers are considered concrete objects that children can manipulate and have “hands on” experiences from around the world with.

Still many parents ask the question, “How are children learning with a digital classroom curriculum, when all they are doing is playing interactive games?” Simply put, this is just not the case. During a personal interview with Mrs. Beth Stiffler, a technology teacher at Hendrix IB World School, she confirmed that “through interactive games and websites children are learning without realizing it.” Likewise, Kristina Hatch’s article, “Determining the Effects of Technology on Children,” asserts that technology accelerates and enriches basic skills, and students who have access to this become more quickly engrossed in the material, and as such are able to absorb the information more quickly. It is a known fact that children have to always be engaged in things that are interesting and fun. That is how they learn. They enjoy the new aged virtual world, so why not make it part of their learning experience?

Mrs. Stiffler went on to state that children starting in 4K are learning the components of the computer. They are starting to understand the mouse and how to manipulate it as well as navigating through interactive children’s websites, which further improves fine motor skills and hand-eye coordination. In Kindergarten and first grade each child is starting to understand the keyboard and how to type sight words they are learning. By the time a child is in the third grade, they understand how to use their creative thinking skills and knowledge to put together a PowerPoint. Educators understand a child’s development, which is why they introduce children to the components of the computer for them to be able to get the most out of their experiences.

It must be stated that computers and other types of technology supplement, and do not replace, highly valued early childhood activities and materials, such as art, blocks, sand, water, books, explorations with writing materials, and dramatic play. Mona and Heyam Mohammad report that as long as teachers choose and find developmentally appropriate software and web sites that meet children’s interests and needs, and integrate them into the curriculum to best support the way young children learn, the children will develop positive attitudes towards learning. Although the same material is being taught as those in previous generations, electronic materials give children a three dimensional representation of what they are learning (Hatch). With the help of interactive educational games, teachers are able to bring math, reading, science, and social studies to life; at the same time children with disabilities like Autism are able to learn alongside their peers in a regular classroom.

Kristina Hatch claims that, “getting children involved with many types of educational tools, including technology, at an early age will further enhance their capabilities to be more successful in the real world and prepare them for the workforce.” Jeffery Macdonald, a journalist for USA Today, agrees with Hatch in that he feels that academic performance rose among those who routinely engaged in writing e-mail or running educational software. Although many researchers confirm a long list of positive reasons to include various technologies within the educational experience, parents question if the use will interfere with children’s ability to express their social skills within the classroom.

Early childhood teachers must understand that they play a key role in a child’s social development. Parents’ concern that the use of technology hinders a child’s social interaction is valid, but the level of social interaction is completely up to the teacher. Research has proven that if the teachers allow the natural process of collaboration to take place via computers or ipads, children will be encouraged to work together cooperatively. Mona and Heyam Mohammad claim that “the computer elicits more social interaction and different types of interaction.” There are moments when a child must focus on an assignment independently, but if a teacher wants the children to remain quiet during every computer related activity, it will have a negative impact on how they interact with their peers. Children need little moments throughout the day to discuss learning. This includes what they experience or notice in the virtual world.
3. Conclusions

Because of research and personal experience with my own children, I understand and support the use of technology in elementary schools. Even so, I believe it can become a problem if overused, and we must spend more time considering the long term effects. Because children enjoy their interactions with digital tools so much, if parents don’t limit use, they will become dependent solely on technology. Outside play and children’s ability to understand nature’s true beauty will become obsolete. Children’s health and connections with others will start to decline because all they will know is a virtual world. Genuine social interaction is still the key to human growth.

The technological world has morphed into more than just a source of entertainment, and there are more benefits from its use than possible disadvantages for children. Still, we must be diligent in teaching our kids how to manage technology. Hatch confirms that, “while it is okay to allow children to use technology for a limited amount of time, when it begins to become a substitution for personal interaction, issues begin to arise.” McDonald and the Education Corner believe having more than one computer in the home may cause children to be disconnected with school through a digital environment because they will become distracted. I believe parents must understand that the need to engage with children, preventing them from becoming completely engrossed in technological gadgets, ensuring that this and future generations have a chance of becoming well-rounded individuals. If we use some measure of common sense, students will not only be able to learn through the fast growing digital transformation, but will also thrive in a variety of environments and interactions with the world as they grow.

Acknowledgements

Tasha A. Thomas, Senior Instructor, Languages, Literature and Composition, Director, Spartanburg Writing Project
Beth Stiffler, Technology Coordinator, Hendrix IB World School, Spartanburg District 2

References


Stiffler, Beth. Personal interview. 19 Nov. 2012.
Participation in Equine-Assisted Therapies: Increasing Nursing Student’s Perceived Self-Efficacy in Caring for Children with Disabilities

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Abstract — The care of children with disabilities can be a challenge for nurses and nursing students. The purpose of this project was to provide nursing students in a 4 year undergraduate program an integrative clinical experience that would allow students to participate in alternative treatment modalities utilized in the treatment of children with disabilities. An additional goal was to increase the student’s perceived self-efficacy in caring for children with physical or mental disabilities. The students participated in equine-assisted therapy which provides horsemanship experiences in the form of therapeutic horseback riding and hippo-therapy to persons with physical and mental disabilities. The students were allowed to assist in the therapy sessions with clients that had various disabilities. Student clinical logs provided feedback which indicated that they were able to see the positive effect this type of therapy had on the clients and the students had an increase in perceived self-efficacy in interacting and caring for children with disabilities.

Keywords — disabilities, nursing students, self-efficacy, equine-assisted therapy

1. Introduction

The purpose of this project was to provide nursing students with an opportunity for an innovative clinical experience that would allow them to explore the role of equine-assisted therapy in disabled children and to increase the student’s self-efficacy in caring for and interacting with those clients. This clinical experience was initiated in part due to recognition that senior nursing students in a pediatric nursing course express their ineptness in caring for children with disabilities. Additionally, there are challenges for nursing schools in providing clinical venues that provide students with opportunities to care for disabled children. The Lander University Equestrian Center provided an opportunity for students to participate in therapy sessions with disabled children. This clinical experience was also instrumental in allowing students to learn more about complementary treatment modalities utilized in the treatment of clients with disabilities and allowed the students to develop a sense of self-efficacy in caring for those clients.

2. Student Nurses and Equine-Assisted Therapy

2.1 Children with Disabilities

According to the 2009-2010 National Survey of Children with Special Health Care Needs, it is estimated that approximately 11.2 million children in the United States have special health care needs. Over 8.8 million households have at least one child with a special health care need. This equates to 15.1% of children and 23% of households requiring specialized care. About 60% of those clients experience more complex service needs that necessitate complementary therapies that go beyond traditional therapies (Data Resource Center, 2010). Furthermore, according to the American Association of Colleges of Nursing, advances in science and technology have allowed individuals to live longer and often with chronic health conditions (AACN, 2011).

2.2 Students Attitudes and Self-Efficacy

Earlier studies demonstrated that nurses and students alike do not exhibit sensitivity and the appropriate attitudes in caring for children with disabilities (Matziou, et al., 2003). Additionally, Cervatez-Thomson et.al (2003) demonstrated that attitudes can be barriers to the rehabilitation progress of those with disabilities. In contrast, more recently, Sahin and Akyol (2010) demonstrated that nursing students and medical students generally had positive attitudes in caring for individuals with disabilities. It is important to note that even though positive attitudes are improved among medical and nursing students, Sahin and Akyol encouraged the development of disability awareness into the curriculum. There is little research regarding students’ perceived self-efficacy in caring for children with disabilities. This represents a gap in the literature and a demonstration of the need for more research in this area. Many nursing programs may be limited in their ability to provide clinical experiences that
provide an opportunity for them to care for disabled clients. Seccombe (2007) recommended that nursing programs design curricula that provide opportunities in caring for disabled clients with the goal to understand disabled clients’ health care needs and to promote positive attitudes. The curriculum for health care professionals should provide a means that students can interact and care for clients with disabilities.

2.3 Types of Equine-Assisted Therapy

The spark for equine-assisted therapies was sparked in the 1952 Olympics when Liz Hartel, diagnosed with polio, claimed that riding helped her recover from polio (DePauw, 1986). In 1992, the American Hippo-therapy Association (AHA) was formed and has been instrumental in facilitating the development of equine assisted programs throughout the United States. Equine-assisted therapy at the Lander University Equestrian Center (LUEC) offers two different types of therapy in treatment of clients with disabilities. Both the hippo-therapy and therapeutic horseback riding program utilize the movement of the horse to improve coordination, gross motor, postural skills, head control, and coordination (Casady & Nichols-Larsen, 2003). One distinction that exists is that therapeutic horseback riding does provide the client with instruction on equestrian skills such as controlling the horse, mounting and dismounting the horse, and care of the horse. In contrast, the client does not control the horse in hippo-therapy, but is assisted by the occupational therapist and two specially trained volunteers that are side-walkers. The side walkers are there to assist the occupational therapist and provide support and safety. There is growing evidence that equine-assisted therapy has many positive effects on clients of varied disability diagnoses. Two studies conducted by Casady and Nichols-Larsent (2003) and Benda, McGibbon, & Grant (2003) demonstrated that hippo-therapy had a positive effect on functional motor performance and muscle symmetry in children with cerebral palsy. Hippo-therapy was shown to have improved balance and decrease spasticity in clients with Multiple Sclerosis (Silkwood-Sherer & Warmbier, 2007). Another study by Lechner et al., 2003 demonstrated that hippo-therapy was successful in decreasing muscle spasticity in clients with spinal cord injuries.

2.4 Lander University Equine Assisted Therapy

Lander University, a four-year, liberal arts university offers an equestrian program that offers a minor in therapeutic horsemanship, a form of equine-assisted activity and therapy for children and adults. The program began offering equine-assisted therapies in the form of therapeutic horseback riding and hippo-therapy services in March 2010 (Lander University, n.d). The Lander University School of Nursing has partnered with the Equestrian Center since January of 2011 to offer clinical experiences for senior nursing students in a pediatric course. The program also collaborates with The Burton Center, which is a non-profit, governmental agency that provides services for people with disabilities such as autism, down’s, cerebral palsy, intellectual disabilities, head and spinal cord injuries. The students assisted the certified occupational therapist who is also a certified instructor by the North American Riding for the Handicapped Association (NARHA), which supports equine-assisted activity and therapy. Students were able to actively participate in the delivery of services by being side-walkers and facilitating follow through with the therapy sessions under the direction of the occupational therapist. This program has allowed to students to see the benefit that equine assisted therapy offers to those with physical or mental disabilities.

2.5 Student Feedback

Self-reflection clinical logs submitted by students demonstrated that students were receptive to the clinical experience at the Equestrian Center. This experience provided the students with an opportunity to participate in a treatment program that offers unique treatment modalities for those with disabilities. Students reported that their comfort level and knowledge level increased related to caring for children with various disabilities. Students made comments such as “now I feel like I have a working knowledge that will assist me in caring for children with disabilities” and “this clinical has helped me understand more about disabilities and the health care needs they have”. Numerous students commented in their logs that they were better able to understand the role of occupational and physical therapists in the care of clients with disabilities. Furthermore, students were complementary of the clinical experience and recommended this clinical for future students.

3. Conclusions

Senior nursing students participated in an innovative clinical experience in conjunction with the Lander University Equestrian Center. Students were able to learn about the innovative role of equine-assisted therapy in the treatment of children with disabilities. Additionally, students
actively participated in caring and providing care for those clients under the direction of an occupational therapist. As a result, students demonstrated improvements in knowledge about equine-assisted therapy and had increase in their perceived self-efficacy in interacting and caring for children with various disabilities. It is important to note that schools of nursing must be innovative in providing opportunities for students so that they can understand and gain an appreciation of the innovative treatment modalities that are utilized in the care of clients with disabilities. Additionally, it is important for students to participate in positive inter-professional teamwork. This outcome was demonstrated in that students commented that the experience was valuable because they were able to participate and see the role of inter-disciplinary care. According to the National League for Nursing, student experiences should be planned around common health problems in population groups and not be totally driven by completing a quota of clinical hours or rotations (NLN, 2008). The focus should be on learning goals and the achievement of the goals rather than the number of hours that a student attends a clinical rotation. This clinical experience which utilized equine-assisted therapies provided an opportunity for students to increase their knowledge and comfort level in caring for children with disabilities.

References


Abstract — As clinical sites in acute healthcare settings evolve with ever changing technology to streamline quality patient care, faculty members are challenged to develop a creative way to enhance clinical teaching. Since many students enjoy such medical dramas as “Grey’s Anatomy”, a miniature version of the “Grand Rounds” approach to clinical teaching was adopted for senior nursing students. The application of adult learning theory was used to develop a strategy for enhanced clinical learning in which students present their patients to each other, stating priority concerns. Additionally, students break away from the bedside for short amounts of time throughout the day and meet to discuss medications, labs, telemetry strips, and nursing skills. Students receive an assignment pertaining to these topics at the beginning of clinical and they must present on their assigned topic in these mini “rounds”. This facilitates students’ abilities to problem solve critical issues in a non-threatening environment. It affords students the opportunity to become active participants in the learning process while encouraging their peers to do the same. What began as an attempt to maintain thorough clinical teaching has evolved into an excellent learning tool.

Keywords — clinical learning, adult learning theory

1. Introduction

Clinical teaching is an integral part of nursing education. It is in the clinical setting that students are afforded the opportunity to apply concepts learned in the classroom to a living, breathing patient. They must carefully use the nursing process, theories, and knowledge they have gained in their nursing courses to provide safe and effective care to individuals and their families during a clinical shift. By the time students reach the senior level in nursing school, their knowledge base is significant. The expectation at this level is that students possess the tools to critically look at their patients and formulate a plan for their care, utilizing the information available to them in the forms of laboratory data, medication lists, assessment data, and others. This educator found this not to be the case among the students for whom she was responsible. Additionally, valuable clinical teaching time was being spent teaching students how to use the various technologies that are available to them in acute care settings. Students were spending much of their time in the clinical setting immersed in the technology: charting on the computer and reviewing labs and medications and less time at the bedside learning those skills of therapeutic communication, touch, and other hands on nursing activities. This nursing educator was faced with the challenge of providing an excellent clinical experience for nursing students in their first semester of their senior year in nursing school while balancing factors such as emerging technologies at the bedside and increasingly higher acuity in patients. In Billings and Halstead (2009), Knowles describes the preferences of the adult learner. They prefer to use problem-focused learning and draw on their life experiences to solve problems. Additionally, according to Jackson and Caffarella (1994), adult learners learn well when connected and supported by their peers and when they see a direct benefit in the concepts to be learned. Using adult learning theory and a popular television show, a method of clinical teaching was developed that allowed students to better utilize their time spent in an acute care clinical setting, while allowing them to solve real life, real time problems using their knowledge learned in the classroom.

2. Project

Students participating in the clinical portion of the Critical Care course are faced with the challenge of caring for patients with higher acuity than they have ever cared for in their nursing education. The nursing faculty was torn between trying to give the students appropriately challenging assignments in terms of acuity as well as increasing the students’ time management skills by adding the responsibility of multiple patients. As previously mentioned, students were struggling with the technology required to care for these patients and seemed unable to fully grasp the “big picture” of their patients. It was noticed that these students were not spending as much time with their patients and they were frustrated about their learning situations. They found little value in caring for multiple patients while trying to chart and use the various electronic applications to document their actions. They felt that their care was disjointed and haphazard.
The nursing educator collaborated with some seasoned nurse educators to develop a plan for the students to enhance their clinical learning using the popular television show Grey’s Anatomy. Using adult learning theory, the students would care for only one patient; however, they would be held to a higher standard in terms of their understanding of patient care. Additionally, students would be given extra assignments to augment their learning in the clinical setting. Students begin their clinical experience with one patient for whom they provide total care. After receiving report, students meet together and, in a format reminiscent of “Grand Rounds”, students present their patients to each other, telling each other pertinent information about their patients and deciding what the top three nursing priorities will be for the day. Additionally, the students prioritize together the patients that get their morning medications first, second, and so on. This concept is presented to students as a format similar to rounding on patients in the show Grey’s Anatomy, where they are asked questions about their patients and their recommendations are considered in their plan for the day.

In order to address the whole patient, the additional assignments students are given reflect an aspect of their patient’s care that needs attention. The student uses clinical time to research that aspect and then presents to the students as a small group. For instance, laboratory values are very important aspects of patient care. Treatment decisions are made based on laboratory data. A student may be assigned “lab rounds” in which they present their patient’s lab data and discuss the implications of that for patient care with their peers. Other students are assigned EKG rounds in which they interpret EKG strips and discuss what their patient’s assessment related to their cardiac rhythm. They also discuss any treatment concerns regarding that rhythm. The student assigned medication rounds discusses their patient’s medications and the nursing implications surrounding medication administration. The students are pulled out of the clinical area for small amounts of time (less than 15 minutes) throughout the clinical day to present on their particular assignment. This peer discussion is merely facilitated by the clinical faculty and the students are presenting what they have researched and are directly relating it to a patient they are caring for at that time. This is in accordance with adult learning theory: recognizing that adult learners learn best when they see value in assignments. These additional assignments assist students in developing a clearer, broader picture of the patients for which they are assigned to care. When students are separated from patient care for such short amounts of time, it becomes very important that they are succinct and present their findings concisely, stay on-topic, and come to conclusions regarding their additional assignments, so that the care of their patients does not seem fragmented. Additionally, providing total care for one patient, while working on these extra assignments ensures that the students will spend time at the bedside to complete their cares, yet it also adds some additional responsibility and rigor to a student’s assignment as a senior nursing student.

3. Conclusions

Technology will continue to change to enhance patient care in acute care settings. Clinical teaching is an extremely important aspect of nursing education and must continue along with and in spite of this evolving technology. Students have been able to relate to this project because it relates to something many of them watch religiously on television. Students participating in clinical utilizing this format have reported great satisfaction and increased learning as a result of this project. The nursing educator’s biannual clinical evaluations have reflected this improvement. Additionally, students have shown anecdotal evidence of deeper learning that has been carried forward to subsequent semesters as a result of participating in this type of clinical experience. This anecdotal evidence alone is substantial enough for this nursing educator to maintain this format for clinical teaching. It seems that in recognizing the method in which adults learn best and capitalizing on them, these nursing students are finding value in their patient assignments, are able to support one another in their learning and decision making, and are acquiring deeper knowledge that will be of great benefit to them as they progress in the nursing program.

Acknowledgements

This project would not have been possible without the direction and creative genius of my coworker, Dr. Holisa Wharton. Dr. Wharton developed the basic concept of resurrecting “grand rounds” and she also made suggestions regarding the extra assignments. The encouragement and support of Dr. Robbie South, Director of the Lander University William Preston Turner School of Nursing has been invaluable in this endeavor as well. Changing the senior nursing students’ patient care responsibility from multiple patients to only one patient may have seemed a step backwards at the time; however, I am grateful that this has
shown to be a step in the right direction in terms of clinical teaching and student learning. Finally, I want to thank my mentor, Dr. Theresa Lawson for encouraging me in everything I do.

References


Perceptions of Graduate Students Transitioning into Nursing Positions

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Abstract — Graduate nursing students experience transition shock when entering the professional work environment and experience ongoing challenges within their first year of practice. The purpose of this paper is to explore the feelings and perceptions of nurses who have graduated within the past year and have transitioned into a staff nurse position in the hospital.

Method: Qualitative research design was used. Purposive sample of nurses who have graduated within the past year from nursing school and who are currently employed in an acute care hospital was used. A semi-structured interview solicited participants' perceptions and feelings about transitioning from student to staff nurse. Results: Five interviews were performed consisting of participants from a variety of work environments. Preliminary results indicate having support, developing trust, and building confidence as important factors in transitioning from a new graduate position into the professional role. More detailed results are pending based on the content analysis of the interviews.

Implementation to Nursing Practice: Sharing the findings from the research with nurse educators may provide information so that nurse educators can support senior students in their transition.

Keywords — new graduate transition, staff nurse, perception, experience

1. Introduction

Students are faced with reality shock when transitioning from a dependent student role to an independent nurse role. The worldwide shortage of nurses is extraordinary and the demand for full-time nurses is increasing faster than the rate at which nursing students are graduating. In North America 33-61% of new employees either change their area of employment or leave nursing altogether in their first year of practice (Duchscher, 2009). Consequently the challenges of replacing those nurses who have left the workplace and the knowledge needed to understand the supportive environment for those entering into the professional role should be considered and explored. The loss of any nurse can be a devastating event to the future of nursing care.

2. Literature Review

It has been reported that the transition into professional practice is thought to occur within the first 12 months, as a graduate becomes a registered nurse (Duchscher, 2008). At the beginning of their nursing careers, new graduates make significant adjustments in both their personal and professional roles. It is a period of adjustment that also includes physical, intellectual, developmental, and socio-cultural changes (Duchscher, 2008, 2009). Entering into the professional environment graduates find that they do not exhibit confidence and practice expertise to navigate the stressful and highly dynamic environment resulting in increased anxiety and stress levels (Duchscher, 2008, 2009).

Gaining knowledge and understanding of the perceptions of role transition from a graduate to a professional nursing role will assist in a successful adjustment of new graduates into the dynamic and intense environment of the professional nursing practice.

Exploring the experiences of new graduates in their transitions in the first year of practice demonstrates ongoing challenges including building confidence, developing trust, and having support. During their transition into the professional role enjoyable and rewarding experiences for the new graduates were reported as being encouraged and supported in their learning (Parker, Giles, Lantry & McMillan, 2012). Dissatisfaction was seen to be related to the absence of this expected support in the workplace (Parker, Giles, Lantry, & McMillian, 2012). New nurses initially feel that they lack confidence in their own abilities, skills, and knowledge. However feeling uninhibited in asking for help and questioning others instills this general confidence that new nurses’ feel they are in deficient of (Parker, Giles, Lantry, & McMillian, 2012). Understanding the important factors that influence the transition of new graduates will provide nurse educators in enhancing and implementing strategies to allow for a healthier adjustment.

The conceptual framework utilized for this research is based on the Transition Theory as described in Duchscher 2008. According to Kramer 2004 as cited in Duchscher, 2008, nurses
experience various levels of stress, disorientation, and disillusionment. Newly graduated nurses must be given the time to gather clinical knowledge, build confidence, establish relationships, define workload demands, and understand the required decision making within the organization.

3. Purpose and Research Question

The purpose of this research study was to explore the feelings and perceptions of nurses who have graduated within the past year and have transitioned into a staff nurse position in the hospital. This information will be utilized in both the educational setting and the practice setting to support graduate nurses’ transition. What are your perceptions of the transition from student to staff nurse?

4. Method

A qualitative method was used for this study in order to understand the lived experiences of the participants. Purposive sampling method was used to select newly graduated nurses to participate in the study. Inclusion criteria were nurses who have graduated within the past year from an accredited nursing school and who are currently employed in an acute care hospital. A semi-structured interview was used to solicit the participant perceptions and feelings about transitioning from a student to a staff nurse. Content analysis techniques were utilized to identify and define themes and concepts. Following transcription of the data participants were asked to review their comments for accuracy and validity prior to analysis.

Following approval of the IRB, the participants were provided with information related to the purpose of the study, the volunteer nature of their participation, and an informed consent was obtained. The participants were informed that the session was taped and transcribed. In addition, the tapes, notes, and transcription were secured and confidentiality was maintained.

5. Results/Conclusion

Five interviews were performed consisting of participants from a variety of work environments. Preliminary results indicate having support, developing trust, and building confidence as important factors in transitioning from a new graduate position into the professional role. More detailed results are pending based on the content analysis of the interviews.

6. Implementation to Nursing Practice

Sharing the findings from the research with nurse educators may provide information so that nurse educators can support senior students in their transition.

References


Preparing Nursing Students for Real Life Using Second Life (Virtual World)

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Abstract — Preparing students to enter the practice environment, educators must develop strategies that encompass the technologies of the 21st century. Purpose/Framework: This research will explore the effectiveness of the MUVE as a learning tool to improve student learning outcomes. Constructiveness learning and game theories are the theoretical underpinning. Research Design: Quantitative quasi-experimental approach consisting of two groups of students enrolled in nursing courses from two campuses (experimental group, control group). Sample: Non-random sampling selected from prelicensure students who volunteer to participate and are enrolled in the nursing courses (interventional group) from one of two campuses. Data Collection: A pre-test and post-test on oral medication administration scenario (OMAS) was given to both groups. Results of the pre-test, post-test will be compared between the interventional group and control group. Student (interventional group) engagement and participation level was measured by identifying frequency students enter SL, participated and completed the OMAS. Results: Thirty-seven 37 students participated in SL, 4 entered SL 20-23 times, 20 entered 5-19 times, and 13 entered 1-4 times. Thirty-one students had a positive score in the OMAS, and 20 students scored 350 points or greater. The results of the pre/post-test, scores on the unit and final exam are pending. Conclusion: This technology allows students to practice, make mistakes and reflect on their clinical reasoning without risk of harm to a real life patient while translating their learning to the hospital environment.

Keywords — Virtual World, Nursing Education, Constructiveness Learning, Second Life, Simulation

1. Introduction

Providing students with multiple and varied means of learning in the complex world of nursing and preparing them to meet the demands of the dynamic healthcare environment is a critical role for today’s nurse educators. In order to adapt to the changing characteristics of today’s nursing students, nursing education must also embrace and apply technology to support student success in nursing programs. It is imperative that educators create opportunities to engage students in a world that draws them in and entices them to become a more active learner. The creation of nursing healthcare complex in a multi-user virtual environment (MUVE) using Second Life© provides an interactive, guided patient, family and healthcare team experience. The student selects an avatar identity in the virtual world and is transported to a simulated healthcare system to care for simulated clients and families. In this environment avatar students develop nursing process skills and clinical reasoning without risking patient’s safety and without experiencing undue stress or anxiety. In addition, skills such as therapeutic communication, assessment, prioritization of care, patient safety, and professional behaviors can be taught in a way that allows the student to recognize patterns.

The potential of the MUVE is tremendous as a learning environment by providing opportunities for students to practice real-life patient scenarios in a virtual safe environment (Broom, 2009; Brown, et al., 2012, and Dutile, et al., 2011). Students of today are more comfortable with technology, social networking and the internet. There have been a number of studies indicating that the use of MUVE has a positive effect on learning both in social interaction, cognitive higher order thinking, knowledge acquisition, and knowledge construction (Beard, Wilson, Mora, & Kellan, 2009; Dass, et al., 2011; de Freitas, et al. 2010; Jarmon, Traphagan, Mayrath, & Trivedi, 2009; Mayrath, Traphagan, Jarmon, Trivedi, & Resta, 2010). Based on constructivist learning theory and serious gaming concept it engages and challenges students. Constructivist and online collaborative learning theories offer concepts that can be used to construct distant and virtual world educational programs and learning opportunities. The inclusion of game theory (Aldrich, 2009; Bauman and Games, 2011; Bronack, et al., 2008; Burguillo, 2010, and Wang and Chen, 2010) enhances engagement and motivation adding to increased student involvement and collaboration in their learning.
2. Problem/ Research Question

Does the MUVE, as an augmented learning tool, provide an effective method to support successful achievement of the program learning outcomes (critical thinking, competency, communication, and professional behavior)? Will students, who experience the virtual world nursing education environment as an augmentation of the traditional methods (lecture/podcasting, textbook, clinical experiences) of learning, have a greater level of engagement in their learning process as compared to the student learning through traditional methods?

3. Methodology

This abstract focuses on phase II of a two phased research study. Phase II is investigating if the use of a MUVE would enhance student learning. A patient scenario for oral medication administration scenario (OMAS) was developed based on Safe Medication Administration principles to evaluate these behaviors of critical thinking, competency of specific skills, therapeutic communication, and professional behavior.

Sample

The sample will be drawn from 47 students enrolled (experimental group) in a first semester skills class and who volunteer to participate. Sixty-five students enrolled in a similar course at a separate campus of the same Southeastern University, was the control group. The students in the experimental group were given a pictorial training manual and provided one-on-one training to assist them in developing the skills necessary to navigate and interact with the virtual world, healthcare complex, and the oral medication scenario. Students were given access to MUVE (avatar name and password) and provided instructor led training sessions. The study was approved by the Institutional Review Board (IRB) approval of University of South Carolina.

Data Collection

Level of participation in the OMAS was measured for all students in the intervention group. An oral medication administration scenario (OMAS) pre-test was administered four weeks into the semester and a post-test was administered at the end of the semester (3 months later) to the experimental and control groups. In addition, test scores on the unit medication test and scores for medication question on the final exam will be compared.

4. Results

Forty-seven students were willing to participate in SL. After 10 weeks of access to SL, 37 students participated in SL, 4 entered SL 20-23 times, 20 entered 5-19 times, and 13 entered 1-4 times. Thirty-one students had a positive score in the Oral Medication Administration Scenario (OMAS), and 20 students scored 350 points or greater. The results of the pre/post-test, scores on the unit and final exams are pending.

6. Discussion/Conclusion

The results are pending as to the effectiveness of student learning using MUVE. Responses from student when asked their perceptions of the MUVE in a post course survey were mixed. The students felt that OMAS met the four program objectives. The students in rank ordered the benefits of MUVE as a teaching strategy with accessibility and simulated a real life environment reported high when performing the OMAS. Though many students did not feel that the OMAS was engaging, several remarked that they would participate in future activities. The deep learning curve, technology issues, and the amount of time where reported to be the barriers to a greater level of engagement by the students. Students did comment that they thought this has potential once some of the technical issues were resolve. This technology has the potential to allow students to practice, make mistakes and reflect on their clinical reasoning without risk to a real life patient while being able to easily translate their learning to the hospital environment.

7. Conclusions

In previous research using focus groups, the both the student and faculty members perceived that MUVE was an effective method in meeting student learning outcomes. The faculty and students perceived that MUVE was easy to use, engaged students in their own learning, and agreed that the SL felt realistic. In addition, students thought the point system was important to keep them challenged and engaged. Both the faculty and students believed that this environment was realistic enough that they could translate their learning experience from Second Life (SL) to Real Life (RL). In the preliminary results of the initial introduction to SL in the fundamentals nursing course, the students found that the technological learning curve was considerable and time consuming. Several students did express that they saw the potential of SL as an excellent learning...
environment because of their ability to practice in a timeframe that was convenient for them. The researcher found the need to strengthen the course content in the area of safe practice medication administration.

This current study is a continuation of the previous efforts using pre/post-testing and student evaluations to explore the use of immersive technology in the form of MUVE (SL) as an effective teaching strategy to support student learning. The learning objectives of competency, critical thinking, communication, and professional role behaviors are goals to achieve in developing a student nurse who can transition successfully into the professional practice of nursing. We envision that use of simulation and MUVE teaching strategies will facilitate student achievement of these learning objectives and prepare them to be responsive, competent, confident, communicative, and caring nurses of the future.

References


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Impact of Item Specific Marketing to Children on Zoo Gift Shop Sales

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Abstract — Children are a target market segment because they generate purchases of their own and influence their parent’s purchases. Advertising to children is incorporated into video games and websites, as well as the traditional television commercials. On-site advertising is also an inexpensive way to induce unplanned purchases. This study explored the impact of on-site marketing at a zoo for specific items located the gift shop. During the first week of research item-specific marketing was displayed on children’s eye-level. The second week of research displayed item-specific marketing on adult-level. The final week was generic advertising for the gift shop without eye-level consideration. Results showed more sales for the item advertised during the first week, than any other week.

Keywords — zoo, children, marketing, sales, gift shops.

1. Introduction

Marketers and psychologist agree parents’ purchases are influenced by their children (Singh & Kaur, 2011; Rust, Langbourne, 1993). From Australia, to India, the UK, and the United States target-marketing aimed at children is of interest to those attempting to better understand how to reach this lucrative market segment and those trying to regulate the practice (Singh & Kaur, 2011; Rust, Langbourne, 1993; Hamilton & Cattrell; Beder, 1998). With an estimated $320 billion in household merchandise sales influenced by children under the age of 12, (Hamilton & Cathrall, 2006) marketers are extremely interested in understanding how to capture the attention of this population (Singh & Kaur, 2011). According to Singh and Kaur (2011), “various studies have shown that almost 30% of parents buy the toothpaste their kids choose p.19.” In addition, Hamilton and Cathrall (2006) stress that even large purchases such as automobiles are influenced by children. While marketers want to better understand how to reach children, others are concerned with marketing’s effect on children.

Marketing to children is everywhere. Once mostly confined to Saturday morning cartoons advertising to children is now incorporated in video games, websites, and movies (Fonda & Rosten, 2004). Researchers agree that children under seven have difficulty distinguishing between ads and entertainment. One study found young children viewed commercials as a form of “public service” (Pine, n.d.). Clay (2000) reported on one segment of psychologist seeking to stop other psychologist from working with companies to help them better understand how to connect with children. One psychologist explained he always asked young clients what they want to be when they grow up. He reports the responses use to be geared toward intrinsic occupations like astronaut or nurse, but more and more the response is “make money”. Marketing to children is also held accountable by researchers for increased violence, family stress, negative values, and most of all childhood obesity (Singh & Kaur, 2011).

Influenced by the prior research, the following study examined the impact of on-premise marketing in a family environment. Marketing aimed at children should capture their attention and motivate them to influence their parents’ purchases. Marketing aimed at parents predictably should have a lesser impact on purchasing behavior. The research further aimed to see if item-specific marketing was more influential than generic marketing. The research was conducted in a local city zoo and promoted items located in the gift shop. The hypothesis of this study is that specific-item marketing efforts on the zoo premises presented on children’s eye-level will produce a greater impact on sales, than specific-item marketing, or generic marketing presented on adult eye-level.

2. Methodology

The study that was conducted was implemented once a week, on Saturdays, over a three-week period on the grounds of the Greenville Zoo. Every week there were four signs placed throughout the zoo in the same areas to allow for consistency. The first was attached to the front of an A-frame located by the entrance gate. This allowed for those waiting in the line to see the advertisement. The next one was on the back of the same A-frame. This gave the visitors a last chance to get gifts and visit the Gift Shop. The third sign was placed outside the Reptile Building and the final sign just outside of the Gift Shop. The only variables that changed were the item the sign advertised and the
eye-level at which it was placed. Finally, an observer spent time outside the entrance gate and by the gift shop to note the reactions of children and adults to the signs. Each advertisement is attached.

The first week was an advertisement placed on the eye-level of children. The advertisement was for stuffed animals. Ideally, it would have just been one animal, however, due to inventory concerns the stuffed animal had to be changed out which also caused an increase in the price. The first animal was a giraffe that was marked at $5.99. The latter animal was also a giraffe, that marked the birth of the Greenville Zoo’s own giraffe, Kiko. It sold for $14.99. The stuffed animal was actually attached to the poster by zip ties. The second week was observing the amount of Kiko Posters that sold on the eye-level of adults. The signs did not have a 3-D effect, as what was being advertised was another poster. The last week was just a generic sign advertisement that stated some of the products that the Gift Shop contained. This sign was put in the same locations as the previous weeks; however, eye-level was not taken into consideration, as this was a control variable. The overall success of this week was recorded to allow for comparison to the other two weeks. Attached are the posters for each week (Figures 1-3) and the corresponding pictures that go along with the poster (picture 1-2).

3. Results

The results supported the hypothesis. Item-specific marketing on children’s eye-level produced a significant increase in purchases of the plush giraffes. The week in which the best results were recorded in relation to the item advertised was the first week. During that time the stuffed animals sold totaled 21 transactions (8 Kiko Giraffes and 13 9” Plush Giraffes), while the Kiko Poster in the following week only sold three despite being significantly less expensive. The final week recorded selling only two Kiko Giraffes and no Kiko Poster.

The number of visitors to the Greenville Zoo was also recorded each week. The first week recorded 519 visitors who spent $393.54 in gift sales. This averaged to $0.76 per person. The second week clocked 1,706 guests with $1,624.20 in total sales. This averaged $0.95 per person. This week had above average sales, as the weather in Greenville was unusually nice. The last week recorded 2,613 visitors who purchased $2,002.60 in gift sales. This averaged $0.77 per person. This week the zoo celebrated the orangutan Baby Bob’s 7th birthday and his Super bowl prediction. Again, while the sales were lowest during the first week, the items advertised on children’s eye-level sold more than in the other two weeks monitored. See the table at the end of the paper for a summary of each Saturday and its results.

4. Conclusion and Limitations

This was a limited study. Only three attempts were made to control advertising and monitor sales in the gift shop at the Greenville Zoo. The results support the hypothesis, but a longer range study over an extended period of time would help to verify results. Due to the shortage of the original item marketed, leading to the necessary use of a more expensive plush toy, the variation in weather and events occurring at the zoo results may fail to show the true effect of diverse marketing styles. Further, while some observations of child-parent interaction supported observations recorded...
in the Rust (1998) study, others failed to show correlation to that study. For example, young children did interact with the 3-dimesional plush animal attached to the sign in week one. Several children appearing to be under age five, touched, hugged, and pointed to the toy, just as recorded in the 1998 study. Children older than five were more inclined to stop and look and ask the adult accompanying them to look at the animal. However, while Rust’s observational study concluded that children under the age of five had the lowest influence on their parents’ purchases; observations in this study saw the opposite effect. Particularly, during week one adults accompanying children younger than five were more likely to enter the gift shop. Adults with multiple children and children over five years of age more frequently declined request to enter the gift shop. Actually, adults with children under five years of age often instigated entrance to the gift shop. This may indicate a difference in locations that marketers should consider. While trips to stores may be a common occurrence, trips to family-oriented destination such as zoos and amusement parks may change the dynamic of purchasing influenced by children. Perhaps due to parents wanting to provide a souvenir especially if it is the child’s first visit to the location.

Another consideration is the presence of grandparents. While many studies examined how children influence their parents’ purchases, grandparents may be a possible market segment that advertisers should consider. In the Greenville Zoo study, it was observed that those appearing to be grandparents almost always took the children, regardless of age into the gift shop. They also appeared to purchase items more often than those adults appearing to be parents.

Children are exposed to consumerism at an early age as they shop with their parents and observe advertising on television and the Internet (Beder, 1998 & Fonda & Roston, 2004). Parenting style influences how children react to marketing (Carlson, Lacznia, & Wertley, 2011). While marketers try to understand how to reach children effectively, many psychologists attempt to help parents understand marketing’s effect on their children and limit its reach. Research shows that more restrictive parents are actually less inclined to want limitations placed on advertising, while more permissive parents believe there should be more controls (Carlson, et al., 2011). This implies that the more restrictive parents take a more active role in socialization of their children. Consumer socialization is “an adult-initiated process by which developing children, through insight, training, and imitation acquire the habits and values congruent with adaption to their culture (Carlson, et al., 2001 p.428).” Marketers may have difficulty reaching the children of these parents. However, through effective advertising they can reach even very young children.

On-site marketing can attract children’s attention by including bright colors and shapes. This also incorporates the parents since research shows parents often use colors and shapes on packaging to teach their children (Rust, 1998). In addition, on-site marketing increases trigger recall and helps promote sale items to induce shoppers to make unplanned purchases (allbusiness.com). This study revealed that purchases influenced by children may vary in family-oriented locations like zoos, as compared to traditional retail environments. Targeting the child segment of society through television and the Internet is effective, but on-site marketing holds possibilities to increase sales of specific items with little cost.

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References


Barth,D., McAlister,A., & Cornwell,T.B.(n.d.). Paths to persuasion when advertising to young children. Advertising Conference Proceedings, 88-68


Maximize your in-store marketing efforts.


Table 1. Summary of results for each Saturday.

<table>
<thead>
<tr>
<th></th>
<th>9” Giraffe</th>
<th>Kiko Giraffe</th>
<th>Kiko Poster</th>
<th>Total Visitors</th>
<th>Total Sales ($)</th>
<th>Average Sales ($)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1 (1/12)</td>
<td>13</td>
<td>8</td>
<td>0</td>
<td>519</td>
<td>393.54</td>
<td>0.76</td>
<td>Eye-Level of children Advertised: Giraffe Plush Animals</td>
</tr>
<tr>
<td>Week 2 (1/19)</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>1,706</td>
<td>1,624.20</td>
<td>0.95</td>
<td>Eye-Level of Adults Advertised: Kiko Poster</td>
</tr>
<tr>
<td>Week 3 (1/26)</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2,613</td>
<td>2,002.60</td>
<td>0.77</td>
<td>General Marketing on Adult Level</td>
</tr>
</tbody>
</table>
Advertising Strategy for a Freelance Business: the Case of Painter Designs Photography

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Abstract — Marketing and advertising is very important to any business. There are many expensive mediums to get your company's message to the public and your target market. However, the most effective form for Painter Designs Photography has been word-of-mouth advertising.

Keywords — word of mouth, freelance, advertising, marketing, small business.

1. Introduction

Many companies and businesses spend millions of dollars on marketing and advertising to get the attention of new customers and to keep their name or product on the minds of previous customers. However, as Goodman (2005) noted, individuals often ignore one of the “most effective and least expensive mediums”, word-of-mouth advertising (p. 16). Good publicity and referrals from happy customers is a great way to obtain new clients. If organizations provide great customer service and a great product, the customers will want to inform their friends, family, colleagues, etc. This research study will discuss the effectiveness of word-of-mouth advertising versus other means of advertising, based on survey analysis, and how it has contributed to the success of a freelance photography business, Painter Designs Photography.

The time-tested success of effective word-of-mouth advertising is a testament to the power of networking and its ability to generate referrals. Ivan Misner of Entrepeneur.com compared relationship networking to catching fish in his article, “Great Referrals Aren't Accidents.” He stated:

Referral networking is a lot like catching fish by casting a net. Each fish comes to the net by a different path--each has a unique “story” that is not repeated. You don't focus on a particular fish and then try to get it to come to the net--in fact, you probably don't even see the fish until you pull in the net. Instead, you focus on the action of setting the net. You know that if you set your net correctly and consistently, fish will eventually come, no matter what path they take to get there (Misner, 2010).

By building relationships with people, the size of the net becomes bigger and the result is more referrals. By harnessing the power of the Internet and social media, building relationships is no longer about a phone call or knock at the door. Even after the sale is complete, it is still important and also possible to make the customers feel special and hopefully, special enough that they will want to share their experience with someone else. Building those relationships in today’s connected world is more important than ever, because potential customers are able to talk about your company instantly by texting, emailing, and “liking” on Facebook or other social networking sites. Misner (2010) said it best when he stated, “When it comes to networking, there is no coincidence about referrals. They are the inevitable cumulative result of the day-to-day activities of relationship-building.”

Brad Fay, the Chief Operating Officer of the research firm, Keller Fay Group stated, “Word-of-mouth used to be considered experimental and speculative, but now it is an essential tool.” Evidence of word-of-mouth advertising’s effectiveness can easily be seen in the company’s spending (von Hoffman, 2007). This is especially true given the small advertising budgets many small entrepreneurs are afforded.

An article in the Journal of Consumer Research, by Andrew D. Gershoff, Ashesh Mukherjee and Anirban Mukopadhyay (2007), explained research that identified a positive effect in evaluations from consumers about a product, brand or company. “Previously loved alternatives” are believed to be more informative than agreement on a product, brand, or company that was previously disliked by the consumer. Prior research has shown this is due to the accessibility of liked or loved memories in the brain about some event. Also, if someone agrees with another individual on some product, brand or company, the person could then assume that they have “similar tastes” on many different types of characteristics. Therefore, the individual will continue to seek out the expertise and advice on other information from
this consumer (p. 500). Research has also shown that the vividness of the information shared through word-of-mouth is important. Information about a subject that is presented in a lively and detailed way “tends to have a stronger influence on product judgments” (Herr, Kardes, & Kim, 1991, p. 454). Social media certainly provides a fast medium in which to both give and receive such advice.

2. Methodology

The study was conducted by using two studies. The first study included a five-question survey. The second study examines information regarding the data on the length of photo shoot sessions booked and advertising. The first study survey was administered on Qualtrics.com and was sent via e-mail to clients that have previously utilized Painter Designs Photography for their photography needs. The respondents equaled thirty individuals. Therefore, the sample size for the survey was thirty and the population was all individuals that could become potential clients. Since participants were e-mailed the survey, they had adequate time to read and respond to the survey on their own time. However, participants responded rather quickly and the results were obtained within forty-eight hours after being sent. The dependent variables were intermixed with another question pertaining to the sex of the survey participants. The survey included a total of five multiple-choice questions.

After individuals responded to the survey, the results were available to view immediately on the Qualtrics website. Most of the participants sent a reply e-mail and explained that they had completed the survey. Those participants were then sent a “thank you” e-mail for responding to the survey.

3. First Study Results

The first question was an independent question and the results were expected. Out of the thirty participants surveyed, twenty-seven were female and three were male. This question was first asked to obtain more information out of curiosity for the overall survey of clients. The results were expected to follow the pattern of being heavily skewed toward the female majority response and explain that my targeted market, woman, is correct.

The second question asked how the client first found out about Painter Designs Photography. The answer choices were: 1) A friend or family member (word-of-mouth); 2) Facebook; or 3) my website. The first choice obtained twenty-four responses (80%). The second choice received six responses (20%) and the third choice received zero responses (0%). Table 1 visually displays the above data:

<table>
<thead>
<tr>
<th>A friend or family member (Word of mouth)</th>
<th>Facebook</th>
<th>My website</th>
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</thead>
<tbody>
<tr>
<td>24</td>
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</tbody>
</table>

Table 1. First study results.

The third question “Do you frequent Painter Designs Photography on Facebook for upcoming specials and events?” required a simple “yes” or “no” response. Twenty-seven participants responded “yes.” “No” received three responses from participants. Question number four had the option of choosing multiple responses. There were five choices that participants were able to choose one or multiple answers from. These included: 1) A thirty-minute family or single session; 2) a one-hour family or single session; 3) an engagement session; 4) a bridal portrait session; and 5) a wedding package.

The first and second options were tied with the most responses from the choices. “A thirty minute family or single session” and “a one hour family or single session” both received sixteen responses each. The third choice, received six responses. The bridal portrait session option received three responses and the wedding package option also received three responses.

The last question in the survey asked, “How likely are you to use Painter Designs Photography again for your photography needs?” The participants were instructed to use a slider mechanism on the website that had a range from zero to one hundred. Zero was “not at all likely” and one hundred was “extremely likely” to use Painter Designs Photography again for a session or package. The participants had the option to slide the mechanism to any number that they felt best described their desired response from zero to one hundred. The average response value was ninety-six. The lowest response received was sixty-five and the highest response was one hundred. The “min value” number of sixty-five brought down and skewed the overall average or mean value.

4. Results/Explanation

The survey results showed that even though some of my clients are male, the majority the clients were female. Since the targeted market has been women, the response was not surprising. It was
also evident that the majority of the clients heard about Painter Designs Photography through a friend or family member (word-of-mouth), though less likely to find the company through Facebook. Since none of the survey respondents chose the option of “my website” for the second question, it demonstrated that people are not typically finding out about Painter Designs Photography through the website. Based on the results from this study, it would not be cost effective for Painter Designs Photography to invest a large amount of a marketing budget on upgrading the company’s website at the current time. Twenty percent of respondents found the company via Facebook. However, twenty-seven respondents seem to continue to view Painter Designs Photography on Facebook for upcoming specials and events. This could demonstrate that even though clients have not first established a connection through Facebook, they frequent the Painter Designs Facebook page to keep updated on promotions. A correlation can also be established in the evidence obtained in the fourth question. There appears to be a strong link in the clients that have utilized a bridal portrait session and have booked a wedding package. Since these two statistics are the same for this data set, it can be seen that for each individual that has first booked a bridal portrait session, they have also decided to book a wedding package.

5. Second Study

After the first study was conducted, it was decided to administer another study to obtain more information regarding the data on the length of photo shoot sessions booked and advertising. Information was compiled from photo shoots conducted since the business was started in 2009. Two categories, small session packages and large session packages, were used with the secondary categories of word-of-mouth advertising and Facebook. The company’s website was dropped out of this study due to the response that no individuals appeared to find out about the company through the website. The group containing small session packages included less expensive sessions, such as thirty-minute family or single sessions, as well as one-hour family or single sessions. The large session packages group contained the more expensive photo sessions: engagement sessions, bridal portrait sessions and wedding packages. A total of fifty sessions were booked.

6. Results/Explanation

Twenty-two small session packages found out about Painter Designs Photography through word-of-mouth advertising. A total of fourteen small session packages were booked after learning about the business through Facebook. The data gathered for the larger and more expensive packages seemed to be somewhat consistent and correlated with the information obtained about the small session packages. Ten large session packages were scheduled after finding out about the company through word-of-mouth, and only four large session packages were booked through finding Painter Designs Photography on Facebook. Because the larger session packages are obviously more costly, individuals could be more likely to schedule a package after hearing good reviews or positive brand information from friends or family members who have been previous clients. Table 2 visually displays the data concerning the overall total of photo shoot sessions.

Table 2. Second study results.

<table>
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<th>Small Session Packages</th>
<th>Large Session Packages</th>
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</thead>
<tbody>
<tr>
<td>Word-of-mouth</td>
<td>22</td>
<td>10</td>
</tr>
<tr>
<td>Facebook</td>
<td>14</td>
<td>4</td>
</tr>
</tbody>
</table>

Thirty-two packages have been booked due to word-of-mouth advertising and eighteen packages have been booked through finding me on Facebook. This study displays that more than fifty percent of my clients have constructed their brand ideas from positive word-of-mouth advertising.

7. Conclusion

Creating and maintaining a positive brand is very important to any business or organization regardless of their advertising efforts. Kevin Keller, professor of marketing at Dartmouth’s Tuck School of Business, stated, “The key is to recognize that in terms of brand equity, all that really matters is that the customer develops a positive image. Experience or word of mouth is probably the best way to do that” (Valenti, 2012). Throughout the research study, this idea can be shown to be true. Based on the quantitative results, developing a positive brand image has been profitable for the freelance photography company, Painter Designs Photography. The information obtained through this research study analysis was definitely beneficial to Painter Designs Photography. It demonstrates that it would not benefit the company to spend a large sum of money on my marketing and advertising efforts where the website is concerned at this time. Based on the
information from the research study conducted, more than half of the clients that have chosen Painter Designs Photography for their photography needs have heard positive things via word-of-mouth advertising about the company. Emmanuel Rosen, contributor for Brandweek, stated that the “most important driver of word-of-mouth (advertising) is the consumer experience itself” (Rosen, 2010, p. 16).

Acknowledgements

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References


Attributes of Successful University Brands in the United States

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Abstract — The attributes and dimensions of a successful university brand are reviewed with recognition that little empirical research exists to understand the brand drivers, especially in regard to institutions in the United States. Empirical analysis is applied to aspects of existing qualitative models of successful university brands. Use of a consumer driven brand rating metric provides a testable method for identified attributes and dimensions such as location and brand experience. The results provide support for particular drivers of a successful university brand. This analysis extends the understanding of university brands and develops a greater understanding of successful university brand components. Policy implications are discussed.

Keywords — brand management, higher education, university branding

1. Introduction
The higher education marketplace in the Unites States is extensive and diverse. The need to stand out in a crowded and competitive marketplace is a driving force for universities to focus on their branding. Over the past four decades, institutions have become sensitized to the metrics of various college rankings. Most of these rankings examine a broad range of variables which can be weighted and scaled in a manner to provide a rationalized ranking. These rankings do provide some useful information for many consumers. This data may include items such as faculty to student ratios or graduation rates. What the data lack is an understanding of which institutions are deemed successful brands, particularly as viewed by the consumer.

2. Literature Review
Operationalizing the meaning of branding is important given the variety of definitions currently circulating in the higher education arena (Wood, 2000). This paper uses the value added concept of brand proposed by De Chernatony and McDonald (2000) who defined the notion of brand as “an identifiable product, service, person or place, augmented in such a way that the buyer or user perceives relevant unique added values which match their needs most closely” (p.20). A key element of this definition is the matching of needs most closely.

International research on branding in higher education is relatively robust. Opoku, Abratt, and Pitt (2006) focus on brand personality of South African business schools as communicated through institutional websites. Understanding what composes a university brand in the United Kingdom has been studied by Ali-Choudhury et al. (2009) and Chapleo (2005, 2007, & 2010). The various brand identities which exist in British universities was explored by Lowrie (2007). Additional research has focused on institutions around the globe including Australia (Balwin & James, 2000); Europe (Bulotaite, 2003); Asia (Gray, et al. (2003); and Africa (Maringe & Foskett, 2002). Of particular significance is Chapleo’s (2004, 2005, 2007, 2010, & 2011) work to more clearly understand not only what makes a successful university brand but to also venture into the means of measuring brand success in the United Kingdom. Surprisingly, however, research on branding for American higher education appears limited.

The challenge to define what composes college brand has been explored broadly in literature related to non-U.S. institutions (Ali-Choudhury et al., 2009; Gray et al., 2003; and Chapleo, 2005). Chapleo’s and Ali-Choudhury et al. studies focused on universities in the United Kingdom. Chapleo’s exploratory work developed a framework composed of 10 attributes believed to contribute to a university’s “successful” brand management. These attributes include: Size of marketing function; growth and structure; resources available for branding activity; researching the brand; support from leadership; location as a factor; clear vision; internal support/"buy-in"; press coverage and public relations; value of marketing communications; and brand experience. Ali-Choudhury et al.’s (2009) research focused on the elements of the institution’s brand which a given institution’s marketing director believed supported student recruitment. In this study, the 13 components identified include: Ambiance; location; physical attractiveness; association with London; safety and security; employability;
vocational training; courses offered; diversity of
student body; ease of entry; course difficulty;
community links; and visual imagery. And finally,
Gray et al. (2003) provide a model of
understanding university brands in Asia through a
framework of brand positioning dimensions. Their
research identified five such dimensions: a
university’s learning environment; reputation;
graduate career prospects; destination image; and
cultural integration. The attributes identified in
this body of literature exemplifies the broad
variance of factors that influences the
understanding of institutional brand.

A review of the compiled attributes and
dimensions from these exploratory studies makes it
clear that most attributes are difficult to gauge
especially from an outside perspective. There are,
however, two attributes and one dimension
identified in the research related to institutional
branding which can be ascertained, reviewed, and
empirically tested. The first such attribute is
location: This factor was found to be important in
all three of the foundational studies. The second
identified attribute is brand experience (Chapleo)
and the final dimension is ambiance (Ali-
Choudhury et al.). Brand experience and ambiance
appear to measure the same construct. As a result
they are coupled for this study. These three
elements provide a foundation from which it
becomes possible to develop and evaluate a
successful university brand model.

3. Hypotheses

Hypothesis 1: The greater percentage of geographic
dispersion an institution has the higher the
institution will be ranked on the Revealed
Preference Rank. Hypothesis 2: The greater
percentage of alumni giving to an institution, the
higher the institution will be ranked on the
revealed preferences ranking.

4. Data

This study analyzed data involving traditional four-
year public and private institutions. The
institutions were colleges that utilized the Revealed
Preference Rank which appeared in the MyChances
(2011) ranking. Specific data was collected for each
of the 394 colleges included in the research. Data
collected includes the institutions’ alumni giving
rate, student geographic dispersion, institutional
age, and endowment. Out of the 394 institutions
examined, 340 cases had valid information for all
variables.

5. Results

Multiple regression analysis was conducted to test
the two hypotheses. The Revealed Preference Rank
served as the dependent variable. The regression
model tested the relationship between Revealed
Preference Rank and geographic dispersion, alumni
giving rate, endowment, and institutional age. The
theoretical attributes and dimensions of location
and brand experience/ambiance held up in the
analysis. The overall adjusted variance explained
by the four independent variables (geographic
dispersion, alumni giving rate, endowment, and
institutional age) was 56.2%. Three of the
predictor variables - geographic dispersion (β =
.084, p = .075), alumni giving rate (β = .287, p =
.000), and endowment dispersion (β = .591, p =
.000) were positively related to Revealed Preference Rank. The remaining predictor variable
- institutional age (β = -.019, p = .650) was
negatively related to Revealed Preference Rank,
indicating the older the institution the higher it’s
ranking. Multicollinearity is not an issue as seen in
the Tolerance values which exceed .1 and VIF is less
than 10. Endowment has the highest correlation (r =
.679, p = .000) with preference rank. This is
followed by alumni giving rate (r = .493, p = .000),
geographic dispersion (r = .383, p = .000), and
institutional age (r = .350, p = .000) (Table 3).

6. Discussion

The results of this study generally support the
theoretical constructs developed by Ali-Choudhury
et al. (2009), Gray et al. (2003), and Chapleo
Giving Rate, Endowment, and Institutional
Age are positively correlated with the Revealed
Preference Rank. Two of the items have
statistically significant results - Alumni Giving Rate
and Endowment. The first hypothesis, location as a
factor that influences university brand, while
positively correlated with Revealed Preference
Rank did not hold significance in the regression
model. Results of this study fully support the
second hypothesis regarding consumer satisfaction
with their brand experience as a direct result of
their brand choice. This finding appears to speak
to the attribute of brand experience/ambiance as
noted: Students who have had positive experiences
while attending a given college appear to be more
willing to support their alma mater, as alumni, with
financial donations. The significance of
institutional endowment as it relates to the
rankings may indicate a proxy of status being
associated with those colleges with significant
endowments. These results may also indicate that
these institutions are able to provide experiences not available at colleges with smaller endowments; such experiences may be deemed of enough value for students to choose these colleges over other colleges.

7. Implications

This study provides initial empirical support for understanding and measuring successful university brands in the United States. Researchers will be better able to delineate understanding of successful university brands by honing in on those elements which have been found to be significant. They can also focus on testing other elements discovered in qualitative studies to see if they, too, can be demonstrated empirically. Results indicate that practitioners should focus on the experience their students have while enrolled at the institution. If the student experience can be designed and evolve to become better than its current state, there exists opportunity to increase positive feelings toward the institution. Additional research must follow up on the significance of endowment. If brand success is tightly linked to having a significant endowment, this poses serious challenge for many institutions.

8. Conclusion

This study sheds light on some of the elements which drive the brand of a higher education institution in the United States. The recent downturn in the global economy has caused most colleges and universities to reduce expenditures and look to increase student enrollment. Understanding what factors a student values in selecting their college can assist institutions in communicating their core values and brand more clearly. Those colleges with the wherewithal to focus on improving their brand will likely position their institution for greater success. The findings of this study suggest those institutions who are able to increase their endowment and increase alumni giving rates will be more likely to be rewarded with brand success. The creation of long term viability for an institution via brand success appears to involve a reinforcing loop of enhancing student experience which leads to increased alumni giving and results in endowment growth that is better able to support enhancements in the student experience. The most successful university brands will likely make different institutional decisions based upon their heritage, location, resources, and mission.

References


An Analysis of Public Pension Systems Reforms

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Abstract — The need to reform public retirement plans in order to maintain solvency and improve performance is one of the most pressing issues facing state and local policy makers. This issue is becoming increasingly important due to aging populations and slow economic growth. This paper examines the state pension and retirement legislation enacted in the recent years across the United States. Exploring the experiences of these states provides insights on ways that policy makers can address the looming public pension crisis more effectively.

Keywords — Retirement Benefit Plan, Pension Reform

1. Introduction

Aging populations and slow economic growth are placing a severe financial strain on public retirement systems across the United States. As a consequence, state and local governments are increasingly searching for innovative ways to reform public retirement benefit systems and improve their performance. Some of the reforms under consideration include lowering benefits, increasing the retirement age, requiring employees to bear some of the investment risk, improving investment oversight, and increasing employee contributions. This paper examines the reforms that have been enacted to address the fiscal health of retirement plans across the United States in the past four years. Analyzing the experience of the states that have enacted reforms should provide insights into how to redesign and manage retirement systems in ways that maintain funding at sustainable levels.

2. State Legislative Actions on Retirement Plans

Most public sector employees in the United States are covered by a state-sponsored retirement plan. However, there is substantial variation in the characteristics of public employee retirement plans across states. Some states offer a single plan that covers essentially all public workers, while others offer separate plans for general public employees, teachers, state police, firefighters, judges, and legislators. Moreover, plans that cover similar groups of workers, such as state police and firefighters, often differ with respect to the contribution rates of employees and employers and the benefits provided.

The financial burdens imposed by these plans can be a significant source of tension for state and local governments, especially in times of declining financial markets and decreased tax revenues. For example, a 2008 Pew Center study reports that there is a $1 trillion gap between the amount available to pay employees' retirement benefits and the amount that is due to be paid. This gap is a result of policy choices that reflect a lack of fiscal discipline, including failing to make adequate annual payments into pension systems, increasing benefits, and implementing cost-of-living adjustments without considering the long-run impact of such changes. Given the projected future costs associated with maintaining these plans, policy makers have become increasingly interested in reforming public pensions systems.

In this paper, I examine the reforms that have been put in place to address the fiscal health of retirement plans across the United States over the years from 2009 to 2012. The information on pension reforms comes from the National Conference of State Legislatures which lists the provisions of enacted state pension legislation by state and year. I focus on reforms in the following areas: employee contributions, age and service requirements to be eligible for retirement benefits, calculation of benefits, and early retirement provisions.

Table 1 provides an overview of the reforms made to state retirement systems to restore or preserve their sustainability. Specifically, it indicates the states that enacted reforms in each of three categories: employee and/or employer contribution rates for participants, the level of retirement benefits, and provisions for early retirement.

Most states have enacted some type of reform from 2009 to 2012. For example, in 2009, as a result of the financial crisis, there was a strong incentive to make the future costs more manageable. Thus a number of states undertook reforms such as increasing the contribution rates for both employees and employers, reducing the new employees’ retirement benefits packages,
increasing the age and service requirements for retirement, and reducing or prohibiting post-retirement benefit increases for certain employees.

The pace of reforms appears to have accelerated in 2010 and 2011. Sixteen states enacted increased contribution requirements rates for employees in 2011. Moreover, sixteen states increased age and service requirements, and six states changed the base on which pension benefits are calculated by extending the period of time for computing the average final salary. A number of states also revised provisions regarding the automatic cost of living adjustments, and a few introduced a voluntary retirement program as an early retirement incentive. Similarly, 2012 was the year of significant changes in the structure of several retirement systems. For example, South Carolina enacted legislation to increase employee contributions for current and new employees, increase age and service requirements for retirement with full benefits, and provide a longer period for calculating final average compensation for general employees and teachers.

Conclusions

An examination of the state pension and retirement legislation enacted in the recent years across the United States shows a clear trend: states are reducing the generosity of public pensions in an effort to control costs and enhance sustainability. It is likely that rapid population aging and slow economic growth over the next several decades will lead to large increases in the public pension expenses. Most states have at least started to address this challenge by implementing measures that are designed to curb the large increase in pension costs. However, because of the political environment, most of the reforms affect only future retirees. Thus, current workers should expect to retire later, save more, and receive less generous benefits.

References


Table 1. Reforms to State Public Pension Plans to Restore or Preserve Sustainability.

<table>
<thead>
<tr>
<th>State</th>
<th>Contributions</th>
<th>Benefits</th>
<th>Early Retirement</th>
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<td>AL</td>
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Notes: An “X” under “Contributions” indicates that the state approved reforms to increase the employee and/or employer contribution rates for participants. An “X” under “Benefits” indicates that the state approved reforms to change the calculation of retirement benefits or the age/service requirements. An “X” under “Early Retirement” indicates that the state revised the provisions regarding early retirement. Source: Retirement Systems and the National Conference of State Legislatures.
Infectious Information

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Abstract — Few things have impacted the history of humankind in the way that plague has, ravaging populations and confounding centuries of innovative thinkers. Infectious disease has shaped and driven the evolution of the human species, both biologically and culturally. The Infectious Information website has been designed to explore a timeline of diseases through history, taking an in-depth look at particularly catastrophic outbreaks and the potentially devastating strains that have been recently identified. The website also examines the viral origins of zombies, vampires, and other monsters in pop culture.

Keywords — Folklore, history, pop culture, infectious disease, web design

1. Introduction

Science is the key to understanding the natural world. It provides the tools to help people explain the unknown. When science and art come together, pop culture can be created. Looking at infectious diseases and viruses can help to begin uncovering the lineages of the supernatural. Studying viral epidemics, conditions, and diseases opens a door of truth among all the fictional monsters that plague the mind. The line between truth and fiction is still a blurry one. Therefore, the question remains: is truth stranger than fiction?

2. The History of Plague

Viruses have been a part of this world since its inception, ravaging species without remorse. Notable outbreaks in history illustrate the destructive power of the virus on humankind. For example, the Black Plague devastated Europe in the fourteenth century, eradicating up to 60% of the population. Spanish Influenza made its way around the world in the early twentieth century, killing millions. Outbreaks such as these remind people that one little bug is capable of ending many human lives.

3. Current Infectious Threats

The late nineteenth century brought forth germ theory and finally gave a face to the unknown killers that claimed countless victims. The discovery of the microscopic world and the advent of vaccines and antibiotics provided a chance to defeat the menace.

The more scientists discover about the microscopic world, however, the more they realize how little control humanity truly has over it. Bacteria and viruses undergo their own evolution despite medical advances to combat them. There are still countless infectious diseases that pose a threat to humanity.

4. Infectious Pop Culture

One of the greatest achievements of the human mind is art. Art is the means by which humanity can explore themes that can have tremendous effect on culture. Through art society can safely explore what it fears. How have real world outbreaks influenced pop culture? What do folk traditions have to tell us about what we fear? Literature, cinema, and fine arts that depict plague and disease help address these questions.

5. Conclusion

Disease has been a major influence on human history. From the Black Plague to Ebola, viruses have changed the way humans view the world and the part they play in it. For centuries humans attributed the symptoms of disease to the supernatural. As time passed, humans became more knowledgeable about diseases, negating the idea that the supernatural was responsible. Today, however, the supernatural is more of an art form than an explanation. Viruses have not just infected the human body; they have also infected the human imagination. Factually and fictionally, viruses have been around for a long time and it is unlikely that they will stop being a part of human lives and culture.

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References


Tet: How the Media Changed the Domestic Face of the Vietnam War

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Abstract — In January 1968, the Vietnam War was a full-scale military operation to repel the oppression of the encroaching North Vietnamese forces against the U.S. backed South Vietnam. The launching of the Tet Offensive on January 30, 1968, which was an overwhelming military loss for the Communists, eventually achieved victory in turning the hearts of the American public against the war. This study elucidates the impact of “General Offensive” and “General Uprising” on the hearts of the American people, and how the Communists were able to achieve victory through the American media. Through thorough examination of first-hand accounts from the fighting during Tet, analysis of the actual news that was reported, study of the American public opinion during 1968, investigation of the military reports concerning Tet, and dissection of the decisions made by the American leadership in the aftermath of Tet, the “General Uprising” that was intended for the South Vietnamese cities found a haven among Americans. With the United States currently entrenched in another ideological war, it is crucial for the nation to understand the value of the media to the enemy soldier. This study reveals the true power of the media over the American public.

Keywords — Tet Offensive, North Vietnamese Army (NVA), National Liberation Front (NLF), Media, Public Opinion

1. Introduction

On the morning of January 30, 1968, a team of National Liberation Front (NLF) soldiers blew a hole in the walls of the American embassy in Saigon. At the same time, a synchronized assault of North Vietnamese Army (NVA) and NLF units was launched against South Vietnamese cities and American military outposts. This attack, while intended to damage the military, was given the supreme objective of destroying the will of the people in South Vietnam and the United States. Focusing their forces on three main locations, Hue, Saigon, and Khe Sanh, the NVA and NLF commanders sought to attack the American public through the nightly news.

2. The Calm before the Storm

At 0300 on January 30, a blast shook the U.S. Embassy in Saigon- Tet had begun. As the team of nineteen NLF fighters entered the compound they were quickly stalled by the door of the main embassy entrance and became entangled in a firefight with the military police in the embassy building. By 0915, all of the NLF fighters had been killed; they failed to achieve their objective of taking the compound. By this time though, Tet was in full-swing and fighting had erupted throughout Saigon, as small teams of NLF forces spread throughout the city hunting the ARVN and U.S. command posts as well as the National Radio Station (Herring, 2002, p. 225-226). These objectives were not designed to overthrow the entire ARVN and U.S. force stationed in Saigon; however, they were meant to break the will of the people and create a civilian revolution.
3.1 The Media at Saigon

The fighting that lasted in Saigon until the second week of February became a goldmine for the media. In two major cases, the documentation of the fighting shook the American public and still provokes strong emotions regarding Vietnam. The first was the live CBS broadcast of the fighting in the Saigon Embassy. Aired to the public, this footage documented not only the firefight, but also the resulting dead and wounded, both Vietnamese and Americans. The broadcast included an interview with the embassy coordinator, George Jacobson, who described to CBS News how he came face to face with an NLF soldier and proceeded to shoot him (Wallace, 1968). The second was the famous photograph by Eddie Adams of the Saigon Chief of Police, Nguyen Ngoc Loan, executing the NLF prisoner (Adams, 1968). In an interview with Newseum, Eddie Adams told the story of how he saw the prisoner, Loan, walk up, draw his pistol, and fire. Adams confessed in this interview that he, Loan, was justified in executing the man. Adams admitted that if he were in Loan’s position he most likely would have acted in the same manner (Newseum, 2013). However, the public only saw the footage full of executions without explanation; the public did not understand the images of death coming from “safe-zones”. News reports prior to 1968 contained shots of the dead, but these reports seemed tame when compared to the reports of Tet. The public had never seen a man executed, and they were shocked at the sight of the enemy storming a United States compound. Led to believe that the Communists were far too weak to launch an offensive, the public was flabbergasted by the reports from Saigon.

4. Hue

As the Vietnamese population prepared to celebrate the Tet holiday, many flocked to the historic Hue City. Hue, much like Old Boston, is a city of great historical significance to the Vietnamese, and is regarded as a cultural center and filled with historical monuments like the Imperial Palace and the Citadel. Thus, when the Tet Offensive reached the streets of Hue, thousands of Vietnamese civilians were caught in the midst of the fighting. Much like the objectives in Saigon, the NLF sought to destroy the will of the public. Though the city was occupied by ARVN forces, the NLF quickly took control of the city and raised their banner over the Citadel, a sight that would stand for nearly a month. In response, American Marines fought their way into the city where they became entrenched in a battle for mere inches. While this fighting is considered “house to house,” in the case of Hue, it may be more properly deemed “step by step fighting.” The Marines fought ceaselessly to regain control of the great historical city of Hue.

4.1 The Media at Hue

As the Marines fought their way back into Hue City, CBS News captured every step of the way. With another front-row seat to the action during Tet, the cameras shot almost as many men as rifles. In Don Webster’s broadcast, he covered the majority of the battle for Hue, capturing the taking of the Citadel and the eventual rising of the American flag in place of the NLF banner. Webster also took advantage of the fighting that surrounded him to best document the true nature of the war. He very clearly narrated a move by the Marines from one wall to another, and the eventual loss of a soldier. Webster’s broadcast also covered the courage of the Marines as he showed two separate occasions where men risked their lives to save another. This broadcast did not appear to be biased against the war or the Marines, however it was honest. Webster did not shy away from showing the truth of the battle, including the danger towards civilians. In an interview with Colonel Ernest Cheatham, Webster was told of the dangers facing civilians. Hue was sectioned off, the Marines understood that certain zones were “friendly,” those caught in “enemy” zones were considered to be enemy soldiers, sometimes even civilians (Webster 1968). The greatest atrocity of Hue City was the massacre of over 2,500 civilians and prisoners that occurred during the Communist occupation of Hue. In a Stalinesque system of purges, the Communists hunted down, tried, and executed various government officials and American supporters. News of these executions from the mere four week occupation shocked both American soldiers and the American public. In an interview at the 2008 American Veterans Center’s Conference, Brigadier General Michael Downs and Colonel Charles Krohn described the massacre as a “North Vietnamese government policy” and that the “American forces did not kill these civilians with artillery because when they were exhumed their hands had been bound” (American Vet Center, 2008). With the destruction of Hue City during the battle, much of which was caught on camera, along with the massacre, the American people found a new disdain for the war. Though the Hue massacre was overlooked by the My Lai massacre, the atrocity was not forgotten. The reality that the NVA was still a formidable opponent came as a shock to the public. The Tet Offensive alone scared them, the reality that the Communists were able to hold a city
throughout a four-week offensive only heightened the public's awareness that the war was far from being won.

5. Khe Sanh

The memory of the 1954 battle at Dien Bien Phu, in which the French Army was overwhelmed by the Viet Minh after a month-long siege lingered heavily in the minds of the American public and commanding officials in 1968. Knowing of the buildup of NVA forces prior to Tet, General Westmoreland and President Johnson feared that the strike would come at the American forward operating base at Khe Sanh, in the north-west corner of South Vietnam where the demilitarized zone met the border of Laos. Both Johnson and Westmoreland remembered the eerily identical situation that the French were in at Dien Bien Phu, and they feared that the North Vietnamese would attempt to recreate the battle (Herring, 2002, p. 227-228). While this attack was not part of the operations that began on January 30, the Siege of Khe Sanh made the Tet Offensive possible and played directly into the hands of the North Vietnamese attack on the American public.

5.1 The Media at Khe Sanh

Though Khe Sanh was feared to be the American Dien Bien Phu, both the American and North Vietnamese commanding officers understood the differences between the situations. In true American fashion, President Johnson ordered the continuous bombing of the area surrounding Khe Sanh for the duration of the siege. Dropping a total payload of 100,000 tons of aerial munitions (Brush, 2006, p. 2), Johnson and Westmoreland intended to flex the muscles of the American military and keep the NVA at bay. The irony of Khe Sanh though, is that General Giap, the commander of forces at Khe Sanh and previously Dien Bien Phu, knew that, "Khe Sanh was not that important to the Vietnamese communists' and that 'it was only important to the extent that it was to the Americans'" (Guan, 2001, p. 3). Seemingly obsessed with the possibility of another Dien Bien Phu, Westmoreland and Johnson became fixated on their fears. As they did so, the American media focused on the similarities of these situations, and created an analogy which captured the attention of the public, and fed their fears (Guan, 2001, p. 2). With reports of a possible Dien Bien Phu and the launching of Tet, the American public became well aware that the war was far from being won. This combination feasted on the confidence of the people in their leadership, and in their purpose in Vietnam.

6. Conclusions

In hindsight, it is clear that the Tet Offensive was a military Hail Mary for the North Vietnamese, and it worked. Hanoi was hopeful of achieving military victory in not only the outlying villages, but also the main city centers. Praying for the “General Offensive, General Uprising” to take root among the South Vietnamese, the American media, including the famed Walter Cronkite, helped carry the “Uprising” to American shores. Led to believe that the war was all-but-won; the Tet Offensive was the straw that broke the camel’s back for the American people. Immediately after Tet, President Johnson’s approval rating dropped to the lowest of his presidency, 35% (Gallup, 2013). After careful study, it is obvious that the American public’s turn against the Vietnam War stems from the deception of the government coupled with the media’s portrayal of the Tet Offensive. Understanding the media’s impact on the public during a time of war is critical to the modern era as America’s enemies are even more media-savvy than the Communists, and yet again the United States is facing an enemy with a strong ideology, just like the Communists in 1968.

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References


From Emigration to Immigration: Spain in the 21st Century

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Abstract — In 1998 the majority of the immigrants coming into Spain were from developed countries. They consisted mostly of Europeans who decided to reside in Spain, whether for study, work, or retirement. However, this pattern changed in 2000. For the previous four centuries, Spain faced a pattern of emigration, but in the years leading up to 2000, emigration began to slow and immigration began to increase. This presentation will explore who started immigrating to Spain and why.

Keywords — Spain, immigration, 21st century

1. Introduction

With its location on the Mediterranean Sea and its proximity to Africa, Spain has always been a destination for immigrants. One needs only to look at the evolution of Spain’s name to truly understand the impact of other cultures on its formation. For example, during biblical times the peninsula was known as Tarshish. As northern Africans established themselves in the area, they called the peninsula Iberia, from where we get the peninsula’s present day name. During the Greek occupation of Spain’s Mediterranean coast, the new inhabitants christened it Hesperia. The Romans referred to the territory as Hispania, which will evolve into España, as it is known today.

Historically, Spain has been known for the emigration of its citizens, but that has changed in recent times. During its economic boom of the early 2000s, Spain welcomed immigrants. According to Matlack and Tarzian (2007), by 2007, Spain had received more than three million immigrants, with “[m]ore than 11% of the country’s 44 million residents […] foreign-born, one of the highest proportions in Europe” (n.p.). As of 2008, Spain trailed behind the United States as having “the largest number of immigrants in the developed world” (Kern, 2008, n.p.). In this presentation, I explore Spanish immigration in the 21st century. Which groups are immigrating to Spain and why? What makes Spain a desirable destination for immigrants?

2. Foreigners vs. Immigrants

In Spain, it is evident that there is a difference between foreigners and immigrants. On one side, “the people coming from Andean, African, Eastern European, and Asian countries, all have characteristics of economic immigrants. They are young, have recently arrived, and take jobs that require little to no skill” (Reher and Requena, 2009, p. 13, my translation). On the other side, previous immigrants coming from developed countries differed dramatically. They had higher levels of education, many arrived retirement in hand and those who were still working worked in fields that required advanced degrees. Spaniards consider these variances so important that they differentiate between the two groups, identifying the first group as “immigrants” and the latter “foreigners.”

In 1998, the majority of the immigrants coming into Spain were from developed countries. They consisted mostly of Europeans who decided to reside in Spain, whether for study, work, or retirement. However, this pattern changed in 2000. For the past four centuries, Spain faced a pattern of emigration, but in the years leading up to 2000, emigration began to slow and immigration began to increase. Some have theorized that this massive influx of immigrants was due to Spain’s passing of new health care laws that granted universal healthcare to everyone, including immigrants. The most outstanding law was the right to a health card and basic health services (Reher, Requena, and Rosero-Bixby, 2009, p. 125). The year 2001 brought another shift in immigration. The terrorist attacks in the United States on 9/11 brought about stricter immigration laws, forcing immigrants to find other countries into which to immigrate. Spain was a natural choice for Spanish-speaking immigrants seeking a new home due to the cultural and linguistic connections. Spain featured a booming economy and had just recently passed a variety of universal health care laws that up until that point neglected to exist anywhere else in the world.

The year 2000 marks a transition in which Spain turns from an emigratory country, a trait it had exhibited since the middle of the XVII century,
into an immigrant country. In 1998, a little more than one million foreign-born people lived in Spain alongside 38.7 million native Spaniards. Ten years later, in 2008, close to 6 million foreign-born people lived in Spain alongside 40 million natives. Immigrants went from representing 3% of the population to 13% in only ten years. This increase of five million individuals can only be described as spectacular (Reher, D. and Requena, M., 2009, pp. 10-11).

According to a survey conducted in 2003, Spaniards see immigration as the fourth most serious issue facing Spanish society, after terrorism, unemployment, and housing. An additional poll conducted in 2007 showed that 62 percent of native Spaniards believed that there were too many immigrants in their country. Many Spaniards are aware of a correlation between immigration and crime. This concept is supported by the fact that 30 percent of inmates in Spanish jails are non-natives, about half of which are Moroccans, Colombians, or Algerians. Additionally, four-fifths of female prostitutes in Spain are foreign-born, usually from Latin America. Furthermore, gangs of young people of Latin American origin have started to materialize in deprived areas of larger cities, such as Madrid. Many of the members of the gangs are adolescents from Ecuador, Colombia, and the Dominican Republic (Ross, et al, 2008, p. 181).

3. Conclusions

The decade between 1998 and 2008 is seen as a period when Spain converted itself into an extremely attractive country to which to immigrate. My preliminary findings suggest that the United States’ stricter immigration policies after September 11, 2001 diverted immigrants to the more prosperous Spain, where an economic boom and the creation of jobs in the construction and service industries attracted immigrants in search of employment opportunities. In the weeks leading up to the Research Symposium, I will be investigating the measures that Spain took to assist immigrants. These measures are in addition to the health benefits provided to the immigrants.

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References

The Art of the Musical Zz: Cultural Implications of Lullabies around the World

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Abstract – The Oxford dictionary online defines the lullaby as, “A soothing refrain, used to please or pacify infants. Also...any soothing refrain” (“Lullaby,” n.d.). Similarly, the Macmillan dictionary defines a lullaby as “a relaxing song that helps a young child go to sleep” (“Lullaby - Definition,” n.d.). In these definitions lies a common thread—the idea that the lullaby is a song by which to coax young children, to sleep— but this research suggests that the lullaby is more than this simple type of melody. As the work of many researchers, including Erik Masuyama, Elizabeth Mackinlay, and Ellen Dissanayake, suggests, lullabies exhibit meanings more than those associated with sleep. Culturally, lullabies are expressions of internal fears, records of social practices and rituals, and manifestations of a mother-infant bond that transcend the bonds created by other forms of music. For many of these researchers, the origin of the lullaby is also contentious, suggesting that the broad definitions provided by the dictionaries are not only inaccurate, but incomplete in their conclusions. What this research seeks to explicate is the multifaceted nature of the origin of the lullaby, as well as discover the inherent cultural meanings which lullabies reveal in diverse cultures.

Keywords – lullabies, cultural-meanings, bonds, origins, Lilith

1. Introduction

A seemingly simple type of melody, the lullaby has been the subject of recent research which seeks to explain its cultural origins and implications. According to multiple dictionaries, a lullaby is a simple song intended to put a child to sleep, but this definition does not explain the origins or cultural implications of the lullaby or its usage as a word in multiple contexts. This research seeks to explore the meanings of the lullaby through its multiple definitions, origins, and usages in different cultures. By exploring and analyzing lullabies from multiple cultures, I hope to analyze the complex definitions of lullabies and assess the meanings inherent in the lullabies themselves.

2. In the Beginning: Origins of the Lullaby:

Before delving into the nature of and purposes of the lullaby, it is important to address the contentious and somewhat mysterious origins of the lullaby itself.

According to the Merriam Webster dictionary, the origin of the lullaby stems from the “obsolete English lulla, interjection used to lull a child (from Middle English) + bye, interjection used to lull a child, from Middle English” (“Lullaby,” 2013). This suggests that the term lullaby was created during the Middle English period, but more research suggests that the lullaby, both as a concept and a word, hearkens from much darker and disturbing origins. According to some sources, “The origin of the term “lullaby” comes from the words “Lilith abi” which means “Lilith, go away.” This meaning refers to the goddess Lilith, described by Rafael Patai using Talmudic, Aramaic, and other cultural texts, was considered a previous wife to Adam and was responsible for leaving him to pursue promiscuity with other men and demons (Patai, 1964). Transformed into a demon who seduced men and killed children born by herself and other mothers, Lilith’s connection to the lullaby seems to defy musical origins and suggest a connection to amulets inscribed with “Lilith abi.” (Omega, 2009). According to Patai, similar amulets with the names of certain angels were used to ward off the evil power of Lilith. However, this does not manifest itself in music until much later, suggesting that the origins of lullabies may not have been musical, but spiritual. However, this also raises the question: Is the purpose of the lullaby still attached to its more mystical origins?

4. Myriad Meanings of the Lullaby

In asking if the lullaby’s origin is tied to its purposes in different cultures, it is necessary to see if the origin of the lullaby shares similarities with definitions of the lullaby. In its quotable contexts, the lullaby has been described in many, often opposing, contexts. Holly Near writes, “Muzak can
put a whole nation to sleep, whereas a lullaby is intended to put a child to sleep in a sweet way” whereas Stefan Jenkins writes “My music is so often like a lullaby I write to myself to make sense of things I can’t tie together, or things I’ve lost, or things I’ll never have” (“Lullaby quotes”). What these personal definitions seem to suggest is the multifaceted nature of the lullaby itself. Rather than being a simple melody intended to put a child to sleep, the lullaby is a powerful tool by which individuals can soothe their children and express their own desires and fears, and by which individuals can make sense of social practices and rituals that may not make sense otherwise. These definitions, both postulated by Americans, suggests that this is a phenomenon of the Western world, but research conducted by multiple scholars of different cultures recommends itself to the multifaceted meanings associated with the lullaby.

### 2.1 Itsuki, Australia, and Ukraine: Cultural Meanings of the Lullaby

In a specific study of lullabies from the Japanese villagers of Itsuki, Erik Masuyama discusses the purpose of the lullabies for local women who became nannies for the children of Japanese nobles. He writes “Lullabies have thus become a vehicle to say what was unsayable in public in order to release their feelings of desire and discontentment. They sang lullabies of yearning, mockery, envy, and so forth...” (Masuyama, 1989). This focus on a particular group within Japanese culture highlights a role of lullabies which extends far beyond the simple Oxford Dictionary definition. Lullabies are in Itsuki transformed into social proclamations, and are thus vehicles through which individuals express specific yearnings which might not otherwise be expressed.

This is similarly expressed by Robert B. Klymasz, whose research on Canadian Ukrainian lullabies argues that a mother’s lullabies reflect concerns for, “her child’s future [and] complaints that the child is the reason her beauty has faded” (Klymasz, 1968). Klymasz expands upon this idea by viewing the lullaby as a form of internal monologue, through which the mother expresses her concerns over her child and the way her child has changed her role in the world. This form of expression, of perhaps greater significance to the singer than the listener, argues that lullabies are characterized by a myriad of purposes and definitions, both of which shape a more complex definition of lullabies and their inherent meanings, whether to ward off evil spirits, quell fears, and express concerns, all of which are incorporated in various cultures.

This, however, should not imply that the lullaby focuses on the singer alone. In a study conducted by Elizabeth Mackinlay of the Yanyuwa Aborigines, she suggests that lullabies are not only used to soothe children, but also, “are sung to babies and young children by older relatives until they reach puberty...when boys become men, their knowledge and performance of Yanyuwa lullabies is strongly linked to roles they play in ceremony...after puberty, the involvement of girls [also increases] as they become mothers” (Mackinlay, 1999). By addressing lullabies in terms of these social practices and ceremonial rites of passage, it is possible to see that lullabies have extended beyond their mystical origins. Instead, their meanings are inextricably linked to values within both individuals and the cultures in which they live.

### 3. Sleeping or Sounding Alarms: Characteristics of Lullabies

According to Norman Weinberger, lullabies possess many of their characteristics as derived from infant directed speech. Rather than addressing the lullaby by its cultural definitions alone, Weinberger suggests that the melodies and words in lullabies share universal qualities, which include simple pitch contours, repeating rhythms, and many elongated vowel sounds (Weinberger, 1995). In an experiment he cites, Weinberger mentions that listeners failed to identify lullabies when sound cues indicating these vocal qualities were removed. By suggesting that these cues dictate what people view as lullabies, Weinberger reveals perhaps the first set of universals concerning lullabies. By providing a clear set of universal sound qualities for lullabies, Weinberger asserts that lullabies, whether or not they share the same meanings, share a distinct evolution and sound quality. In sharing these qualities, lullabies can be classified into a specific sound quality, though the speeds of the rhythms and the notes used may vary from culture to culture depending on the purpose of the lullabies.

This sound quality also favors Ellen Dissanayake’s research into and explication of the universal characteristics lullabies within the context of the mother-daughter relationship. In her research, she “suggest[es] that the human behavior of music...would have evolved gradually, perhaps initially from regularized, repetitive movement which-performed individually or communally, would have been soothing...Synchronized chorusing, ‘rudimentary song,’ and mimetic expressions...may well have been other elements of
music derived from protomusical antecedents in mother-infant interactions” (Dissanayake, 2001).

Such vocalized interactions may have evolved into the musical lullabies with which we are familiar today, indicating a unique and more complete view of the nature and purposes of such lullabies from various cultures, many of which were centered around the bonds of parent-infant relationships and which may have evolved their various purposes within the context of the mother-infant bond proposed by Dissanayake to share the characteristics mentioned by Weinberger.

**Conclusions**

Lullabies have long been viewed throughout the world in the context of their abilities to place infants and young children in a blissful state of rest, but research into the various definitions and purposes of lullabies suggests a much more complex relationship between lullabies and those who utilized them. By tracing the evolution of the lullaby, from its mysterious etymological origins to its characteristics shared among cultures, a more comprehensive view of the lullaby develops in an analysis of its roles in rites of passage, expressions of parental or individual concerns, and even as the cornerstone of development through adolescence for its listeners.

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**References**


Sterile Water Injections to Treat Back Pain in Labor: Using the ACE Star Module to Incorporate Evidence Based Guidelines for Implementation to the Inpatient Hospital Setting

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Abstract — Many women in labor seeking a natural un-medicated childbirth often have few options in an inpatient hospital setting. Nurses can provide non-pharmacological pain relief focused specifically on the lower back by using sterile water injections. The ACE Star model guides a current literature review to demonstrate best practicing standards in non-pharmacological sterile water injections to treat back pain in labor and then guides implementation into evidence based practice. In order to implement evidence based practice, nursing staff must be properly educated, and be able to demonstrate competency and posttest. Procedural guidelines for sterile water injections guided by the ACE Star model incorporate current research literature into a policy and procedure manual. A consent form is necessary for any invasive procedure, though sterile water injections are not truly invasive, a consent form ensures patient authorization and informed decision. Women/consumers in labor seeking a natural un-medicated birth must be informed of the option of sterile water injections, thus an education flyer or birthing plan was created to allow the consumer to choose interventions based on her current desire, stage of labor, and physician orders. Best practice standards are facilitated by the ACE Star model into evidence based practice of sterile water injections.

Keywords — non-pharmacological intervention, labor back pain, sterile water injection

1. Introduction

As technology has increased intervention intensive care has increased at the bedside for laboring women. With increased interventions nurses and care providers spend more time managing technology that can pose risks, and care can become fragmented, causing women to feel less in control of their labor and less satisfied with their experience (Romano & Lothian, 2008). A pregnant woman in labor/the consumer has choices to use pharmacological or non-pharmacological interventions. Typical pharmacological interventions include an epidural, nerve blocks, and IV push medications. Epidurals and nerve blocks can cause a woman to feel less involved in and feel a loss of control in the birthing process thus causing a decreased perception in satisfaction felt (Enkin et al., 2000). Examples of typical natural interventions include positioning, relaxation, massage, guided imagery, paced breathing patterns, participation of the significant other, and basic comfort measures. These interventions do little to target pain and are used as a coping mechanism and as a distraction (gateway theory). Sterile water injections can provide 30%-80% targeted relief to lower back pain in labor for one to two hours with both intradermal and subcutaneous injections (Duff, 2008; Lee et al., 2011). Sterile water injections can be completed by a nurse or other certified healthcare professionals who are given training on placement techniques, and placement sites as the injection routes of subcutaneous and intradermal are already a practiced part of the nurse’s basic skills in medication administration. The ACE Star model allows for assimilation of knowledge in a five step cycle with the end goal of incorporating the evidence found in the literature into practice. Evidence based practice allows for current effective care following established guidelines and principles. The ACE Star model guides research evidence into an accessible and methodical structure for operational use (Stevens, 2004). Facilitating research evidence of sterile water injections can give laboring women more support and options thus allowing the labor process without the use of pharmacological pain relief, creating individualized consumer focused care.

2. ACE Star model

Sterile water injections have been used in obstetrical practice since the 1920’s as a local anesthetic that is cheap, effective, and has minimal side effects (Mårtensson & Wallin, 2008). In the last 10 years there has been a resurgence in research and in the use of sterile water injections for use in non-pharmacological management of labor pain. The five pointed ACE Star model’s first point is discovery research. Articles by Centre for Reviews (2009), Duff (2008), and Lee et al., (2011), Mårtensson & Wallin, (2008), Romano and
Lothian, (2008) are just a few of the examples found in a computerized database literature search to validate the use and effectiveness of sterile water injections. The ACE Star model’s second point is an evidence summary. Each literature example illustrates that sterile water injections can be used as a pain management technique providing relief for 1-2 hours, with minimal risks, and can be repeated as necessary. No side effects have been noted except for a burning or stinging sensation during administration with intradermal injections only. Research additionally demonstrates that sterile water injections are a more effective treatment intervention than a control group tested using sterile saline injections (Lee et al., 2012). The ACE Star model’s third point is translation into guidelines. With this knowledge the policy and procedure guideline was modeled. The ACE Star model's fourth point is practice integration. Practice integration in an inpatient hospital setting requires the training of staff and education to the public of options available to them. To integrate the policy guides must establish safe care management and include the annual competency guideline, the birthing plan educational information pamphlet, and the consent form. Nurses must demonstrate annual knowledge and competency in the skill, to ensure safe practice. Patients are given a pamphlet of available labor interventions. The ACE Star model's fifth point is process, outcome, and evaluation. Literature suggests pain reduction is achieved for 1-2 hours with sterile water injections.

3. Implementation of the ACE Star Model

3.1 Procedural Translation into Guidelines

“Procedural guidelines for sterile water injections to ease back pain in labor” establish the proper technique for sterile water injection as dictated by current literature research. Clearly established policies should be available in policy and procedure manuals and made available to all staff. Physicians and administration must verify and approve any new procedure before it is set into practice. Sterile water injections do not require the hospital to acquire any additional resources that are not already purchased, used, and readily available at times. A procedural guideline provides nurses with instructions to provide accurate, safe, and appropriate care to all consumers.

Table 1. Procedural guidelines for sterile water injections to ease back pain in labor
1. Obtain order from primary physician.
2. Explain procedure to the woman and describe area of injection. Be sure that the woman understands she may feel a burning/stinging sensation that will accompany the injection for 30-90 seconds, but that back pain relief will occur within 1 to 3 minutes and will last from 1 to 2 hours. Obtain written consent.
3. Assemble equipment: Four 2-mL syringes with 25 gauge needles, preservative-free sterile water (do not use 0.9% saline), and alcohol swabs. Position woman either sitting, upright, or laterally. Have labor partner or another staff member hold woman's hand and offer support and encouragement during the procedure.
4. Identify areas for injection sites.
   A. When using standard injection sites based on anatomy markers- mark the areas to be injected with a pen, prior to administration. The sacral dimples can be palpated for guidelines.
   One injection is given at the posterior superior iliac spine on both sides and second injection at 1 cm medial, and 1-2 cm inferior to the first point on both the sides using the 25 gauge needle. These points overlies the area called Michaelis' rhomboid (See figure one below).
   6. Draw up 0.5 mL of sterile water in each of four syringes.
7. In preparation, cleanse the skin with an alcohol swab, and allow to air dry. Don gloves.
8. Injection Procedure:
   A. Plan to do the injections during a contraction (preferred) or between contractions (if woman's preference). Plan for two nurses to be available (preferred) so that injections can be done simultaneously on each side, to minimize the time and pain of injections. Injections can all be done by one nurse if necessary.
   B. Subcutaneous injection (preferred): The angle of inject is determined by the woman’s body weight, this can be estimated by the amount of tissue that can be grasped by pinching up a small area between the index finger and thumb. The angle of insertion is usually 45 degrees; however with individuals who are obese or who have larger amounts of tissue the angle may be increased up to 90 degrees.
   C. Intra-cutaneous (intradermal) injection: The angle of insertion is 15-20 degrees.
   D. For both injection depths: No aspiration during injection is necessary. Slowly inject 0.5 mL of sterile water in the chosen areas. Avoid touching or rubbing this area after injections.
9. The procedure can be repeated once the pain relief wears off, in 2 hours.
10. Document the pain scores before and after the injections. Procedure and results should be recorded in the progress notes.

**Figure 1. Michaelis’ rhomboid and injection sites**

### 3.2 Practice Integration

In order to train staff and ensure patient education an annual competency guideline, a consumer consent form, and a birthing plan educational information pamphlet were created. Staff needs to receive adequate training to be competent on departmental specific policies, tests, and procedures (refer to table 2). Competencies must be evaluated on an annual basis to verify competency. Though sterile water injections are not invasive, consumers may want additional information to increase their knowledge on the unfamiliar procedure, or be aware of the position, risks, and procedure (refer to table 3). To meet the needs of the consumer/the laboring woman, verify that they understand the procedure, benefits, and risks involved. Documenting this verification of knowledge is accomplished through the signing of a consent form (refer to table 4).

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Annual Competency Guidelines for sterile water injections to ease back pain in labor</th>
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<tbody>
<tr>
<td>“Annual Competency Guidelines for Sterile Water Injections to Ease Back Pain in Labor”</td>
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</tr>
<tr>
<td>Step 1: Read the Procedural Guidelines for Sterile Water Injections to Ease Back Pain in Labor</td>
<td></td>
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<tr>
<td>Step 2: Please review the following EBP articles:</td>
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<tr>
<td>Step 3: Please review the following guidelines for placement:</td>
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<tr>
<td>I understand that injections are preferred as subcutaneously. Subcutaneous injections are usually found to be almost painless. If the injection is not given deep enough in intradermal/subcutaneous injection, there is no risk to the patient. Intra-cutaneous injections have a side effect of burning at the injection site. Intra-cutaneous injections will relieve pain with equivalent effectiveness of subcutaneous injections. When giving sterile water injections use the location of the anatomical landmarks and Michaelis’ rhomboid. When locating the top 2 points of injection, find the anatomical landmarks of the posterior superior iliac spines. You may mark these with a pen. Then go down 3cm and inward to midline 1 cm from the posterior superior iliac spines to make second inject sites.</td>
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<table>
<thead>
<tr>
<th>Table 3</th>
<th>Birthing plan educational information pamphlet</th>
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<tbody>
<tr>
<td>Your Birthing Story: A guide for you to make it what you want:</td>
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<tr>
<td>Natural birth options (non-pharmacologic):</td>
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<tr>
<td>Birthing ball</td>
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<tr>
<td>Rocking chair</td>
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<tr>
<td>Telemetry systems (to allow baby monitoring while you are up and walking)</td>
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<tr>
<td>Instructions on positions to facilitate labor</td>
<td></td>
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<tr>
<td>Instructions on Lamaze breathing to facilitate labor</td>
<td></td>
</tr>
<tr>
<td>Instructions on massage to facilitate labor-tennis balls are available for your birthing partner to assist you</td>
<td></td>
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<tr>
<td>Sterile water injections to treat back pain “back labor” ask your nurse for details</td>
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<tr>
<td>Other options for pain management (pharmacologic):</td>
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<tr>
<td>Intravenous (IV) medications</td>
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<tr>
<td>Epidural</td>
<td></td>
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<tr>
<td>Nerve blocks</td>
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</tbody>
</table>

***Discuss with your physician and nurse what is right for you
Some options may be limited by your stage of labor and other factors, ask your physician or nurse
***You can try a variety of these options to suit your birthing needs
You can start out with natural labor options and then change your mind and use pharmacologic options for pain management. |

| Table 4: Informed Consent: Sterile water injections to ease back pain in labor |
|-----------------|-----------------------------------------------------------------------------------|
| Name (printed) ________________ |
| Date of Birth ________________ |

By signing this form I acknowledge the following:
1. I understand the procedure of sterile water injections:
   The nurse will inject 0.5 mL of sterile water subcutaneously or intra-cutaneously into four chosen areas in the lower back, specifically in the lumbar region. I may have
Injections at the discretion of my physician, with a frequency of up to every 2 hours for pain management.

2. I understand the benefits of sterile water injections:
The benefit of sterile water injections is to reduce back pain in labor. I understand according to research studies, back pain is significantly reduced by 30-80%.

Individuals wishing to choose a more natural labor experience may choose this option as it is a non-pharmacological (without the use of drugs) alternative, and has been proven by research to be more effective than anesthetic (a drug that causes loss of sensation/numbness) injections.

3. I understand the risks of sterile water injections:
There are currently no known risks to a patient’s health or to their unborn child.

4. I understand the side effects of sterile water injections:
The side effect of sterile water injections is slight burning lasting 30-90 seconds at the injection site. I understand not all individuals feel this sensation, and research studies describe many individuals as reporting the injections as almost painless.

5. I understand that choosing to receive sterile water injections does not limit or delay any other treatment option. I may still receive IV drug therapy and/or an epidural at any point after the administration (with doctor’s consent).

6. I understand that I may stop or refuse treatment at any time, and this will not affect my overall care or the services available to me. If I have any questions regarding this consent form or about the services offered, I may discuss them with my nurse or physician.

I have read and understand the above. I consent sterile water injections.

4. Conclusions
In the fifth point of the ACE star model process outcome and evaluation, the results are assessed. The annual competency guideline, the policy and procedure guideline, the birthing plan educational information pamphlet, and the consent form were submitted for approval to a local hospital for practice integration. The ACE star model is well suited as a means of transportation to guide knowledge from research literature pulling out textual evidence, into policy and procedures, and assimilating the evidence into practice. Each of the five points in the ACE star model allows for a continuing sequence of facilitated movements to transform research literature from evidence, to adaptation into guidelines that then becomes evidence based practice.

References


Correlation between Manual Pulse Rate and Heart Rate Variability

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Abstract — Many chiropractors focus on a condition known as vertebral subluxation. One of the main aspects of vertebral subluxation is its neurological disturbance component. One type of neurological disturbance in traditional chiropractic theory pertains to low variability of neurophysiological findings such as temperature or heart rate. The low-tech method of manual pulse rate (MPR) is used for a variety of reasons, including use as a general (autonomic) neurological marker. The author wondered how well, if at all MPR correlated with a high tech method that assesses autonomic variability such as heart rate variability (HRV). Thus, the present study compares MPR with HRV in a convenience sample of 32 chiropractic students. An inverse relationship between the two variables (HRV and manual pulse rate) is expected since: a) a lower pulse rate is typically considered healthier than a higher pulse rate, and b) higher heart variability is typically considered healthier than lower heart variability. As expected, an inverse correlation between the two methods was observed, and the correlation was moderate strength and statistically significant. Thus, the user-friendly, manually-palpated pulse rate may be a useful method for assessing a neurological component of the vertebral subluxation.

Keywords — Heart rate variability, pulse rate

1. Introduction

Many chiropractors focus on a condition known as vertebral subluxation, defined in concept as a minor biomechanical aberrancy between vertebrae (e.g., a slight misalignment) resulting in some type of neurological disturbance. One type of neurological disturbance is diminished autonomic variability, typically assessed with heart rate variability (HRV) technology. The autonomic variability model is consistent with traditional chiropractic theory regarding possible neurological effects of vertebral subluxation. Chiropractors who focus on vertebral subluxation may be interested in neurological assessments that are sufficiently user-friendly for use on all patient visits. One such user-friendly option may be the manual pulse rate (MPR) - a simple procedure that is used for a variety of reasons including as a marker for autonomic health (Verrier and Tan, 2009). Previous research has revealed a moderate strength, inverse correlation between: a) resting heart rate (derived from a 10 second ECG recording) and b) HRV (Nussinovitch et al, 2011). In the pursuit of a user-friendly method of assessing a neurological component of vertebral subluxation, within the variability model of nervous system function, the present study compares MPR to HRV. In particular, the study compares MPR to HRV’s standard deviation of normal-to-normal beats (SDNN) value. The full paper for this study is published elsewhere (Hart, 2012). Outcomes research indicates that a lower resting heart rate is associated with improved health outcomes compared to a higher resting heart rate, at least according to long-term studies (Mensink and Hoffmeister, 1997; Hsia et al, 2009). Since a higher SDNN (indicating greater heart rate variability) is associated with better health outcomes compared to a lower SDNN (Lauer, 2009), an inverse relationship between MPR and SDNN is expected.

2. Methods

Thirty-two conveniently sampled chiropractic students were examined with: a) HRV (using the Biocom HRS v. 1.0 unit) and b) two 15 second MPR measurements. The average of these two pulses was compared to participants’ corresponding SDNN values using Pearson correlation in Stata IC 12.1 (StataCorp, College Station, TX).

3. Results and Discussion

An outlier was observed in scatter plot inspection so calculations were performed with and without the outlier. The direction of the coefficients was inverse as expected. With the outlier, \( r = -0.560, p = 0.0009 \); without the outlier, \( r = -0.543, p = 0.0016 \).

Results were essentially the same whether the outlier was included or not. A limitation to the study is that its convenience sampling approach inhibits generalizable-ability of the findings. Another possible limitation is the relatively short time frame used to obtain the MPR – 15 seconds (for two average measurements), when the 30 or 60 second time frame options could have been used. However, a good correlation has been observed for pulse
rates obtained with time frames of 15 seconds, 30 seconds, and 60 seconds (Hwu et al., 2000).

4. Conclusion

A moderate strength, statistically significant inverse correlation was observed between MPR and SDNN for this group of participants. Thus, MPR may be a valid, user-friendly method for assessing a neurological component in subluxation-based practice. Further research, which includes patients from the general population, is indicated to verify these findings.

References


Comparison of Muscle Activity During the Olympic Deadlift and a Walk-In Deadlift Machine

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Abstract — The deadlift exercise is a common resistance training exercise used to strengthen the entire lower body and the low back, but inexperienced lifters are at a higher risk for low back injury if the proper technique is not practiced. Fifteen resistance trained individuals were recruited to discover if using a machine deadlift had the potential to reduce injury in inexperienced lifters. Electromyography was used to measure muscle activation during the standard Olympic deadlift (ODL) and three different variations of the walk-in machine deadlift (WID): 2) WID with toe alignment and pronated (palms down) grip (ToePro), 3) WID with ball of the foot alignment and pronated grip (BallPro), and 4) WID with ball of the foot alignment and a neutral grip (BallNeut). The results showed that there was less back muscle activity during one of the variations of the WID (BallPro) compared with ODL. In addition, there was higher quadriceps activity and lower gluteal activity for all variations of the WID when compared to the ODL. Based on the difference in low back muscle activity, it can be concluded that the WID may be safer for both high and low skilled individuals, but each participant must consider differences in leg hip muscle activation when deciding which exercise to use during their workouts.

Keywords — Deadlift, electromyography, low back injury

1. Introduction

The deadlift exercise is a commonly prescribed exercise for athletes in all sports because of its involvement of most lower body and upper body musculature and importance as a basic component of several other commonly prescribed power lifts such as the power clean. Like most full-body exercises, however, significant time must be spent by the athlete learning proper technique in order to avoid musculoskeletal injuries. The low back in particular is a common injury site, even in well-trained individuals. A six-year study of elite powerlifters by Calhoon et al. (2009) indicated that 23% of all injuries during that time were low back injuries, 74% of those being muscle strains. Another study by Keogh et al. (2006) reported that in 101 lifters of different ages and genders, 23.7% of all injuries were low back injuries, with the deadlift exercise alone accounting for 11.9% of all injuries.

It is likely that injury rates are even higher in inexperienced lifters with less background in proper technique. In fact, data from Escamilla et al. (2001) reported that less skilled lifters have a wider stance, which results in a wider grip and a more bent over stance in the initial stage of the lift. This created a greater stress on the low back (greater lever arm) which can increase injury risk in the lower skilled participants.

Alternate exercises which place less stress on the lower back while athletes are learning proper technique and developing necessary muscle strength would be highly desirable to minimize injury risk. For example, in contrast to the conventional deadlift, the sumo style deadlift utilizes a significantly wider ‘toe-out’ stance which allows the arms to be placed inside the knees. The result is that the trunk is significantly more upright prior to the lift (2000, 2001) and the bar stays closer to the body during the lift (Cholewicki, 1991), resulting in a reduction of joint moments and shear forces (Cholewicki, 1991). Unfortunately, the sumo style deadlift is a more advanced lift, and despite the advantages cited above, would not be a suitable alternate to the deadlift for lifters still developing their skills.

The use of a ‘walk-in’ deadlift machine uses independent handles instead of a weighted bar, allowing the subject to position the load on either side of the body instead of in front of the legs. Theoretically, this would allow alignment of the load with the body’s center of gravity throughout the range of motion, decreasing the moment arm, and allowing a more upright torso position. Measurement of the activity of lower back muscles will answer the question of whether this machine will be a safe training alternative for the deadlift for inexperienced, rehabilitating, or delinquent lifters.

Therefore, the purpose of the study was to compare muscle activity during the standard Olympic deadlift (ODL) with three slightly different variations of the walk-in deadlift machine (WID). It was hypothesized that back muscle activity would be lower during the WID lifts compared to the ODL, but that activity in other muscles would be the same.
2. Data Collection and Analysis

2.1 Methods

Fifteen active weightlifters (2 females, 13 males) with no recent injury history were recruited through word of mouth, flyers and email solicitation. After signing an informed consent form, subjects reported to the Spartan Performance Center on the USC Upstate campus on two separate occasions. On the first occasion, all lifters were given a short training session by a certified instructor on basic safety for the deadlift before any testing was done, but not given detailed technique instruction. Next, subjects were tested to find their 3-repetition maximum (3RM) on a standard Olympic-style deadlift (OD). A Certified Strength and Conditioning Specialist conducted all 3RM testing and training. The 3RM procedure consisted of a warm up with a light weight followed by 3-4 sets with progressively increasing weight, culminating with an attempt at the expected maximum. Following determination of 3RM, subjects were separated into a high skilled and low skilled group based on their experience with the deadlift exercise: subjects who had been taught advanced deadlift technique by an experienced strength coach, and who had been consistently utilizing the deadlift in their current workouts for more than six months were classified as high skilled (n=8), while all other subjects were considered low skilled (n=7). On the second and final visit to the lab, the electrical activity of four muscles was monitored using electromyography (EMG) while subjects performed submaximal deadlifts using both the Olympic bar and the walk-in machine. On this occasion, subjects had adhesive electrodes placed on the skin over four muscles: the gluteus maximus (GM) – the buttocks, vastus lateralis (VL) – the front of the thigh, biceps femoris (BF) – the back of the thigh, and erector spinae (ES) – the lower back. This involved vigorously cleaning the site with an alcohol pad, and firmly pressing the electrode to ensure the integrity of the signal. Next, electrode wires were attached to each electrode and then to a data processor (Biopac, Goleta, CA) in order to capture and analyze the electrical activity in each muscle during exercise.

During all exercises, subjects had reflective markers placed on their wrist, shoulder, hip, knee and ankle joints to allow sagittal plane measurement of joint angles, moment arms, and movement speed and distance throughout the lift (data not presented). Three high-speed video cameras collected marker positions at 120 frames per second and were analyzed by laptop computer with MaxTraq 3D software (Innovision Systems, Columbiaville, MI).

After the preparation for EMG and video data collection was complete, subjects performed a maximal contraction against immovable resistance at a specified joint angle for each muscle. The data collected during each attempt was recorded as the maximal electrical activity of the involved muscles and was used to normalize results from the upcoming submaximal lifts by dividing the activity by the measured maximal activity. The joint position for each muscle test was as follows: GM – 90 degrees of hip flexion, straight knee; ES – lying prone; VL and BF– seated with hip and knee flexed to 90 degrees. Following a brief rest, subjects completed, in random order, three repetitions each of four different exercises at 80% of the 3RM for that exercise, separated by a 3-minute rest period. The exercises were: 1) ODL, 2) WID with the machine’s handles aligned with the end of the toes and held with a pronated (palms down) grip (ToePro), 3) WID aligned with the ball of the foot and held with a pronated grip (BallPro), and 4) WID aligned with the ball of the foot and held with a neutral grip (BallNeut). At the conclusion of the final set, subjects were released and allowed to remove electrodes at their own discretion. Electromyographic activity, expressed as % maximum activity, was later analyzed and compared between the ODL and the three variations of the WID. A Two-way Repeated Measures ANOVA was used to compare exercise as the within-subjects factor and training status as the between-subjects factor, with significance level set to p≤0.05 for all comparisons.

2.2 Results and Discussion

Statistical analysis revealed that in the combined low and high skilled groups, activity of the quadriceps was significantly higher in all three WID variations compared with ODL (+70.2% for BallNeut, +64.4% for BallPro, and +32.2% for ToePro), while GM activity was lower (-37.9% for BallNeut, -36.1% for BallPro, and -36.0% for ToePro). BF activity was unchanged for all four exercises. Activity of the ES of the back was 27.4% lower (p≤0.05) than ODL during the WID BallPro variation, but was statistically unchanged for the other two variations. There were no differences in muscle activity of low skilled subjects compared with high skilled subjects in any of the four lifts.

Many studies have been carried out to compare muscle activity during variations in other exercises, including squats, leg presses and even deadlift exercises, but to our knowledge, this is the first study to compare muscle activity while performing...
a machine deadlift to the standard Olympic lift. One study compared EMG during different foot positions and torso angle for the leg press exercise (Da Silva, 2008). The results showed that during lifts requiring 80% maximal effort, quadriceps and hamstrings activity was higher with the feet placed lower on the platform compared to the higher foot placement. Likewise, gluteal activity was greater with the higher foot placement compared to the lower foot placement. The authors concluded that differences in the joint angles and lengths of the respective muscles brought about by changes in foot placement changed their force producing capabilities and therefore their necessary activation levels.

In the current study, small differences in foot placement, hand position, and the relative position of the load center seem likely to have had a similar effect on muscle lengths and activation levels as seen in the Da Silva (2008) study, despite the difference in posture between the two exercises. Biomechanical data are currently being analyzed to determine how much, if any, differences in posture and joint angles may have affected the outcome of the study.

3. Conclusions

Based on the lower ES muscle activation during at least one variation of the WID compared with the ODL for both high skilled and low skilled lifters, it can be concluded that the WID may be safer for both high and low skilled individuals. However, the WID may also be used as an alternative exercise if the participant desires greater activation of the gluteal muscles during the deadlift exercise.

Acknowledgements

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References


HIV/AIDS Prevalence among the Hispanic Community in Spartanburg, SC

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Abstract — While not much is known about the risk of HIV/AIDS among the Hispanic community in Spartanburg, there is indication that this community may be at high risk of HIV infection. The only effective means of controlling the spread of HIV/AIDS is through HIV testing. In spite of the fact that the Hispanic population is the fastest growing ethnic group only around 1% of Hispanic population in Spartanburg has been tested for HIV. This study examines the factors preventing the Hispanic population from receiving HIV test. The results of this study will contribute to more effective HIV/AIDS campaigns and intervention, especially among minority ethnic groups.

Keywords — HIV/AIDS, Hispanic, HIV testing, HIV intervention, Spartanburg County

1. Introduction

Despite media depictions, HIV/AIDS infections in the United States continue to be a public health scare, which is routinely overlooked by the press. There are 1,148,200 people living with HIV in the United States, including 207,600 who are infected but are unaware of their status—which places them at greater risk of spreading the disease (AVERT, 2013). Approximately 50,000 Americans become infected with HIV every year (CDC, 2013). In other words, every 9.5 minutes, someone in the United States is infected with HIV (Foundation, 2013). What is frightening is the fact that despite the estimated 15,529 deaths caused by AIDS in 2011 alone, the disease continues to be seen as an “overseas” problem that does not affect Americans (CDC, 2013). In fact, despite the seriousness of the HIV/AIDS epidemic in the United States, it was not until 2010 that the U.S. government developed a comprehensive plan in response to the disease (AVERT, 2013).

Geographically, HIV infection rates are the highest among the Southeastern states of the U.S. (Beadle, 2012). The South has half of all the new cases of HIV/AIDS, but it only has a third of the country’s population (Beadle, 2012). This can be attributed to many factors including, but not limited to, poverty, which was calculated at 18.2% of South Carolinians in 2011 (SCDHEC, 2012), and the lack of access to sufficient healthcare (Theis, 2012). The lack of comprehensive sexual education requirements in many Southern states are another contributing factor (Culp-Ressler, 2013) and because of this, the youth in Southern states are growing up with insufficient knowledge about sexual health in the importance of getting tested regularly.

South Carolina was recently ranked 7th in the nation in 2011 for the rate of new AIDS cases annually and continued to grow with an average of 65 newly reported HIV infections every month during the past year (SCDHEC, 2012). It is considered as one of the top 10 “hot spots” in the nation for HIV infection and for the fourth year in a row, South Carolina has been ranked as number 1 in the nation for the heterosexual transmission of HIV (ABFSC). As of December 31, 2011, an estimated 14,945 people were living with HIV/AIDS in South Carolina (SCDHEC, 2012), and it was recently described as “the buckle of the AIDS belt” (Jackson, 2012).

Spartanburg County is not immune to the HIV/AIDS epidemic. As of December 31, 2009, there were 972 known cases of HIV/AIDS infections in the county (Jackson, 2012). Approximately 40-59% of the people in Spartanburg that know that they are HIV positive are not receiving any medical care (Jackson, 2012).

The Hispanic population represents one of the most at-risk populations when it comes to HIV/AIDS infections in the United States, as well as in South Carolina. Hispanics have the highest rate of new cases of HIV infection in the United States (Connolly, 2008). According to recent studies, Hispanics represent 16% of the population but accounted for 21% of new HIV infections and 19% of people living with HIV in 2010 (Latinos and HIV, 2012). AIDS continues to be the 6th leading cause of death for Hispanics ages 25-44 (Latinos and HIV, 2012). Though the Hispanic population has the highest rate of new HIV/AIDS cases in the United States, the problem has...
received very little attention (Connolly, 2008). Research among HIV/AIDS infections among African Americans is extensive; however, research among the Hispanic population is limited and has been overshadowed by the epidemic among gay men and African Americans (Connolly, 2008). In fact, the true number of infections is not known because many states have not reported their numbers to government officials. The Hispanic Community tends to be a “hidden population” as far as their risk for HIV is concerned and also in terms of their tendency to not seek HIV testing.

Another concern relating to HIV infections among the Hispanic population is the fact that they are the largest and fastest growing ethnic minority group in the U.S. (Latinos and HIV, 2012). In South Carolina, in the last ten years, the Hispanic population has increased by 135% (Largen, 2011) and by 3% in Spartanburg County (Jackson, 2012). Of the total number of HIV/AIDS infections in Spartanburg County, 72% are African American, 22% are White, and only 7% of the total number of infections are Hispanic (2012 HIV/AIDS Summary: South Carolina, 2012).

According to the 2010 Census, there were 16,658 Hispanics living in Spartanburg County which represented 5.9% of the total population—slightly higher than the state’s average of 5.1% (Largen, 2011). Of the 16,658 only 1,791 of them were tested for HIV (People Tested for HIV in South Carolina Health Department Clinics, 2012). This is approximately 1.08% of the total Hispanic population in Spartanburg County. This fact raises the question about the factors that are preventing the Hispanic population in Spartanburg country from getting tested for HIV/AIDS.

Getting tested regularly is the key to stopping the spread of HIV/AIDS infection to others, including yourself, because it is the only way to know for sure if the infection is present in your body. It is impossible to tell if someone is infected with HIV by merely looking at them, because symptoms can potentially take up to 10 years to appear and a person who is HIV positive may look and feel perfectly healthy (WHO, 2013). Seeking HIV testing between partners is necessary as well, and has led to the spread of infection when chosen not to be tested before a new partner (HIVTest.com, 2012). The need for testing on a regular basis needs to be a priority in the education of HIV/AIDS within the Hispanic population as well as other ethnic groups within the county. Because there is a period of time right after initial infection of the disease, called the “window period”, tests will not be able to detect HIV even if a person is already infected and they could continue to spread the disease unknowingly (WHO, 2013). Testing for HIV on a regular basis is the best way to protect your own life and the lives of those you care about. If infected, steps can be taken before any symptoms appear, in order to obtain the required medical treatments, lesson the effects of the disease, and begin other services that may be needed to prevent additional health complications. Denying the importance of HIV testing could potentially eliminate the ability to live a healthy life and allow the infection to continue to spread.

Studies suggest that part of the reason why the Hispanic are living “in the shadows” of HIV/AIDS is due to social and language barriers, in addition to questions about their immigration status (Sherry Deren, 2005), which, as Daren argues, makes it difficult to gain their trust and gain access to their communities to get the necessary information (Sherry Deren, 2005). There are several problems with generalizing conclusions from the national studies on the Hispanics.

First, arguments that the Hispanic are afraid to undertake HIV testing due to questions over their immigration status are incorrect because such conclusions only perpetuate the false and incorrect stereotype that all Hispanics have questions about their immigration status. While this may be true among people who are in the country illegally, such arguments cannot be generalized to apply to all Hispanics. This is why it is important to examine the true reasons that prevent many of the Hispanics from seeking HIV testing. Second, these conclusions are based on studies of Hispanics in other parts of the country. It is important to examine whether these conclusions would be true among the Hispanics in Spartanburg County.

Is the low prevalence of HIV/AIDS infections among the Hispanic population in Spartanburg County because they are at low risk of HIV infection? Why are the Hispanics not coming forward for HIV testing? These questions become pertinent especially in view of the fact that in 2012, the United Nations set a goal of “Zero new infections, zero discrimination, and zero-AIDS-related deaths by 2015” (Gellner, 2012). We cannot reach this goal if we do not have an accurate picture of the HIV prevalence rates of the different racial and/or ethnic groups. In addition, we cannot attain this goal unless we have a proper understanding of the factors that prevent certain groups that may be at high risk of HIV infection from being tested. This is especially important for the Hispanic community because they are the largest and fastest growing ethnic minority group in the United States as well as in Spartanburg County (Latinos and HIV, 2012).

The findings of this study will help to determine the cause of the low prevalence of HIV/AIDS infection among Hispanic communities...
in Spartanburg relative to the United States’ fairly high prevalence within the same group. The results will identify potential factors including language, cultural, or social barriers that are inhibiting the members of the Hispanic communities in Spartanburg and therefore, preventing them from seeking HIV testing. The study also aims to provide the basic information to create programs to ensure the increased participation among Hispanics in HIV/AIDS testing throughout our community.

2. Methods

This is part of a larger study that will be done to examine factors preventing the Hispanic community in Spartanburg County from seeking HIV testing. In the first phase of this study we utilized archival data from multiple sources, including HIV Surveillance data from the Spartanburg Department of Health and Environmental Control (DHEC), HIV data from Piedmont Care, Inc., and HIV/AIDS data from the Center for Disease Control (CDC), among others. Other data was obtained through research including the differences among the Hispanic cultures, the social behavior shared among families and friends in both their native country as well as in America, and further information about Hispanic cultures that were deemed necessary to our be successful in our research. This data provided the initial statistical information needed to develop our research plan as well as a clear basis of understanding of Hispanic socioeconomic factors, cultural norms, and behavioral trends needed to understand hypothetical reason for the low prevalence of infection amongst their community. In the second phase of the study, we organized two separate focus groups in which personal acquaintances were recruited for open discussion and brainstorming. The focus groups were planned and maintained as open, non-discriminatory discussion about the Hispanic culture as an entirety. The two focus groups included a total of 10 participants; 6 females, and 4 males. The participants ranged in age from 19-69 years old, and though they were all considered of “Hispanic origin”, they differed in specific ethnicities. Their education level ranged from “less than high school” to the “completion of a Bachelor’s Degree”. Finally, all of the participants were United States Citizens, with two born in another country, and the rest born in the US. The participants were asked a range of questions while in a group therefore keeping the conversation generalized and less personal and allowing the participants to be comfortable. After asking a question, I allowed all the participants to speak freely until they were done talking and we could all move on to the next question together. The goal for these focus groups were to gain a broad understanding of Hispanic culture and norms while keeping every participant comfortable and happy so that they would freely discuss their opinions. After the focus group was finished, each participant gave me the names of family members or friends that I could contact.

The third and final step will include personal interviews with the focus group participants in a one-on-one setting as well as their family and friends. Personal interviews will also be conducted with the target population, including the friends and family member given to us during the focus groups and leaders of the Hispanic community. Between the initial archival data, the focus groups, and personal interviews with Community Outreach Programs that work one-on-one with immigrants and members of the Hispanic Community as well as with the Spartanburg South Carolina Health Department, the reason for the low prevalence of HIV/AIDS will become clear. Additionally, personal interviews with Hispanics in the Community will support our findings as well.

3. Results

In my preliminary results, obtained through my archival research and focus groups, information about cultural barriers and stigma’s were uncovered as possible barriers when seeking HIV treatment among the Hispanic. Most differences learned through my research to date is that the grandmother is the matriarchal figure for the entire family as opposed to the man in American traditions. The family turns to her for support and advice. Through the focus group discussions it was revealed that she is normally very conservative and would not be open to discussion with her family or friends about HIV/AIDS testing. Personal interviews will follow with more in depth questions to reinforce the current findings and understand in more depth.

4. Discussions

Preliminary results based on archival data shows that the majority of the Hispanic population in Spartanburg County is not being tested for HIV/AIDS because of cultural barriers between members of the Spartanburg Hispanic population and HIV Service Organizations (HSO) and clinics. Currently, in Spartanburg, there is one HSO and one AIDS clinic. HIV testing in Spartanburg mainly takes place at the AIDS clinic which is located at the Spartanburg Regional Hospital. There is only one physician – a white male doctor, in the AIDS
clinic. Some testing is also done at the local HSO which does not have any Hispanic personnel. While the absence of a Hispanic care provider may not be an issue to many non-Hispanic members, this presents a big hindrance to members of the Hispanic community.

Medical sociology literature (Cockerham, 2012) suggests that cultural barriers prevent patients from seeking or receiving medical care when the patients perceive that the care providers do not share the same cultural backgrounds as themselves. This is particularly true of many of the Hispanics who already have a language barrier if, in addition, there is no service provider available who shares their cultural background, as is the case in the local HSO and AIDS clinic in Spartanburg. HIV is, in itself, a life-changing medical problem which is still fraught with a lot of social stigma. Having to expose oneself to a “stranger” presents an understandably major hindrance to many Hispanics who may prefer to keep their HIV status unknown than face the unknown consequence of being found HIV positive. Undoubtedly, the question of their immigration status also further augments the need to remain in the shadows of HIV for many Hispanics.

What these findings suggest is that in considering issues such as HIV/AIDS infections, the diversity of different cultures and the knowledge of cultural stigmas and social norms need to always be taken into consideration. The challenges that the Hispanic community faces needs to be taken into account as well including language barriers, lack of education, immigration status, and their lack of trust towards outsiders. Steps need to also be taken to bridge the cultural barriers that may prevent members of certain communities from taking necessary medical actions, such as receiving HIV testing, that are critical to the successful management of those health problems.

References


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Sleep Deprivation amongst College Students

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Abstract – The effects of sleep loss in college students were examined in 112 surveyed and seven interviewed students at Spartanburg Methodist College. Of the seven interviewed students, two were examined by naturalistic observation. The 112 students surveyed answered questions about their sleep schedule, diets, and use of alcohol or tobacco products. The interviewed students were asked about how they felt after using these products or after getting the required amount of sleep versus getting less sleep as recommended. When cross-referenced, evidence shows that regular caffeine, alcohol, and tobacco use all inhibit sleep. Additionally, the sleep-deprived tended to take more naps throughout the day and attempt to sleep more before an exam. The two students examined through naturalistic observation both exhibited unhealthy sleep patterns. They claimed to feel alert during the first few days of sleep deprivation, and then complain of fatigue every three or four days. On days they felt alert, physical activity had declining results as well as their academic performance. Their confidence in their work did not match the grades they received. When they attempted to sleep more, they complained of not being able to fall asleep. This evidence shows that sleep deprivation can inhibit classroom performance, performance during physical activity, and can make obtaining a normal sleep schedule problematic. In the paper, I referred to REM (rapid eye movement) sleep, which is a recurring sleep stage during which dreams occur and muscles relax (Myers, 2011, p. 84).

Keywords- sleep deprivation, student sleep, sleep patterns

1. Introduction

Sleep is required for a number of functions necessary for mental and physiological health. During non-REM sleep, when the brain is not as active, the brain repairs and replenishes damaged or exhausted cells. Cells require this replenishment to function properly. The better the cells’ function, the stronger the body is. One’s immune system strengthens because of the cell repair that specifically takes place during sleep. Since less neurons fire during sleep, one’s brain can reproduce neurons at this time. An increase in neurons improves attentiveness and cognitive thinking as well as reaction time and physical potential. These neurons “exercise” themselves during sleep as well. Sleep is also necessary for production of growth hormones, which is why growing children require more sleep than a grown adult does (Myers, 2011, p. 88-89). The National Sleep Foundation claims that an average college student (an adult of or above eighteen years old) should get between seven and nine hours of sleep per night (Myers, 2011, p. 87). My study showed that less than half of college students get this amount.

2. Causes of Sleep Deprivation

Sleep deprivation occurs for many reasons in college students. The number one cause for staying up is social life. The common college student is incredibly socially active because of the newness of the experience and the close proximity to other students. There is more going on than they are used to living at home, so they tend to stay up later socializing. The next reason is work related to school. A student falls behind due to their social life, work schedule (if employed), or basic procrastination and stays up later to make up for lost time. These reasons are the most obvious though, and found out by simply speaking to any few college students chosen at random. I sought to find other reasons for the sleep loss epidemic amongst college students with a survey I distributed to 112 psychology students at Spartanburg Methodist College. Previous texts reviewed claimed that consumption of alcohol, use of tobacco products, and use of caffeinated drinks and energy supplements cause loss in sleep (Myers, 2011, p. 109). While speaking to students, the consensus was that use of alcohol and tobacco actually helped them sleep rather than inhibit their sleep schedule. This was clearly an erroneous perception because my study disagreed with the students and favored with the aforementioned literature.

2.1 Effects of Alcohol on Sleep Schedule

The majority of students that use alcohol claim that it helps them sleep better. My survey asked students how many hours they usually slept per night, how many times they usually woke up in the middle of the night, and the frequency at which
they consumed alcohol. On average, over seventy-six percent of students that drink exhibited poor sleeping habits. This evidence led me to conclude that consumption of alcohol inhibits proper sleep. Alcohol is a depressant, which slows down cognitive function and will cause drowsiness at certain levels (Myers, 2011, p. 109). However, the body works to burn off the alcohol once ingested, so the body continues to work, but just at such a slow rate that one feels drowsy. This effect resembles that of known causes of sleeplessness like eating or exercising close to bedtime, but contrasts them because the student does not feel alert. Thus, the student believes he/she sleeps better because, unlike eating and exercising, drinking makes you feel tired. This continuation of metabolism inhibits REM sleep, which rests the muscles and exercises cognitive brain function. Because the body continues to burn off the alcohol, it cannot rest properly. This, in turn causes a decline in brain repair and neuron reproduction, which causes a decrease in cognitive thinking and physical potential. Consequently, although a student may sleep between seven and nine hours after consuming alcohol, his/her body does not rest properly and the time spent asleep is not justified by the student’s potential.

2.2 Effects of Stimulants on Sleep Schedule

Tobacco products contain the addictive chemical nicotine. Those that use these products generally claim that they can sleep better by using this product close to bedtime. In contrast, my survey showed that only about twenty percent of the sample had healthy sleep patterns. The reason for this is the stimulant nicotine. Stimulants excite neural activity and speed up body functions, making it difficult to get to sleep (Myers, 2011, p. 104). I infer that the reason for their claim that using tobacco helps them sleep lies within the addictive properties of nicotine. The student feels relaxed after smoking or chewing tobacco because it satisfies his/her craving for nicotine. More frequent tobacco users actually wake up more during the night because their bodies suffer mild withdrawal from nicotine in the middle of the night (Alic, 2011, p. 4024). The use of tobacco products make it difficult to get to sleep and increased use prevents one from staying asleep during the night. Additionally, a continuously rising fad amongst college students is the energy drink. Approximately seventy-two percent of surveyed students claim to regularly consume caffeinated drinks or use other similar energy supplements. Of this percentage, about seventy-four percent had unhealthy sleep schedules. Unlike alcohol and tobacco, college students know the effects of energy drinks. Energy drinks gained popularity because students claim that these keep one awake, so students admit that such an abundance of caffeine and other energy supplements do not adversely affect their sleep habits. They do not realize, however, that such high doses of caffeine taken regularly can lead to anxiety and even insomnia (Myers, 2011, p. 109).

2.4 Genetic Causes for Sleep Loss

Although behavior is the primary reason for most college students’ sleep loss, some people suffer from sleep disorders that make sleep loss unavoidable. None of the interviewed students suffered from a sleep disorder, but they deserve mention for their contribution to sleep loss in college students. Attention deficit/hyperactivity disorder (AD/HD) is a commonly diagnosed disorder that inhibits the victim’s sleep. The patient is usually over energetic and has trouble relaxing enough to sleep regularly. Narcolepsy is another disorder that causes sleep loss. Those that suffer from narcolepsy will randomly fall straight into REM sleep without warning. Although most people believe in the fallacy that this group of people sleep frequently, these unannounced and arrhythmic REM sleep “episodes” make it difficult to fall asleep at night. Narcoleptics rarely sleep for long periods because the disorder interrupts their sleep just as abruptly as it brings it on (Brandt, 2006, p. 1278). Insomnia is another disorder that is onset by acute anxiety and makes falling asleep incredibly difficult for the victim.

3. Effects of Sleep Deprivation

Whenever the body does not get the required amount of sleep, it cannot carry out the functions necessary to maintain health. For example, the immune system relies heavily on sleep and weakens as sleep decreases. With a weak immune system, a college student is more susceptible to illness. The decrease in neuronal rest and reproduction will slow reaction time and impair cognitive thinking as well as decision-making. Decrease in sleep also causes depression and decrease in sensitivity to loss. Not only will the student perform poorly, but likewise not care as much. Also, students without the required amount of sleep repeatedly experience headaches. Repeated loss of sleep leads to more serious effects such as violent outbursts because of irritability, substance abuse to help sleep or stay awake, or automobile accidents due to slowed reaction time (Alic, 2011, p. 4024). My study showed that the irritability and overall exhaustion...
did not occur right away. It usually came in cycles of every three or four days. The student felt fine most days, and then appeared exhausted and irritable every three or four days of sleep deprivation. Although the students feel fine after improper sleep, Pilcher and Walters’ study suggests otherwise (1997). They reported that students deprived of sleep thought they felt more focused and believed they scored better on a cognitive thinking test than those that had the recommended amount of sleep. But in reality, the sleep deprived subjects scored much lower. Likewise, on days they felt alert, my sample who were student-athletes ran a slower mile on days following a night without enough sleep. This evidence suggests that physical potential also decreases with decreased sleep.

Conclusions

Based upon the evidences gathered through survey and natural observation, substances that students claim help them sleep actually cause them to sleep less. Although most college students claim to feel fine during the day after not sleeping for the recommended time, my individual study proved that the negative effects of sleep loss occur whether or not the student realizes it. Students who want to reach their full potential physically and educationally should get the recommended amount of sleep. Students can sleep better when they avoid alcohol, tobacco products, caffeinated drinks, and other energy supplements.

References


Perception and Posttraumatic Stress Disorder

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Abstract – This study hopes to shed enlightenment concerning those who have been diagnosed with Post Traumatic Stress Disorder (PTSD), specifically those who have served in the military. This study regards as to how their perceptions have been changed by PTSD. In order to gain a more accurate analysis, research has been conducted through a series of interviews with veterans, all of whom have been diagnosed with PTSD. Through the interviews, close analyses were focused on cognitive processes, encoding of experiences, motivations as well as emotions. All of which altered the veterans’ perceptual outlooks that conflicted with traditional culture. Motivation, in particular, focused primarily on their drive to survive.

Keywords – perception, PTSD, cognition, emotion, motivation

1. Introduction

Not too long ago, in 1980, Post Traumatic Stress Disorder (PTSD) has been added by the American Psychiatric Association to the 3rd edition of its Diagnostic and Statistical Manual of Mental Disorders (DSM-III) (Friedman, 2007, 1). Although a recently determined disorder, it had made great strides into being viewed as a serious concern by the public. It has impacted many people like those who have been victims of rape, by natural disasters, or war. For these people, it can be quite hard to maintain the perceptual outlook they once had as regards life and experiences. This does make it quite difficult for PTSD sufferers to live and interact with people who are not able to understand fully the experiences and difficulties they are dealing with.

This study closely examined veterans with PTSD and how it influenced their perceptual outlooks. To maintain confidentiality and to protect their privacy, veterans who have been interviewed for this research remain anonymous and have been labeled with names different from their own. Through the interview method, symptoms, alongside cognitive, emotional, and motivational factors that influenced their perceptions and mental health were examined. According to the National Center for PTSD (2007, pp. 1-4), all these aforementioned factors meet the requirements for treatment and therapy.

2. Cognition and Experiences

Cognition plays a major part in most aspects of life and plays a key role in PTSD. Cognition is defined as “all mental activities associated with thinking, knowing, remembering, and communicating” (Myers, 2009, p. 143). Through the process of cognition and in the case of traumatic events, people are forced to adapt to situations presented to them. As they adapt, the brain would process and store information obtained from the individual’s behavior (Berger, 2008, p. 184). In the case of PTSD sufferers, although said information may have been essential to survival at that time, it can be quite maladaptive later when returning to the culture they once knew. It is also much harder to readjust if the behavior is repeated for a length of time.

When it is time for veterans to return home from war, readjusting and forming new experiences can cause conflict most especially when they behave in accordance to their military experiences and background. Conflict and difficulties arise from within their families, the people in the community, and culture. Macionis (2008) defined culture as “the ways of thinking, the ways of acting, and the material objects that together form a people’s way of life. Culture includes what we think, how we act, and what we own. Culture is both our link to the past and our guide to the future” (p. 58). After living in a regimented, military culture where survival is the number one priority, it can be quite difficult for veterans to readjust to the more relaxed life of the average civilian. It is because the life they had from the past does not link them to the present and future. It is then common for veterans to experience anxiety and stress while trying to reenter the civilian culture. Both Victor and Paul, veterans with PTSD who served in Iraq, found it quite frustrating when they came back to the United States. They said that civilian life lacked the structure that they got used to in the military (Victor Smith, personal communication, February 12, 2013; Paul Smith, personal communication, February 13, 2013). Such difficulties and problems fomented ill feelings towards the culture they once knew so well. Victor stated that, “Ever since I got
back and started work again, I can’t stand working with and for civilians. The constant drama of complaining over basic bull shit just pisses me off so much”. It can be quite frustrating for veterans to come home to a society who have not seen what they have seen.

3. Motivation

Human motivation compels one to seek the relief and satisfaction of physical needs before all other wants and desires. Ultimately, the greatest motivator of them all is survival. When in war, soldiers put themselves in harm’s way. So they then learn to be watchful and wary of all situations that come across their path; perceiving any possible threat that might occur. With the continuous threats that their environment throw at along their path, it can be quite simple for them to fall into a state of paranoia. Willard Gaylin M.D. believes that with over awareness, one is far more likely to give authentication to one’s own perception rather than what is really happening within the world (Gaylin, 2003, p. 110). Soldiers, with their mixture of experience in battle and life threatening situations, often develop hypervigilance which is defined as “an abnormally anxious response to stimuli...refers to the continuous scanning of one’s environment for possible threats; the mind and body instinctively remaining alert to any potential threats that is beyond scope of what is considered “normal”...a sense of panic or anxiety is embedded in this hyper arousal state often causing the level of anxiety one experiences to worsen” (Sandor, 2009, p. 1).

For many veterans with PTSD, this constant motivation to survive along with cognitive processing led them to develop hypervigilance. This was when they developed a heightened sense of perception and was constantly aware of their surroundings. Often times, veterans with hypervigilance developed an acute sense to perceive possible threats in case of danger or some sort of emergency. David, a veteran of the Vietnam War, claimed that whenever he walked into a new room, he automatically checked to see how many people were in the room, how many were behind him, and where all possible exits were located (David Smith, personal communication, January 21, 2013). Hypervigilance gave them an eye for details even in the smallest of things. Victor narrated that even a simple incident of finding a trash can in the middle of the road while driving his daughter to school was enough to cause anxiety and hypervigilance (Victor Smith, personal communication, February 12, 2013). Hypervigilance came naturally and had a profound impact on the veterans’ perception.

4. Emotions

Those who suffered from PTSD had emotional troubles due to their traumatic experiences. The top two were anger and anxiety. While describing his time in Vietnam, David said that, “There were two emotions that you felt out in the jungle, hate and fear. If you didn’t feel either you wouldn’t last very long” (David Smith, personal communication, January 21 2013). Dr. Willard Gaylin described fear as “an emotion that made one to respond to a threat whereas rage acted as a response to something that separated someone’s goals or pursuits” (Gaylin, 45).

Although these emotions served to be useful in surviving a war, they can quickly become maladaptive in a traditional culture. PTSD sufferers felt the ill effects of anger on their relationships both at work and in their respective families. Victor did describe himself to be short-tempered with his wife and children (Victor Smith, personal communication, February 12, 2013). Also, both Victor and Paul stated that they had a difficult time dealing with “stupid” or “ignorant” people, especially in a work environment (Paul Smith, personal communication, February 13, 2013). If things did not go according to their expectations, they got mad and anxious. Victor and Paul both described themselves as having had serious issues with anxiety especially when in large groups and while driving. Ultimately, their experiences in battle changed how they acted, how they perceived different situations, and how they emotionally reacted to different experiences and stimuli.

5. Conclusion

Understanding cognitive processes along with experiences, motivation, and emotions play key roles in trying to understand those who suffer from PTSD. Motivation empowers them to survive and allows them to experience life- situations to where these are cognitively processed and stored for later use. With repetition, acts of survival then become almost instinctive. And when they no longer need to be in a survival mode, frustration, anxiety and anger mount. All of these factors have their own individual effects on the perception of veterans with PTSD. It is truly difficult to fully understand what they perceive without experiencing what they have seen and been through.
Acknowledgements

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References

Smith, David (January 21, 2013). Personal Communication & Interview.
Smith, Paul (February 13, 2013). Personal Communication & Interview.
Smith, Victor (February 12, 2013). Personal Communication & Interview.
Trauma Exposure and Posttraumatic Stress Symptoms among College Students

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Abstract — In this study we explore not only the prevalence of posttraumatic symptomatology among college students, but also specific types of trauma exposure and their posttraumatic effects. Further, we examined the likelihood of participants experiencing multiple trauma exposures. Results revealed that 78% of our sample reported at least one lifetime potentially traumatic experience, with correspondingly moderate to high levels of posttraumatic symptoms. Studies will most likely continue to utilize college students in psychological research for purposes of convenience, but it is important to note that this particular sample may in fact reflect a population with an identity and culture of its own. For example, resilience among college students with PTSD may be higher than those individuals outside of this demographic.

Keywords — Trauma, posttraumatic stress disorder, college students

1. Introduction

It is well-known that a large amount of psychological research is conducted with college student samples. For example, in a review article examining this phenomenon, it was found that 73% of articles published in the Journal of Abnormal and Social Psychology and 85.7% of articles published in the Journal of Experimental Psychology utilized college students as research participants. Only 2 out of 342 articles reported using a general population sample (Smart, 1966). One primary reason for this reliance on college students in psychological research is convenience. Conversely, and quite interestingly, research in the area of trauma exposure and posttraumatic stress disorder (PTSD) does not employ college student samples as extensively. The prevalence of PTSD in the general population is typically reported at 8-10%, with approximately 60-70% of individuals experiencing at least one potentially traumatic event (PTE) during the course of their lifetime (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Read, Ouimette, White, Colder, and Farrow (2011) note that, while there is a limited collection of studies examining PTSD in college students, the research that does exist reports prevalence rates ranging from 6-17%. In their own study, Read et al. found that 66% of their college sample experienced at least one lifetime PTE, with 9% of the sample meeting diagnostic criteria for PTSD. Numbers like these suggest that PTSD among college students is a real concern, and one that needs further investigation.

The present study will examine prevalence rates for trauma exposure and PTSD symptomatology among a college student sample. Given that entry into college is an important developmental milestone and period of transition into adulthood, which may place young adults at particular risk for both exposure to PTEs and the development of posttraumatic effects, this is a critical and timely area of study. We hope to add to the existing, albeit limited, literature that currently exists to substantiate the very real existence of these concerns among college students.

2. Method

Participants included 382 college students from a small, public university in the southeastern United States. Seventy percent of the sample was female and the average age was 22-years-old (with a range from 17-50 years). The sample was 51% Caucasian, 28% African American, 7% Hispanic, and 6% Asian, which is fairly representative of the racial demographic of the university population.

All measures were administered through the online survey portal PsychData®. The surveys included the Life Events Checklist (LEC) and PTSD Checklist (PCL). The LEC is a seventeen item self-report measure of PTSD symptomatology. Participants indicate whether they personally experienced an event, witnessed it happen to someone else, learned about it happening to someone close, not sure it fits, or does not apply. The PCL is a seventeen item self-report measure of PTSD symptomatology. Participants indicate the extent to which they have been bothered by each symptom (e.g., repeated, disturbing dreams of a stressful experiences from the past, trouble remembering important parts of a stressful experience from the past, being super-alert or watchful or on guard,
etc.) in the past month using five-point Likert scales with anchors ranging from “Not at all” to “Extremely.” Different approaches exist for scoring the PCL. The present study examined both a continuous measure of symptom severity and a dichotomous symptom cluster approach. The continuous approach simply utilizes a summed severity score, while the symptom cluster approach typically requires a score of 3 (“Moderately”) or greater on 1 reexperiencing symptom, 3 avoidance/numbing symptoms, and 2 hyperarousal symptoms. Participants also provided basic demographic information including sex, age, race, marital status, year in school, academic major, and whether the participant has been diagnosed with and/or is receiving treatment for PTSD.

The data presented here are part of a larger study investigating the effectiveness of a free smartphone application (i.e., PTSD Coach) developed by the Department of Defense and the Department of Veterans Affairs in the management of posttraumatic symptoms. Data were collected at three time points, with one month between the first and second survey and three months between the second and third. The present study examines data from the first time point only, and focuses primarily on participant responses to both the LEC and PCL.

### 3. Results

Based on results from the LEC, 297 participants (78% of the sample) reported that they personally experienced a potentially traumatic event. The mean number of reported traumatic events was 2.0 (SD = 1.8), with 25% of participants reporting 1 event, 19% reporting 2 events, and 34% reporting 3 or more event exposures. The most commonly experienced traumatic events were transportation accident (52%) and sudden unexpected death of someone close to you (35%). Rates of trauma exposure were equivalent among males and females, with a 77% exposure rate for males and a 78% exposure rate for females. See Table 1 for a breakdown of trauma exposure by type of traumatic event and by sex.

**Table 1. Rates of Trauma Exposure by Event Type and Sex**

<table>
<thead>
<tr>
<th>Trauma Type</th>
<th>Rate of Exposure (n)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Total Sample</td>
</tr>
<tr>
<td>Natural disaster</td>
<td>21% (79)</td>
</tr>
<tr>
<td>Fire/explosion</td>
<td>11% (42)</td>
</tr>
<tr>
<td>Transportation accident</td>
<td>52% (198)</td>
</tr>
<tr>
<td>Serious accident (work/home/recreational)</td>
<td>20% (77)</td>
</tr>
<tr>
<td>Exposure to toxic substance</td>
<td>4% (14)</td>
</tr>
<tr>
<td>Physical assault</td>
<td>20% (76)</td>
</tr>
<tr>
<td>Assault with weapon</td>
<td>8% (31)</td>
</tr>
<tr>
<td>Sexual assault</td>
<td>8% (30)</td>
</tr>
<tr>
<td>Combat/war-zone exposure</td>
<td>3% (12)</td>
</tr>
<tr>
<td>Life-threatening illness/injury</td>
<td>6% (24)</td>
</tr>
<tr>
<td>Severe human suffering</td>
<td>2% (8)</td>
</tr>
<tr>
<td>Sudden unexpected death</td>
<td>35% (132)</td>
</tr>
<tr>
<td>Sudden violent death (homicide/suicide)*</td>
<td>9% (34)</td>
</tr>
<tr>
<td>Serious injury/harm/death caused by you</td>
<td>4% (16)</td>
</tr>
</tbody>
</table>

*Frequency scores for this item are based on reports of witnessing exposure, as personal exposure is not possible.

Considering only those participants who experienced at least one potentially traumatic event, the average total score on the PCL was a 35 (SD = 15, with a range of scores from 14-85). An examination of the PCL cluster scoring method indicated that 24% (70 participants) likely met DSM-IV (American Psychiatric Association, 1994) diagnostic criteria for PTSD. The traumatic events with the highest average PCL scores (40+) typically corresponded with the greatest likelihood for PTSD diagnosis based on the cluster scoring approach (i.e., sexual assault (53%), severe human suffering (50%), serious injury/harm/death caused by you (38%), sudden violent death (44%), fire/explosion (36%), and physical assault (32%)). The only trauma type with a higher likelihood for diagnosis based on cluster scoring (50%), but less than a 40 average total PCL score (39) is combat/war-zone exposure. See Table 2 for a complete listing of PCL scoring by type of traumatic event.
Table 2. PCL Scoring by Event Type

<table>
<thead>
<tr>
<th>Trauma Type</th>
<th>Average PCL Score</th>
<th>PCL Cluster Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural disaster</td>
<td>33</td>
<td>17% (13)</td>
</tr>
<tr>
<td>Fire/explosion</td>
<td>40</td>
<td>36% (15)</td>
</tr>
<tr>
<td>Transportation accident</td>
<td>36</td>
<td>24% (47)</td>
</tr>
<tr>
<td>Serious accident (work/home/recreational)</td>
<td>38</td>
<td>26% (20)</td>
</tr>
<tr>
<td>Exposure to toxic substance</td>
<td>38</td>
<td>14% (2)</td>
</tr>
<tr>
<td>Physical assault</td>
<td>40</td>
<td>32% (24)</td>
</tr>
<tr>
<td>Assault with weapon</td>
<td>36</td>
<td>26% (8)</td>
</tr>
<tr>
<td>Sexual assault</td>
<td>49</td>
<td>53% (16)</td>
</tr>
<tr>
<td>Combat/war-zone exposure</td>
<td>39</td>
<td>50% (6)</td>
</tr>
<tr>
<td>Life-threatening illness/injury</td>
<td>39</td>
<td>25% (6)</td>
</tr>
<tr>
<td>Severe human suffering</td>
<td>44</td>
<td>50% (4)</td>
</tr>
<tr>
<td>Sudden unexpected death</td>
<td>37</td>
<td>26% (34)</td>
</tr>
<tr>
<td>Sudden violent death (homicide/suicide)*</td>
<td>40</td>
<td>44% (15)</td>
</tr>
<tr>
<td>Serious injury/harm/death caused by you</td>
<td>43</td>
<td>38% (6)</td>
</tr>
</tbody>
</table>

*Scores for this item are based on reports of witnessing exposure, as personal exposure is not possible.

4. Conclusions

In the present study, the scores from the LEC and PCL are fairly consistent with previous findings reported by Read et. al. (2011) and Kessler et. al. (1995). While results between this study and previous research were similar, the participants in this study actually reported higher rates of exposure to PTEs compared to the aforementioned research articles. Furthermore, our participants reported high rates of exposure to multiple PTEs, with some participants reporting as many as 11 out of 14 lifetime traumatic events. However, the present study reported no differences between rates of trauma exposure among men and women, despite previous research indicating that women are typically at greater risk for both trauma exposure and the development of PTSD (Read et al., 2011; Kessler et al., 1995). Finally, our results revealed clinically meaningful levels of posttraumatic symptomatology among our sample, with scores on the PCL indicating moderate to high diagnosable rates of PTSD (Keen, Kutter, Niles, & Krinsley, 2008). Most interestingly, even with the large number of individuals reporting exposure to PTEs (many of whom likely meet PTSD diagnostic requirements), only four participants reported that they were previously diagnosed with (and/or received treatment for) PTSD. One possible reason for this disparity might lie within the realm of resilience. Future research should examine why college students, who seem to be at such high risk for trauma exposure and posttraumatic effects, manage to cope with their trauma histories well enough to excel in their pursuits toward higher education.

References


Control of Gold Nanoparticle Size Using Urea

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Abstract — The size control of metallic gold nanoparticles (NPs) is an area of intense study. While nanoparticle synthesis methods involving Au³⁺ reduction have been known for quite some time, the impact of urea on this process has not been widely studied. The molar concentration of urea in the presence of AuCl₄⁻ and ascorbic acid showed an inverse, nonlinear relationship in the size of Au NPs produced. Size of Au NPs was determined by measuring the plasmon band of solution-phase products in the UV/VIS/NIR region.

Keywords — gold nanoparticle, urea, thiourea, plasmon band

1. Introduction

Bulk materials (those with particle sizes on the order of micrometers and larger) have well-established properties that have been observed for millennia. Meanwhile, particles on the nanoscale (1-100 nm in diameter) have been shown to have dramatically different properties than those in the bulk—even for materials with the same chemical makeup. The familiar color of gold changes to red when the particles of gold are made in the size regime of a few nanometers and suspended in liquid or glass (Faraday, 1857). This dramatic change in color is just one of the many properties that change upon entering such a small size regime. Magnetic, electronic, and catalytic properties all change when the size of particles decreases to the submicron size (Daniel and Astruc, 2004).

To create such small particles, chemists cannot use a top-down approach (cutting large particles into small particles), but must use a bottom up approach (growing particles from individual atoms into larger clusters of atoms). Being able to control this growth is of the utmost importance in exploiting the unusual properties at the nanoscale.

In 1999, Link and El-Sayed published a study showing the absorbance band due to electronic transitions on the surface of the gold particles (the plasmon band) showed a direct correlation to particle size. In the size regime studied (9-100 nm particles) the plasmon band absorbance increased from 517 to 575 nm. Thus, particle size could be determined by means other than observing particles using electron microscopy. Additionally, Goia and Matijevic´ (1999) showed that the pH of the growth solution had an inverse correlation to the particle size over the pH range of -1 to 13; higher pH values gave smaller diameter particles. Thus, conditions can affect the growth of Au NPs and that growth can be measured by the plasmon band. While urea has a negligible effect on pH, it is well known that the morphology of sodium chloride crystals changes from cubes to octahedral when grown in the presence of urea (Dammer, 1894). This effect is due to surface adhesion on specific growing planes of the NaCl crystal. This line of work seeks to determine if urea can have a similar effect on the growth of Au NPs.

2. Experimental

2.1 Materials

Hydrogen tetrachloroaurate(III) trihydrate (HAuCl₄·3H₂O, 99.9+%) and thiourea (CH₄N₂S) were purchased from Aldrich. Urea (CH₄N₂O, ACS Reagent) and L-ascorbic acid, sodium salt (C₆H₇O₆Na) were purchased from Sigma. Products were analyzed on a Perkin Elmer Lambda 750 UV/Vis/Near IR Spectrometer.

2.2 Making Gold Nanoparticles

A stock solution of 0.0217 M AuCl₄⁻ was made and a 0.38 mL aliquot of this was pipetted into 5 mL of DI water in a conical, capped, plastic centrifuge tube. Separately, 30.13 mg of ascorbic acid was diluted with 15 mL of DI water in a conical, capped, plastic centrifuge tube and 5.0 mL was removed and placed in a third tube. The ascorbic acid was mixed all at once with the gold solution, capped, and shaken for 30 seconds. The resulting mixture was the characteristic purple color of gold NPs. Absorbance measurements were performed immediately.

2.3 Making Gold Nanoparticles in the Presence of Urea

Following the same procedure as making Au NPs, various concentrations of urea were added to see the effect it would have on plasmon absorption.
Four tubes were charged with 0.0307 g, 0.0151 g, 0.00743 g, and 0.0034 g urea and were mixed with 5.0 mL of ascorbic acid solution as described above. The effective concentration of urea in each of these tubes was 0.100 M, 0.050 M, 0.025 M, and 0.010 M, respectively. Each urea/ascorbic acid solution was mixed with a separate gold solution (5.0 mL, as prepared above), capped, shaken for 30 seconds, then the absorbance was measured via UV/Vis/NIR.

2.4 Making gold nanoparticles in the presence of thiourea

Similarly, thiourea was placed in solutions of ascorbic acid to make corresponding concentrations of 1.00 M, 0.50 M, and 0.10 M of thiourea. These were each mixed with a separate gold solution, capped, shaken for 30 seconds, and the absorbance of these solutions was measured via UV/Vis/NIR.

3. Results

Using a double beam, UV/Vis/NIR spectrophotometer, samples were analyzed within 1.5 hours of making the Au NPs. Figure 1 shows a series of trials with varying amounts of urea being added and the relative shift of the plasmon band with an increase in urea concentration. As the urea concentration increases to 0.100 M, there was a blue shift in the absorption of light. A plot of $\lambda_{\text{max}}$ for each curve against the concentration of urea (Figure 2) gives a trend that is nonlinear, but shows good correlation ($R^2 = 0.9963$) as urea concentration increases. This result, coupled with the results from Link and El-Sayed (1999) who found a decrease in particle size corresponding with a decrease in plasmon band absorption, indicates that smaller particle sizes are being achieved with higher urea concentrations. Since there is no direct reaction between urea and the reduction of gold with ascorbic acid, it is proposed that there could be a surface effect occurring where urea is blocking particle growth, thereby inducing nucleation of new gold particles. Urea is known to interact with growing NaCl surfaces to produce different morphologies of crystals (octahedral instead of cubes) and though this study cannot determine morphology of the gold NPs, at the highest concentration of urea (0.100 M), there is a 16:1 Au$^{3+}$:urea ratio, providing a large amount of urea to potentially adhere to the surface of the growing Au particles. Another possibility is that the urea is coordinating to the gold(III) ions in such a way that the reduction potential with ascorbic acid is altered. A different reduction mechanism could result in a kinetic approach to different sized particles compared to the absence of urea.

Figure 3 shows a similar reaction set-up to the previous reactions, but with thiourea in place of urea. Only the control (no thiourea) acted as expected. Solutions with thiourea did not undergo reduction of the Au$^{3+}$ to Au$^{0}$, thus rendered no plasmon band. At the lowest concentration of thiourea studied, there was a slight modulation in the curve, but there was so little deviation from baseline, no definitive absorption could be determined. Thiourea appeared to alter the reduction potential of the gold(I)I) enough that ascorbic acid cannot act as a reducing agent in this environment.

Figure 1. Plasmon absorbance of Au NP solutions prepared with no urea (top line) and increasing concentrations of urea. The absorbance decreases as urea concentration increases, but more importantly, the $\lambda_{\text{max}}$ shifts to a lower wavelength correlating to smaller Au NPs.

Figure 2. Plasmon band absorption ($\lambda_{\text{max}}$) over the molar urea concentrations studied. Linear and exponential fittings are presented with nonlinear data showing a better correlation.
4. Conclusions

Urea concentrations inversely affected wavelength of the plasmon band of gold nanoparticles, which in turn correlates to the size of the gold particles. An increase in the molar concentration of urea resulted in smaller particle size as evidenced by the blue shift of the plasmon band. Though this pattern is nonlinear, there is a strong correlation. Thiourea prevents reduction of gold(III) via ascorbic acid. Further research into the mechanism of how urea affects particle size is warranted and use of SEM or TEM would conclusively determine particle size rather than relying on inference from plasmon band absorbance.

Acknowledgements

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References

Dammer, O. (1894). Handbuch der anorganischem Chemie. Publisher: F. Enke
Synthesis of Carbohydrate-Porphyrin (CPC) and Carbohydrate-Bacteriochlorin Conjugates (CBC) via Metal-Catalyzed Cross-Coupling Reactions

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Abstract — The use of photodynamic therapy (PDT) as a viable cancer treatment has been hindered by the many limitations of the photosensitizers used in this therapy including, solubility in biological fluids, weak absorbance at clinically useful excitation wavelengths (NIR) and selectivity. Recently, carbohydrate-porphyrin (CPC) and carbohydrate-bacteriochlorin (CBC) conjugates have gained attention for their ability to address several of these issues. Recent advances in the development of a concise and high yielding route for the synthesis of brominated porphyrins and bacteriochlorins has opened the door for the development of a modular synthetic approach for the rapid and high yielding synthesis of CPCs and CBCs based on a palladium-catalyzed cross coupling strategy. Herein we report our investigations into the first general and accessible approach using this strategy for the synthesis of an entirely new class of water soluble carbohydrate-bacteriochlorin conjugates (CBCs) with the potential to serve as a phototherapeutic agent.

Keywords — Photodynamic therapy (PDT), porphyrin, bacteriochlorin, carbohydrate, cross-coupling

1. Introduction

Photodynamic therapy (PDT) has gained popularity as a viable and noninvasive alternative to surgery, radiation therapy and chemotherapy in the treatment of solid cancers of the head and neck, brain, lung, breast, prostate, pancreas, skin and intraperitoneal cavity (Wainwright 2009). Photodynamic therapy involves administering a photosensitizer via intravenous or intraperitoneal injection to the patient. Following a period of time necessary to maximize the differential uptake of the photosensitizer between neoplastic and healthy cells, the area of the body containing the tumor is irradiated with specific wavelengths of visible or near-infrared light. This results in the production of reactive oxygen species (ROS) and other reactive intermediates that destroy the tumor (Bellnier and Henderson 1992; Dubbleman et al. 1992; Moan 1991; Russell 1992; Vernon and Walker 2009).

Despite the progress that has been made in the design and development of PDT photosensitizers, there are still several major shortcomings (Ali and van Lier 1999). First, the majority of photosensitizers, such as Photofrin (porphyrin based), are nonpolar aromatic compounds that exhibit very poor solubility in biological media (water), causing aggregation and ultimately a reduction in the ROS produced. A second major limitation is weak absorbance at clinically useful excitation wavelengths (near-infrared, NIR), preventing the treatment of deep seeded tumors and sizeable lesions (Dougherty and Marcus 1992; Driver et al. 1991; Wan et al. 1981). A third limitation is limited selectivity, which may lead to the damage and destruction of healthy cells.

Bacteriochlorins, an aromatic hydrocarbon (a close relative to porphyrins) which absorbs in the NIR between 700-800nm, have shown significant promise as next generation photosensitizers (Yang et al. 2011). While solubility and selectivity issues continue to remain problematic with this class of compounds, bacteriochlorin conjugation to water soluble molecules such as carbohydrates can be used to obviate these challenges. In addition to imparting solubility in biological media (water), carbohydrate ligands can be designed to bind specific proteins involved in tumor transformation and metastasis. The resulting CBCs could be considered a new class of selective photosensitizer with direct applications as a PDT cancer therapy.

In the past twenty-five years only two examples of carbohydrate-bacteriochlorin conjugates (CBCs) have been reported and of those examples only one report provided limited data on the potential of these compounds to serve as photosensitizers (Grin et al. 2012; Silva et al. 2002) Therefore, significant work remains in order to realize the full potential of this class of compounds. One major factor limiting progress in this area is the lack of a modular synthetic approach for the rapid and high yielding synthesis of CBCs bearing different carbohydrate ligands. Recent advances in the development of a concise and high yielding route for the synthesis of brominated bacteriochlorins has opened the door for the development of such an approach based on a palladium-catalyzed cross coupling strategy (Kim and Lindsey 2005; Krayer et al. 2010; Mass and Lindsey 2001). Utilizing conditions established for the production of carbohydrate-porphyrin-conjugates (CPCs), we sought to expand our...
methodology to include a new class of CBCs targeted specifically at carbohydrate binding proteins involved in tumor transformation and metastasis (Unpublished results).

2. Synthesis of Carbohydrate-Bacteriochlorin-Conjugates (CBCs)

2.1 Synthesis of Bromo-bacteriochlorin (11)

The synthesis of bromo-bacteriochlorin (11), shown in Scheme 1 was established by Lindsey and co-workers (Kim and Lindsey 2005; Krayer et al. 2010; Mass and Lindsey 2011). The synthesis begins with the Wittig olefination of the 4-methyl benzaldehyde (1) to produce the corresponding alkene (2) resulting in a 97% yield. This is followed by pyrrole formation (3) and subsequent decarboxylation to produce 3-(p-tolyl)pyrrole (4). Formylation of the pyrrole ring to give 5 followed by condensation and reduction yields the desired Michael donor 6, resulting in a combined yield of 20%. Reaction of Michael acceptor 6 with 7 in the presence of DBU produces 8 in a yield of 54%. Subsequent formation of pyrrole ring using the conditions established by McMurray and co-workers results in compound 9 (McMurray 1973). Generation of the bacteriochlorin macrocycle (10) is performed under acidic conditions established by Lindsey (Krayer et al. 2010). Finally, bromination of the bacteriochlorin in presence of NBS generates the desired compound 11, in a yield of 85%. The synthetic protocol generated over 600mg of bromo-bacteriochlorin in an overall yield of 2.7%.

2.2 Synthesis of Carbohydrate-Bacteriochlorin-Conjugate (CBC)

Based upon conditions established for the synthesis of CPCs, a general route for the preparation of CBCs is shown in Table 1 below (Unpublished results). Using standard schlenk technique, the synthesis of CBCs can be accomplished by dissolving brominated bacteriochlorin (11), the palladium source, ligand, base and carbohydrate in an appropriate solvent (toluene), and heated until the starting material is consumed as monitored by thin layer chromatography.

Our initial conditions, established from our work with the synthesis of CPCs, did not result in any detectable product formation (Table 1, entry 1). We found that altering the palladium source to palladium acetate produced trace amounts of product (entry 2). Further alteration of the reaction conditions, specifically the nature of the palladium catalyst, by using Xanthophos as the ligand (instead of DPEphos) generated a bacteriochlorin in 16% yield (entry 3). Although, using a combination of palladium acetate and Xanthophos did not generate an isolatable amount of product (entry 4). Utilizing the conditions that was successful with the 4-OH carbohydrate did not produce any coupled product when the carbohydrate was changed to Man-2-ol (entry 5). By applying our original conditions established in our CPC work, we found that Man-2-ol was produced in 24% yield (entry 6). These results indicate that the palladium source and ligand will likely need to be tailored to each carbohydrate substrate to optimize the cross-coupling conditions.

Conclusion

We were able to successfully synthesize two CBCs utilizing our metal-catalyzed cross-coupling strategy using the 4-OH and Man-2-ol carbohydrates derivatives as substrates. Alterations in reaction conditions to investigate solvent, palladium source, and ligand dependencies are in progress to achieve optimized yields of CBCs. The coupling of more complex carbohydrate substrates are of future interest and will be explored after suitable conditions have been established.

Acknowledgements

This work was supported by the Office of Sponsored Awards and Research Support (USC Upstate) and we would like to thank USC for a Magellan Scholarship awarded to Ryan Dolewski.

References


Unpublished results.


Table 1. Synthesis of CBCs using palladium-catalyzed cross-coupling.

<table>
<thead>
<tr>
<th>Entry</th>
<th>ROH</th>
<th>Pd source</th>
<th>Ligand</th>
<th>Yield (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4-OH</td>
<td>Pd(_2)(dba)(_3)</td>
<td>DPEphos</td>
<td>NR</td>
</tr>
<tr>
<td>2</td>
<td>4-OH</td>
<td>Pd(acetate)</td>
<td>DPEphos</td>
<td>&lt;5</td>
</tr>
<tr>
<td>3</td>
<td>4-OH</td>
<td>Pd(_2)(dba)(_3)</td>
<td>Xantphos</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>4-OH</td>
<td>Pd(acetate)</td>
<td>Xantphos</td>
<td>&lt;5</td>
</tr>
<tr>
<td>5</td>
<td>Man-2-ol</td>
<td>Pd(_2)(dba)(_3)</td>
<td></td>
<td>NR</td>
</tr>
<tr>
<td>6</td>
<td>Man-2-ol</td>
<td>Pd(_2)(dba)(_3)</td>
<td>DPEphos</td>
<td>24</td>
</tr>
</tbody>
</table>

Scheme 1. Synthesis of brominated bacteriochlorin (11).
Determination of Pollen-to-Ovule Ratios to Infer Mating Systems in Silene

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Abstract — Plants have various mating systems, including self-pollination (autogamy), cross-pollination (xenogamy), or a combination of strategies. Pollen-to-ovule ratios tend to reflect a species’ breeding system; lower ratios suggest self-pollination, while higher ratios suggest cross pollination. We sought to determine pollen-to-ovule ratios of six Silene species at a study site in Yunnan Province, China in order to infer their likely mating systems. For at least 10 flowers of each species, anthers and ovules were collected. The numbers of ovules and pollen grains per flower were determined, and from this data, pollen-to-ovule ratios (P/O ratio) were calculated. Two species (S. arcucaulis and S. yunnanensis) have high pollen-to-ovule ratios that suggest reliance on cross pollination; two species (S. asclepiadceae and S. chungtienensis) have intermediate ratios that suggest a mixed pollination strategy; two species (S. huguettiae and S. nepalensis) have low ratios that suggest self-pollination. Ongoing research investigates whether the self-pollinating species are better at avoiding damage from a moth pollinator whose larvae feed on Silene flowers.

Keywords — Breeding systems, mating systems, nursery pollination, pollen-to-ovule ratio, Silene

1. Introduction

A plant’s breeding system may influence the number of pollen grains it produces. Autogamy refers to transfer of pollen to stigma within a flower (self-pollination), while xenogamy refers to transfer of pollen between different plants (cross pollination). Species that produce seeds autogamously tend to have lower pollen-to-ovule ratio (P/O ratio) in comparison to species that primarily reproduce xenogamously (facultative xenogamy); consequently, the P/O ratio is a useful predictor of plant breeding systems (Cruden 1977). Species that exclusively rely on autogamy (obligate autogamy) have an even lower P/O ratio than species that occasionally cross pollinated (facultative autogamy) (Cruden 1977).

Silene (Caryophyllaceae) is a model system for the study of pollination because its members have many different pollination strategies. Silene includes autogamous and xenogamous species (Jürgens 2002). Cross-pollinating Silene may rely on different pollinators, including butterflies, bees, and moths to acquire pollen from one flower and deposit it onto another (Kephart et al. 2006). Nocturnally pollinated Silene species are visited by nursery pollinating Hadena moths, which are pollinators that rear offspring on the seeds of the plant (Kephart et al. 2006). Hadena benefits and harms its host plants at different states of the moth’s lifecycle (Kephart et al. 2006). Hadena benefits plants by pollinating them; however, Hadena larvae feed on the developing seeds of their hosts, which is energetically costly to the plant (Kephart et al. 2006). The question arises is to whether it is better to be pollinated by the moth or to pollinate autogamously.

To avoid this parasitic relationship, species may evolve to self-pollinate autogamously. However, self-pollination results in the loss of genetic diversity, which allows for detrimental alleles to have greater frequencies. Self-pollination has shown to decrease pollen grains, ovules, seed production, and pollen-to-ovule ratio (Cruden 1977). Along with lower pollen-ovule ratios, studies show self-pollinating plants to have smaller styles and flower parts, including petals, sepal s and anthers (Jürgens et al. 2002). In a study by Jürgens et al. (2002), selfing species were found to have significantly lower P/O ratios than of outcrossed species. This study also showed significantly more pollen grains and ovules when comparing outcrossing and selfing species.

We are generally interested in whether self-pollination reduces damage of Hadena moths on Silene. In this study, we assess P/O ratios of six Silene species growing at the same study site in Yunnan Province China in order to infer the extent to which these species rely on selfing.

2. Methods

Pollen and ovules were collected from 6 species of Silene growing at Alpine Botanic Garden, Shangrila, Yunnan Province, China. Two anthers were collected per flower and stored in microcentrifuge tubes in 70% ethanol. To release the pollen, both anthers were squashed using a dissecting needle placed in 250 μL (for species with smaller anthers) or 500 μL (for species with larger anthers) of water and shaken. Twenty microliters of the pollen suspension was pipetted onto a slide, and all pollen grains on the slide were counted.
under light microscopy at 40X total magnification. Three aliquots were counted for each sample, and the average pollen count was multiplied by 12.5 (for species with smaller anthers) or 25 (for species with larger anthers) to estimate the pollen count for the 2 anthers sampled. Each flower contained 10 anthers, so the value for 2 anthers was multiplied by 5 to estimate total pollen per flower. To determine ovule counts, ovaries were dissected and ovules were counted using a dissecting scope.

To estimate pollen-to-ovule ratio (P/O ratio), the estimate of total pollen grains for each flower was divided by the number of ovules for the flower. ANOVA was used to determine whether pollen counts, ovule counts and P/O ratios varied among species in each case after confirming normality of residuals. Statistics were formed using R (R Development Core Team 2008).

3. Results

ANOVA indicates that there was a significant effect ($P < 0.001$) of species on pollen counts (Table 1A), ovules counts (Table 1B) and P/O ratio (Table 1C). For pollen counts, Tukey’s test separated the species into the following four groups, arranged from lowest to highest: A. *S. nepalensis* and *S. huguettiae*; B. *S. asclepiadaceae*; C. *S. chungtienensis* and *S. gracilicaulis*; and D. *S. yunnanensis* (Figure 1A). For ovule counts, Tukey’s test separated the species into five groups, arranged from lowest to highest: A. *S. gracilicaulis*; B. *S. asclepiadaceae* and *S. nepalensis*; C. *S. chungtienensis* and 5. *S. huguettiae* (Figure 1B). For P/O ratio, Tukey’s test separated the species into five groups, arranged from lowest to highest (Figure 1C): A. *S. huguettiae* and *S. nepalensis*; B. *S. asclepiadaceae* and *S. chungtienensis*; C. *S. gracilicaulis* and *S. yunnanensis*.

4. Discussion

As seen in the results, there were significant differences among the six species for total pollen, ovules, and P/O ratio. Previous researchers have investigated P/O ratios for plants with different breeding systems, both across the angiosperms (Cruden 1977) and within the family Caryophyllaceae more specifically (Jürgens 2002). Cruden (1977) found the following P/O ratios ($\pm 1$ SD) for plants with different breeding systems: 27.7 ± 13.5 for obligate autogamy; 168.5 ± 134.4 for facultative autogamy; and 796.6 ± 429.6 for facultative xenogamy. Jürgens et al. (2002) found that hermaphroditic plants that self-pollinated on average had a P/O ratio ($\pm 1$ SD) of 131 ± 97; while facultative xenogamy according to Cruden (1977). This ratio suggests that both species are primarily cross pollinated according to the data of Jürgens et al. (2002). *Silene asclepiadaceae* and *S. chungtienensis* had P/O ratios between 100-200, which is similar to the P/O ratio for plants that have a facultatively autogamous breeding system according to Cruden (1977). This ratio suggests that both species are primarily cross pollinated according to the data of Jürgens et al. (2002). *Silene huguettiae* and *S. nepalensis* both had P/O ratios around 50 or less, which is most similar to the P/O ratio of plants with an obligately autogamous breeding system.

To further investigate the breeding systems of these species, we have conducted field experiments where we exposed plants to pollinators or left them enclosed in netting. Analysis of the fruit and seed production of these plants will allow us to determine the success of each species in making seeds autonomously. Additionally, we have investigated the rate of *Hadena* moth egg laying on each species, and we will compare these rates to the breeding systems in order to determine whether the species that rely more on cross pollinating are also attacked at a higher rate by this nursery pollinator.

5. Conclusions

Our data on pollen-to-ovule ratios indicate that *Silene* at our study site fall into one of three mating systems. Two species appear to be primarily autogamous; two species appear to be facultatively autogamous; and two species are primarily outcrossing.

| Table 1. ANOVA tables for differences among 6 *Silene* species in number of ovules per flower (A), total pollen per flower (B) and pollen-to-ovule ratio (C) |
|-----------------|-----------|-----------------|-------------------|-----------------|-----------------|
| Variable        | Df        | Sum of squares  | Mean Square       | F     | P     |
| A. Ovules       | Species   | 247.324         | 49.465            | 170.83 | < 0.001 |
|                 | Residuals | 30.404          | 0.290             |       |       |
| B. Total pollen | Species   | 199.807         | 39961             | 130.18 | < 0.001 |
|                 | Residuals | 32847           | 307               |       |       |
| C. Pollen-to-ovule ratio | Species | 3304.9 | 660.99 | 121.62 | < 0.001 |
|                 | Residuals | 570.7           | 5.44              |       |       |
Figure 1. Average (± 1 S.E.) of total pollen (A), ovules (B), and pollen-to-ovules ratios (P/O ratios) (C) among six species of Silene from Yunnan Province, China. Different letters above bars indicate significant differences according to Tukey’s test (P < 0.05).

Acknowledgements

Financial and logistical assistance were provided by S.Q. Huang. Funding was provided from a Scholary Start Up Package Grant and a Scholary Student Assistantship Program grant to D. Dendy and B. Montgomery from the USC Upstate Office of Sponsored Awards and Research.

References

Assessment of Timing of Stigma Receptivity and Pollen Longevity in *Linum rigidum* (Stiff Flax)

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**Abstract** — To ensure self-fertilization, stigma receptivity and pollen viability must overlap. We were interested in this overlap during the time at which delayed selfing occurs. *Linum rigidum* has a unique mechanism that allows it to abscise the corolla and drag the anthers up resulting in self-pollination. To determine whether the timing of pollen viability and stigma receptivity allows for delayed self-pollination to result in ovule fertilization, we performed tests for pollen viability and stigma receptivity prior to, at the time of, and after corolla abscission. Pollen grains were stained using MTT. The intensity of the stain indicated viable pollen. Hydrogen peroxide was used to test stigma receptivity. The oxygen gas (bubbling vigor) that is produced in the presence of peroxidase indicates a receptive stigma. Detection of viable pollen and receptive stigmas at the time of corolla abscission would indicate that delayed self-pollination could lead to fertilization.

**Keywords** — Delayed self-pollination, flax, flower phenology, pollen longevity, stigma receptivity

1. Introduction

The ability to self-pollinate autonomously (i.e. without wind dispersal or animal pollinators) helps plants to ensure seed production when pollinators are lacking (Darwin 1876, Kalisz et al. 1999). This may be especially important in areas with challenging environmental conditions. However, there are advantages to outcrossing (fertilizations resulting from cross pollination), especially avoidance of inbreeding depression. Self-pollination may occur before outcrossing (prior), simultaneous with outcrossing (concurrent), or after outcrossing (delayed) (Qu et al. 2007). Of the three, delayed autogamy is regarded as the most adaptive strategy, because it uses inbreeding to ensure reproduction, but only after opportunities for outcrossing have passed (Carrió et al. 2008). Delayed autogamy has been detected in other species, including *Hibiscus* (Klips and Snow 1997), *Pedicularis* (Sun et al. 2005) and *Collinsia* (Kalisz et al. 1999).

*Linum rigidum* (stiff flax) is a wildflower that is native of the North American prairie and southwest, where high winds may occur, reducing opportunities for pollination on windy or rainy days. *Linum* appears to have an unusual mechanism for delayed self-pollination. Specifically, petal abscission in windy conditions leads the basally attached petals to be blown off the flower, in the process dragging the anthers across the stigmatic surface (B. Montgomery, pers. obs). This mechanism has only previously been documented in one other species (Qu et al. 2007). For this self-pollination mechanism to result in self-fertilization, it is necessary for the stigmas to be receptive and the pollen to be viable when self-pollination occurs. For *L. rigidum*, flower anthesis begins in morning, typically followed by abscission of the corolla later the same day.

We were interested in quantifying stigma receptivity and pollen viability around the time period in which delayed selfing could occur in order to determine whether it could result in seed production. A colorimetric assay, using MTT solution (3-(4,5-dimethylthiazyl)-2,5-diphenyl tetrazolium bromide), was performed to quantify pollen viability. The use of MTT to test for pollen viability is effective due to the activity of mitochondrial dehydrogenases in metabolizing the MTT and forming a red formazan reaction product, which results in viable pollen staining dark red (Slomka et al. 2010). It has previously been found that MTT staining has a positive correlation with pollen germination and that pollen viability decreases with longer wait times between collection and staining (Khatun and Flowers 1995).

A simple procedure was used to determine stigma receptivity by relative peroxidase activity. Receptive stigmas have elevated levels of peroxidase activity (McInnis et al. 2006). Consequently, when a receptive stigma is exposed to hydrogen peroxide (H$_2$O$_2$), oxygen gas is released which results in bubble formation (Kearns and Innuye 1993). Peroxidase activity has been used to determine stigmatic receptivity by other researchers (Galen and Plowright 1987, Kalisz et al. 1999, Masierowska and Stpiczynska 2005).

2. Methods

The study was performed on greenhouse-grown plants originating from seeds purchased from a...
native plant nursery. Plants were grown in 5 cm pots under controlled conditions in a growth room with a 12/12 hour light/dark cycle, supplement by window light. Plants were watered daily and fertilized weekly with general purpose fertilizer.

2.1 Pollen

We tested the viability of pollen of *Linum rigidum* at different phenological stages. We checked the plants for new flowers and if there were some then we harvested the anthers with forceps and placed them on a labeled slide. Each flower's pollen was tested in the morning and afternoon of the day that the flower opened as well as the day after and two days after opening. To test pollen viability, we used refrigerated MTT solution which contained one part of a 10 g/L MTT solution (3-(4,5-dimethylthiazyl-2)-2,5-diphenyl tetrazolium bromide), with five parts of a 60% sucrose solution. We added one drop of MTT solution to a slide and transferred the pollen from the anther to the MTT placed on the slide. We then let the slides sit for five minutes in laboratory conditions and afterwards we added a coverslip. We then placed the slides in the incubator for 25 minutes at 33°C after which we removed them and sealed them with colorless, clear nail polish. Twenty anthers were stained per treatment.

2.2 Stigmas

The viability of the stigmas was tested at different phonological stages by measuring the vigorousness of the bubbles produced by the stigma in hydrogen peroxide. We randomly assigned each newly opened flower a morning, afternoon, next day, or two-day later testing time. We labeled flowers with different colors of paint on the base of the flower. Petals and anthers were removed to prevent self-pollination. To test peroxidase activity, we used forceps to obtain the stigma. We added one drop of hydrogen peroxide (H₂O₂) to a slide and put the stigma on the slide with a small portion of the cut end of the style overhanging the edge. We then added a coverslip. We then looked at the slide under the microscope to note the bubble vigor. Two minutes after adding the coverslip, the slide with the stigma was placed under a petri dish and photographed. Twenty stigmas were photographed per treatment.

3. Ongoing research

To test the viability of pollen, we will count for multiple transects of each slide containing pollen the number of pollen grains that are stained dark reddish versus those that are lightly colored. To test stigma receptivity, we will use ImageJ analysis software to measure the area of the photographed bubble that has formed around the stigma as a result of peroxidase activity. For both measures, we will compare outcomes among the four treatments using ANOVA.

Acknowledgements

We appreciate the help of Adrian Hayes in watering plants.

References


Assessment of Traits Contributing to Delayed Self-Pollination in Linum rigidum

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Abstract — We are interested in whether Linum rigidum undergoes self-pollination at the time of petal abscission. To explore this question, we determined whether petal abscission reduces herkogamy (anther-separation), and we investigated whether self-pollen can sire seeds (i.e. self-compatibility). To investigate herkogamy, we measured the distance from the anther to the style and stigma for two anthers on each of 30 flowers before and after petal removal. To investigate self-compatibility, 15 flowers were self-pollinated and 15 were cross pollinated. Styles were collected one day after pollinations for detection of pollen tubes using fluorescent microscopy, and fruit and seed set were determined for each treatment. Anther-style and anther-stigma distance both significantly decreased when petals were removed. There was no significant difference between treatments in the proportion of flowers with pollen tubes present, the proportion of flowers with pollen tubes reaching the base of the style, fruit set, or seed set. These results indicate that petal abscission facilitates self-pollination and that self-pollination may result in seed production, suggesting that L. rigidum does engage in delayed self-pollination to make seeds.

Keywords — Delayed self-pollination, herkogamy, mating systems, self-compatibility

1. Introduction

Mechanisms for reproductive assurance, which enable plants to autonomously self-pollinate when pollinators are absent or infrequent, are topics of active research in pollination biology and plant mating system evolution (Busch and Delph 2012). Selection favors traits associated with reproductive assurance when conditions for vector-mediated pollination are not met due to pollinator scarcity or infrequent visits, such that pollination limits reproduction (Darwin 1877, Eckert 2000). This may also involve overcoming herkogamy (Kalisz et al.1999). However, incurring self-pollen leads to three main costs for a plant: inbreeding depression, pollen discounting and seed discounting. For example, inbreeding can lead to harmful alleles persisting in a population (Kalisz et al. 2003, Kalisz et al. 2004).

Some plant species engage in mixed mating, meaning that flowers are capable of cross or self-pollination. In these plants, there are three types of self-fertilization strategies, prior, competing, and delayed. In prior self-fertilization plants self-fertilize prior to opening their flowers, and before the chance for outcrossed pollen to be deposited. Competing self-pollination is a co-occurring strategy where plants are exposed to the possibility of receiving outcrossed pollen at the same time of selfing. In delayed selfing plants are exposed to pollinators for the longest amount of time to allow for outcrossing to be the primary choice for pollen, however plants utilize their delayed selfing mechanism after they have had the chance to receive outcrossed pollen. One way to achieve delayed self-pollination is to reduce anther-stigma distance (herkogamy) throughout flowering (Kalisz et al.1999). A reduction in anther-stigma distance has shown to increase the rate of self-pollination (Barrett 2003).

Our study plant, Linum rigidum, appears to have a mechanism for delayed self-pollination, which occurs at the time that petals release and after the chance to receive outcrossed pollen. One anecdotal observation suggests that when petals release, the anthers are freed from being held in an outward position and move toward the stigma. This subsequently allows the petals to scrape the anthers across the stigma as the petals are displaced beyond to stigma. For delayed self-pollination to make seeds the plant must be self-compatible. The genus Linum is known to have self-compatible and self-incompatible species (McDill et al.2009). One goal of this study is to determine the extent to which petals releasing causes a reduction in herkogamy. In addition, this study investigates whether self-pollen can sire seeds (i.e. is self-compatible).

2. Methods

Linum rigidum (Linaceae) is an annual plant native to Midwestern and Southwestern North America. This specific species contains 10 ovules per flower. Petals are basally connected and detach in the same form. Morphology of the flower includes 5 anthers and 5 stigmatic lobes from 1
central style. Flowers typically last for 1 day and petals fall off in afternoon or early evening, and petals can detach faster in the presence of wind. Flowers are primarily visited by pollen-collecting bees. Seeds for this study originated from a native plant nursery and were grown under controlled conditions in a growth room with 12 hours of artificial light and some additional window light each day. Plants were grown from seed and planted into 5-cm pots. Plants were watered daily and fertilized weekly with general purpose fertilizer.

Thirty flowers total from eight greenhouse grown plants were chosen to measure herkogamy before and after petal release. The perpendicular distance from the anther to the style and the diagonal distance from the anther to the stigma were measured using digital calipers for two anthers on each flower before and after petals were removed by hand. For both anther-stigma distance and anther-style distance, a paired t-test was used to compare distances before and after petal removal.

To investigate self-compatibility, 30 newly open greenhouse-grown flowers were labeled, emasculated and randomly assigned to receive either self or cross pollen. Forceps were used to transfer the anther containing pollen to the stigma of the appropriate flower. Pollinations were conducted in the morning. Styles were harvested the next morning and then placed in microcentrifuge tubes with 70% ethanol. To detect pollen tubes, styles were treated with 6M NaOH for 24 hours then treated with 0.1% aniline blue in 50 mM KPO4 for 24 hours. Styles were observed using fluorescent microscopy (380 nm excitation 510 nm emission filter) to detect pollen tubes. Pollen tubes that reached the vertex of the style were counted as present and it was determined whether pollen tubes reached the base of the style. A chi-squared analysis was conducted on the presence or absence of pollen tubes for self and cross pollinated flowers. In addition, a chi-squared analysis was conducted on whether or not pollen tubes reached the base of the style for self and cross pollinated flowers.

### 3. Results

Anther-style distance significantly decreased when petals were removed (t = 17.7, df = 14, P < 0.001) (Figure 1). Anther-stigma distance significantly decreased when petals were removed (t = 106.7, df = 14, P < 0.001) (Figure 1). There was no significant difference between self and cross pollinated flowers for the presence of pollen tubes (Table 1). Cross pollinated flowers had pollen tubes that reached the base of the style more often than self-pollinated flowers; however, the difference was not significant (Table 1). Fruit set was the same for self and cross pollinated flowers (Table 1). Moreover, there was no significant difference between the number of seeds produced per fruit between cross and self-pollinated flowers (Table 1).

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**Figure 1.** Mean (± 1 SE) for anther-style distance and anther-stigma distance for *Linum rigidum*. Distances were measured with digital calipers before and after petals were manually removed.

**Table 1.** Number of flowers with pollen tubes present, number with pollen tubes present at the base of style, fruit set, and number of seeds per fruit for *Linum rigidum* flowers that were self or cross pollinated. Pollen tubes and pollen tubes present to the base of style were detected using florescent microscopy. *P* values were determined with a t-test (seeds per fruit) or Chi-squared test (all other variables).

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Pollen tubes present</th>
<th>Pollen tubes present to base of style</th>
<th>Fruit set</th>
<th>Seeds per fruit (average ± 1 SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td>92.31% (n=13)</td>
<td>30.77% (n=13)</td>
<td>86.66% (n=15)</td>
<td>5.8 ± 0.8</td>
</tr>
<tr>
<td>Cross</td>
<td>85.71% (n=14)</td>
<td>64.29% (n=14)</td>
<td>86.66% (n=15)</td>
<td>6.0 ± 0.7</td>
</tr>
</tbody>
</table>

**P value (df)** > 0.5 (1) 0.081, (1) 1, (1) t = 0.407, df = 22, *P* > 0.8

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### 4. Discussion

One purpose of this study was to determine whether the annual plant *Linum rigidum* is self-compatible. Our results indicate that self-
compatibility occurs because pollen tubes were detected in nearly all self-pollinated flowers as well as most cross-pollinated flowers. The results indicate that around twice as many cross-pollinated flowers had pollen tubes that reached the base of the style compared to self-pollinated flowers. This does not however indicate that cross-pollinated flowers had higher reproductive success compared to self-pollinated flowers because fruit set was identical and seed set was not significantly different between pollination treatments. Another purpose of this study was to investigate if petals maintained herkogamy. Our results indicate that once petals were removed there was a significant reduction in herkogamy for both anther-stigma distance and anther-style distance.

We plan additional research for spring and summer of 2013 to investigate whether delayed self-pollination increases fruit and seed production for L. rigidum. To investigate this question, we plan to expose plants to pollinators in the field. Then, prior to petal abscission and self-pollination, we plan to remove petals from half of the flowers while leaving petals intact on the other flowers. We will then compare fruit set and seed set between these groups. If delayed self-pollination is effective, we predict that flowers with their petals remaining will have higher fruit and seed set than flowers with their petals removed.

Conclusions

The overall goal of this project is to determine if delayed self-pollination facilitated by petal abscission occurs and leads to seeds production in L. rigidum. This research supports the idea that delayed self-pollination occurs. We have shown that a reduction in herkogamy occurs, which increases the chances of self-pollination occurring. We have also shown that L. rigidum is self-compatible which allows self-pollination to produce seeds. Concurrent research is investigating for L. rigidum whether stigmas are still receptive and pollen is still viable when self-pollination occurs.

Acknowledgements

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References


Greenwood Golf Course Pond Quality

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Abstract — The purpose of this research was to study the effects of pesticide and fertilizer application, watershed characteristics, temperature, growth seasons, and other seasonal factors affecting water quality. Samples from Par Three Golf Course, Parkland Golf Course, and Greenwood Country Club’s golf course ponds analysis indicated the levels of nitrate and orthophosphate were within the regulations of South Carolina Department of Health and Environmental Control (S.C.D.H.E.C.) during a nine month sampling period. The results of this study were there were not any subsequent significant impacts on the three pond water quality locations when traces of pesticides were present.

Keywords — Golf, Course, and Pond

1. Introduction

The standards of the D.H.E.C. demands protection of water quality from chemicals applied to golf courses. The concerns about pesticides on golf courses are largely due to the potential for chemicals to transport to ground water. Information on this concern were found posted on the internet, technical reports, and publications of public interest.

Measurements to preventing negative impacts on water quality from pesticides applications to golf courses involves a combination of practices, pest management strategies, improved chemical applications methods and the products that are based on environmental conditions. This approach is to help protect water quality and effectiveness of management measures. There are few modeling studies which evaluate nutrients and pesticides transport from the golf course turfgrass into pond water and groundwater. Permits are issued to golf courses monitoring pesticides application impact on water quality.

The objective of this study was to evaluate the impact of pesticides applications on pond water quality at Par Three West, Parkland, and Greenwood Country Club golf courses, paying special attention to the levels of pH, TDS, conductivity, salinity, nitrates and orthophosphate.

2. Experimental

2.1 Field sample method

The instrumentation and equipment used to gather water samples are nitrate kit, phosphate kit; field sheet, ruler, waders, ice, cooler, TDS probe, thermometer (°C), pH strips, distilled water, and four to six 250-mL amber dedicated propylene bottles. The samples were taken from Par 3, Greenwood Country Club, and Parkland Golf Course ponds. There were two samples taken at each site once a month from February through November, to account for seasonal affects. Field observations included weather conditions, water depth, location of nearest sources of potential contaminants, any unusual observations, and vegetation. TDS, temperature (°C), pH, nitrates and orthophosphate were measured.

2.2 Analytical methods

TDS, temperature (°C), pH, nitrates and orthophosphate were measured. TDS and temperature were measured at the time of sample collection using a TDS probe and pH test paper, respectively. Nitrate and orthophosphate analyses were completed using LaMotte test kits, following instructions that accompanied the kits. Results were calibrated against standards. Samples were analyzed for conductivity and salinity with an Extech Ec500 Waterproof ExStik®II pH/Conductivity Meter within 24-hours the sample was taken. The Gas Chromatography Mass Spectrometer was used to detect and identify potential pesticides in samples. Pesticide concentrations were not determined.

3. Results and Discussion

Nitrate and phosphate levels in all three ponds showed consistent, low levels throughout the sample period. Samples from one location, Par Three West Golf Course, had high pH levels in the March, April October and November samples. This may have been due to spring and autumn algal blooms. Similarly high pH levels were not observed in the other two pond locations. Rather high temperatures (28 to 31 degrees C) were obtained for all three pond locations in the summer months. This was expected, given the shallow
depths of the ponds and absence of shade. Such warm water temperatures may be of concern because of the lower solubility of dissolved oxygen under those conditions and potential harm to aquatic organisms unable to tolerate such high temperatures. Pesticides were detected only twice during the project, once each for the Par Three West Golf Course and the Parkland Golf Course. TDS, salinity and conductance values were typical for fresh water ponds in this area. However, fluctuations in levels of salinity and conductance are notable in all three ponds, which may reflect significant runoff episodes. Additional data will need to be collected to confirm this. High TDS values at the Greenwood Country Club may be due to high run off rates, location in the middle of City of Greenwood (lack of wooded buffer along waterways), reductions of base stream flow due to ground or surface water withdrawals or long periods without significant precipitation, and entry of storm water pollutants washed from the parking lot. During this experiment systematic errors may have occurred due to preparations and testing samples. To avoid these errors, samples were tested more than three times and calculate the average and standard deviation for each location to ensure precision for results.

4. Conclusion

The purpose of this research was to study the effects of pesticide and fertilizer application, watershed characteristics, temperature, growth seasons, and other seasonal factors affecting water quality for Par Three West Golf Course, Parkland Golf Course, and Greenwood Country Club’s golf course ponds. Results found for nitrate and orthophosphate were within S.C.D.H.E.C. regulations. Pesticides were detected in only two samples using GCMS. The results indicate that it is possible to operate a golf course pond without damaging its aquatic environment. Further study of seasonal affects is indicated to understand more completely the observed fluctuations in pH and salinity/conductance.

Acknowledgements

The research team would like to thank Dr’s. Dukes, and Trousdale for advisement throughout this project and providing field and lab materials. We also like would like to show appreciation and gratitude towards Par Three Golf Course, Parkland Golf Course, and Greenwood Country Club’s golf course ponds for allowing the research team collects multiple samples from their ponds in a nine month period.
Table 1. Par Three West Golf Course data collected samples from their pond over a 9 month period.

<table>
<thead>
<tr>
<th></th>
<th>12-Mar-12</th>
<th>4-Apr-12</th>
<th>17-May-12</th>
<th>7-Jun-12</th>
<th>12-Jul-12</th>
<th>25-Aug-12</th>
<th>5-Oct-12</th>
<th>2-Nov-12</th>
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<tbody>
<tr>
<td>Ph</td>
<td>10.4</td>
<td>9</td>
<td>7.4</td>
<td>6.9</td>
<td>7.6</td>
<td>8.4</td>
<td>9.8</td>
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<tr>
<td>Temperature, °C</td>
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<td>23</td>
<td>27.6</td>
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<td>27.5</td>
<td>22</td>
<td>21.9</td>
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<td>TDS, ppm</td>
<td>40-50</td>
<td>0-10</td>
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<td>40-30</td>
<td>20-10</td>
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<td>Nitrates, ppm</td>
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<tr>
<td>Pesticides</td>
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<td>Conductivity, µs</td>
<td>118.8</td>
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<td>132</td>
<td>250</td>
<td>124.3</td>
<td>115.2</td>
<td>117</td>
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</table>

Table 2. Parkland Golf Course data collected samples from the main pond over a nine month period.

<table>
<thead>
<tr>
<th></th>
<th>12-Mar-12</th>
<th>4-Apr-12</th>
<th>17-May-12</th>
<th>7-Jun-12</th>
<th>12-Jul-12</th>
<th>25-Aug-12</th>
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<td>Ph</td>
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<td>6.5</td>
<td>7.2</td>
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<tr>
<td>Temperature, °C</td>
<td>17.5</td>
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<td>24.7</td>
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<tr>
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<td>4.4</td>
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Table 3. Greenwood Country Club data collected samples from the golf course main pond over a nine month period.

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Analysis of the Contribution of Wastewater Treatment Plants to the Dissemination of Antibiotic Resistant Escherichia coli in the Broad River Watershed

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Abstract — The purpose of this study was to provide the foundation for future experimentation and a general analysis of antibiotic resistance in E. coli from samples of water at a wastewater treatment plant and the effluent receiving stream. Samples were taken from raw influent after solids removal, the aeration basin, 200m upstream the effluent discharge point, and 200m downstream the effluent discharge point. Resistance was tested against 10 different antibiotics using the Kirby-Bauer disc diffusion susceptibility test. Resistance was determined by colony formation within the zone of inhibition. The coliform isolates showed increased resistance to Ampicillin (AM), Tetracycline (TE), Nalidixic acid (NA), and Cephalothin (CF) as they progressed through the wastewater treatment process. Moreover, there was a very slight increase in resistance seen from the sample downstream the effluent, compared to upstream the effluent. We hope to use these findings as a foundation for further investigations in the future.

Keywords — Wastewater treatment, Antibiotic resistance, E. coli, Effluent, River waters

1. Introduction

Higher frequencies of antibiotic resistant (AR) and multiple antibiotic resistant (MAR) bacteria have been observed in fresh water environments due to the increased use of antibiotics in humans and animals (Servais and Passerat, 2009; Ash et al., 2002). With increasing populations and limited resources, wastewater treatment plants have trouble properly disinfecting and releasing the large amount of waste produced (EPA, 2004). Therefore, the dissemination of AR and MAR bacteria through wastewater effluent is likely to occur. There have been many studies that indicate wastewater treatment plants (WWTP) release relatively large amounts of AR and MAR bacteria into effluent receiving streams (Reinthaler et al., 2003; Akiyama and Savin, 2010; Zhang et al., 2009). This in turn has detrimental effects on the naturally occurring microorganisms in the environment (Martinez, 2009).

Most wastewater treatment plants take in massive amounts of sewage (EPA, 2004). This sewage harbors significantly large amounts of AR and MAR bacteria that are exposed to one another throughout the treatment process. Research has shown that this exposure allows transfer of antibiotic resistance to take place among bacteria, and consequently introduces antibiotic resistant microorganisms to stream ecosystems receiving wastewater effluent (Zhang et al., 2009). Furthermore, once these AR bacteria reach rivers and creeks they are incorporated into local biofilms, which have been shown to enhance the transfer of AR and MAR genes (Molin and Tolker-Nielsen, 2003).

The original goal of this study was to show (a) the significant effects of wastewater treatment plants on antibiotic resistance selection among E. coli, and (b) the effect of wastewater effluent on the number of AR and MAR E. coli in rivers and creeks of the Broad River watershed. However, due to lack of funds and problems encountered during experimentation, this study serves only as an analysis of antibiotic resistant E. coli in wastewater treatment plants.

2. Materials and Methods

2.1 Sampling site

Sampling took place at ReWa’s wastewater treatment plant on Mauldin Road, Greenville, SC. This plant uses UV irradiation to disinfect the wastewater before releasing it into the aquatic environment. Samples of 250mL were taken from (1) raw influent after solids removal, (2) the aeration basin, (3) 200m upstream effluent discharge point, and (4) 200m downstream effluent discharge point.

2.2 Processing, culturing, quantification, and confirmation of E. coli

Vacuum filtration was used on all samples. All samples were diluted with working buffer solution (WBS), comprised of MgCl₂ solution and Phosphate buffer solution, before filtration. To culture E. coli
and perform preliminary identification, samples were plated on selective mFC agar and incubated at 44.5°C for 24 hours. As a control, WBS and a known E. coli sample were plated on mFC agar to test sterility of the filtration unit, WBS, and to observe if mFC properly cultures E. coli. After incubation, plates with 30-300 colonies were selected. Dark colonies were counted and dilution factors were used to calculate original colony forming units (CFU) per ml. Dark colonies were then selected and transferred to nutrient agar slants and incubated at 35°C for 22 hours and then stored at 5.0°C. Secondary identification of E. coli was completed through a two-step confirmation process using Lauryl Sulfate Broth and EC broth.

2.3 Antibiotic resistance susceptibility testing

Antibiotic resistance susceptibility testing was completed through Kirby-Bauer Disc Diffusion method using fresh cultures of E. coli. Testing was completed using antibiotic sensitivity discs (BBL™ Sensi-Disc™) with 10 different antibiotics: ampicillin (AM, 10 µg), tetracycline (TE, 30 µg), chloramphenicol (C, 30 µg), gentamicin (GM, 10 µg), nalidixic acid (NA, 30 µg), amoxicillin/clavulanic Acid (AMC, 30 µg), rifampin (RA, 5 µg), erythromycin (E, 15 µg), sulfamethoxazole/trimethoprim (SXT, 25 µg), and cephalothin (CF, 30 µg). Antibiotic discs were placed on Kirby-Bauer plates with Standard Methods Agar and incubated at 35.9°C for 24 hours.

2.4 Analysis and statistics

After incubation, plates were analyzed by measuring zones of inhibition. Isolates that had resistant colonies forming within the zones of inhibition were re-plated for confirmation, and the resistant colonies were plated twice to confirm their resistance to the antibiotics. Statistics were not performed due to shortage of data. This was due to problems that occurred during the study as well as shortage of funds.

3. Results

The median value of E. coli from the raw influent sample was 4.3 × 10⁴ CFU/ml (n=3). Median values for the samples from the aeration basin, 200m upstream the discharge point, and 200m downstream the discharge point, were 1.4 × 10² CFU/ml (n=3), 8.0 × 10⁹ CFU/ml (n=3), and 7.0 × 10⁹ CFU/ml (n=3), respectively. A total of 36 isolates of E. coli were tested for antibiotic resistance (10 from raw influent, 10 from the aeration basin, 8 from 200m upstream, and 8 from 200m downstream). Of these isolates, 21 (58% of total) had resistant colonies forming within the zone of inhibition for one or more antibiotics (6 from the raw influent (60% of total from this site), 8 from the aeration basin (80% of total from this site), 3 from 200m upstream the discharge point (37.5% of total from this site), and 4 from 200m downstream the discharge point (50% of total from this site)). Of these 21 isolates with resistant colonies, 1 had resistant colonies with one antibiotic, 6 had resistant colonies with two antibiotics, and 14 had resistant colonies with three or more antibiotics. Only an analysis was completed, there was no testing for the statistical significance of the results due to shortage of data.

4. Conclusions

Based on the findings, CFU/ml of E. coli dropped by 100-fold from the raw influent to the aeration tank, and a 10,000-fold decrease from the raw influent to both sites 3 and 4. Furthermore, the greatest number of E. coli isolates with resistant colonies within the zone of inhibition occurred at site 2. Site 2 had one isolate that had resistant colonies forming within the zone of inhibition for two antibiotics, and the rest of the isolates had resistant colonies forming for three or more antibiotics. These results show that the proportion of AR E. coli seems to increase as this bacteria goes through the wastewater treatment process (Figure 1). Specifically, antibiotic resistances against TE, CF, and AM seem to increase. These findings were also observed by Reinthaler et al. (2003) (for TE and CF against E. coli) as well as Akiyama and Savin (2010) (for AM against E. coli). Further experimentation is required to show that there is a statistically significant increase in antibiotic resistant E. coli, and that there might be a pattern of selection of resistance within this species of bacteria at wastewater treatment plants - through plasmid transformation and conjugation experiments. Furthermore, there seems to be a slight increase in the percentage of antibiotic resistant bacteria from upstream to downstream the effluent, against the antibiotics CF and AM. Akiyama and Savin (2010) observed similar findings with E. coli in a tributary receiving treated effluent in Fayetteville, Arizona. Once again, further experimentation must be completed in order to show that there is a statistically significant increase in antibiotic resistant E. coli. Finally, while the results seem significant, this study merely serves as an analysis to lay the foundation for research in the future.
Acknowledgements

We gratefully acknowledge Dr. Steve Graef, Ann Sims, and Tony Hollingsworth for allowing us to gain access to ReWa’s facilities and aiding in sampling. We also thank Dr. Vince Connors for advising us when we ran into major problems.

References


Reproductive Investment in Female Copperheads (Agkistrodon contortrix) at the Extreme of Their Northern Range: Do Large Females Produce Large Progeny?

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Abstract — Increase in female size in many ectotherm lineages results in the production of more neonates, but not larger neonates. Such trade-offs may be particularly evident in viviparous snakes in northern latitudes. In these populations, ingress to hibernation can occur shortly after parturition, and adults and neonates remain in overwintering refugia for extended periods. Therefore, there is likely selection on females to produce larger neonates capable of surviving extended periods of hibernation. Assuming a trade-off between neonate number and size, we tested the hypothesis that larger females in northern viviparous snake populations will produce larger neonates (instead of more neonates) due to fitness benefits of large neonate size. We tested this hypothesis using a North American pitviper—the copperhead snake (Agkistrodon contortrix)—at the northeastern extreme of its range. Contrary to our hypothesis, we found that large females produce more neonates, with no increase in neonate size. Potential constraints to neonate size increase may include thermal limits to increasing neonate size through prolonging gestation.

Keywords — copperhead, female, reproduction, investment, Agkistrodon

1. Introduction

In many ectothermic lineages, female fecundity is related to female body size (Fitch, 1970), with larger females producing more neonates per litter than smaller females (Shine, 1988). Certain environments, however, may favor large neonate size. In northern latitudes, for example, ingress to hibernation among viviparous snake taxa can occur shortly after parturition, with adults and neonates sequestered in overwintering refugia for extended periods (Smith, Schuett, Earley, & Schwenk, 2009). Hence, there is likely strong selection acting on female size-dependent reproduction to produce larger neonates capable of surviving extended periods of hibernation. Given a presumed energetic trade-off between neonate size and neonate number (Smith & Fretwell, 1974) and that larger neonates have been shown to have higher survival in other ectotherms (Ferguson & Fox, 1984), we tested the hypothesis that increase in female size results in larger neonate size in a viviparous snake—the copperhead (Agkistrodon contortrix)—at the northeastern extreme of its extensive geographic range (Gloyd & Conant, 1990), where birth occurs in late summer followed shortly thereafter by a six to seven month hibernation period.

2. Methods

The study site was located in a 485 ha parcel of basalt trap rock ridge ecosystem situated 4.75 km NW of Meriden, Connecticut. Details of the topography of this area are presented elsewhere (Smith et al., 2009). Females were located in the field by periodically visiting known gestating sites (Smith et al., 2009), and those suspected of being pregnant (\(n = 24\)) were immediately brought to the laboratory, processed, and provided private enclosures. Measurements for each female were taken at the time of capture (21 July 2011) and included body mass (BM: ± 0.5 gm), and snout-vent length and tail length (SVL: ± 0.2 cm; TL: ± 0.2 cm). Two females were not pregnant, and two litters were unusual in having a single neonate and a number of infertile ova (two and five infertile ova respectively), thus twenty litters were ultimately used in the analysis.

Immediately following parturition (<1 hr post-parturition), females and neonates were weighed (females BM: ± 0.5 gm, neonates BM: ± 0.0001 gm). In addition, individual neonates were gently restrained, and dorsal and ventral photographs were taken. Ventral snout-vent length (SVL: +/- 0.01 mm) and ventral tail length (TL: +/- 0.01 mm) were measured using photographs imported into ImageJ (http://rsb.info.nih.gov/ij/index.html).

3. Statistical Analysis

Prior to performing analyses, all data were inspected for outliers, normality (skewness and kurtosis), and homogeneity of variance (Zar, 1999; Quinn & Keough, 2002). To separate the effects of female body condition from the effects of female body size on reproductive output, we used the residuals of an ordinary least squares (OLS) linear regression of pre-parturient female mass against...
SVL as an index of condition (body condition index= BCI) (Reist, 1985). Based on Mahalonobis and Jacknife outlier distances and Cook’s D analysis, a single female was identified as an extreme outlier and was removed from the calculation of BCI and all analysis using BCI as a predictor. Using the resulting index, the effects of female BCI, as well as pre-parturient female mass and SVL on litter size (neonate number), mean neonate mass, neonate BCI (calculated the same as female pre-parturient BCI) were determined using analysis of variance (JMP Pro 10.0, 2012, SAS Institute Inc, Cary, North Carolina). Alpha levels were set at 0.05 for all analysis.

4. Results

We found no effect of female pre-parturient condition (BCI) on individual neonate mass, neonate size (SVL), or neonate BCI. Additionally, we found no effect of female pre-parturient mass or female SVL on mean neonate mass, neonate size, or neonate BCI. We did, however, find an effect of female size (SVL) on neonate number (litter size, including stillborns) \( (F = 7.3753, \ P = 0.0142, \ df = 19, \ n = 20) \) and total litter mass \( (F = 12.4916, \ P = 0.0025, \ df = 19, \ n = 20) \).

5. Conclusions

Contrary to our hypothesis, we found no evidence that an increase in female body size translates into the production of larger neonates capable of surviving an extended period of hibernation. Rather, increase in female body size in A. contortrix results in larger litters consistent with previous studies (Fitch, 1970). Our results are surprising given that hibernation may entail high mortality in all life stages, including neonates (Parker & Plummer, 1987), and larger neonates may have greater survival during the period before and during hibernation (Saint Girons & Naulleau, 1981; Gregory, 1982).

Our results may reflect limited opportunities for females to invest in larger offspring. For example, in species with some placental transfer (obligate, facultative, or a combination of both) it is possible for the mother to use her current resources to prolong gestation (Swain & Jones, 2000) to increase neonate fitness (Stewart, Blackburn, Baxter, & Hoffman, 1990), perhaps through production of larger neonates. Based on extensive field observations of this population (Smith et al., 2009), females described in the present study likely were mated in late summer, showed obligate long-term sperm storage during winter, and ovulated in mid spring (late May or early June) (Smith et al., 2009). Given that parturition in the population typically occurs in late August and early September (Smith, unpublished data) there is a small environmental thermal window for females to maintain temperatures appropriate for gestation.

Additionally, prolonging gestation requires that there are no other adverse fitness effects (Swain & Jones, 2000). Climatic conditions that do not provide sufficient opportunities for gestating females to maintain preferred body temperatures can affect neonatal fitness directly by influencing rates of embryo mortality (Lourdais, Shine, Bonnet, Guillen, & Naulleau, 2004). Under such conditions, cooler gestation temperatures, particularly during late gestation (Burger & Zappalorti, 1988; Lourdais et al., 2004), result in a high incidence of stillborns and late stage neonate death. Because thermal dependence of embryonic development is so widespread among squamate reptiles (Hubert, 1985), female copperhead snakes in northern latitudes may be constrained from producing larger neonates, via extending gestation length, due to decreasing environmental temperatures in late summer months.

Acknowledgements

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References


Facultative Parthenogenesis Discovered in Wild Vertebrates

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Abstract — Facultative parthenogenesis (FP) – asexual reproduction by bisexual species – has been genetically confirmed in a variety of multicellular organisms but only recently in snakes, varanid lizards, birds, and sharks. Unlike the approximately 80 taxa of unsexual (obligate parthenogenetic) reptiles, amphibians, and fishes that exist in nature, FP has yet to be documented in the wild. Based on captive documentation it appears that FP is widespread in squamate reptiles and its occurrence in nature seems inevitable, yet the task of detecting FP in wild individuals has been deemed formidable. Here we show, using microsatellite DNA genotyping and litter characteristics, the first cases of FP in wild-collected pregnant females and their offspring of two closely related species of North American pitviper snakes – the copperhead and cottonmouth.

Keywords — Parthenogenesis, reproduction, copperhead, Agkistrodon, snake

1. Introduction

The discovery of facultative parthenogenesis (FP) in vertebrates can be traced to the late 1800s with reports of parthenogenetic development in domestic fowl (Gallus domesticus) (Oellacher, 1872). However, it was not until reproductive studies began on commercial strains of turkey (Meleagris gallopavo) that a robust research programme was developed to understand the genetic and physiological processes governing this unorthodox form of reproduction (reviewed in Olsen, 1975). One major finding was pouls that hatched from unfertilized eggs were always male. The resulting outcome was attributed to the sex-chromosomal system (ZW) shared with many non-avian reptiles but differing from that of most mammals, fishes and other vertebrates (XY), where males are homogametic (ZZ) and females are heterogametic (ZW) (Olsen, 1975). In this avian system, ZZ and ZW are the only viable conceptus outcomes (Olsen, 1975), with the combination of WW cells postulated to result in developmental failure. However, recent analyses that FP in boid snakes has demonstrated that WW cells produce viable progeny [Booth, Johnson, Moore, Schal, & Vargo, 2011a; Booth et al., 2011b]. With the discovery that all the parthenogenetic offspring produced by females were male, early investigators of FP surmised that the second polar body, a meiotic product that typically degenerates, essentially behaves like a spermatozoon to activate and fertilize the ovum and restore diploidy, a process known as terminal fusion automixis (Lampert, 2008). The resulting parthenogen is therefore not a clone of the mother, but a half clone (Lampert, 2008). This genome wide homozygosity may explain the variety of developmental abnormalities, including stillbirths and deformities, which have been reported in certain parthenogenetic litters (Booth et al., 2011b; Reynolds, Booth, Schuett, Fitzpatrick, & Burghardt, In press; Schuett et al., 1997; Watts, Buley, Boardman, Ciofi, & Gibson, 2006). Despite reports of developmental abnormalities, a parthenogenetic strain of the domestic turkey was developed in which most males appeared normal and reproduced successfully (Olsen, 1975). These results indicate that the ability to reproduce by way of FP is heritable and, as hypothesized by Olsen, Wilson, & Mark (1968), potentially linked to a single autosomal recessive gene.

Understandably, FP held little interest to most evolutionary biologists since it was known only in domesticated birds. This view began to shift with reports of FP in snakes [Booth et al., 2011a, b; Reynolds et al., In press; Schuett et al., 1997; Booth & Schuett, 2011; Dubach, Sajewicz, & Pawley, 1997; Groot, Bruins, & Breeuwer, 2003], lizards, including the endangered Komodo dragon (Watts et al., 2006) and sharks (Chapman, Shivji, Louis, Sommer, Fletcher, & Prodoehl, 2007; Feldheim et al., 2010). In all instances, females had long been removed from the wild or were captive bred; therefore, ovulation and gestation were restricted to captivity, resulting in FP being considered as a captive syndrome. With this string of events, the study of FP is gaining momentum as a research programme rather than just being viewed as rare cases of incidental reproductive peculiarities (Lampert, 2008; Booth & Schuett, 2011; Neaves &
Baumann, 2011; Sinclair, Pramuk, Bezy, Crandall, & Sites, 2009). Nonetheless, despite these recent advances, whether FP exists in wild vertebrates remains unknown (Booth & Schuett, 2011; Feldheim et al., 2010), primarily because of the formidable effort required to address this question.

Among vertebrates, squamate reptiles represent lineages seemingly predisposed to FP (Avise, 2008), as evidenced by the growing number of reports in captivity [Booth et al., 2011a, b; Reynolds et al., In press; Schuett et al., 1997; Booth & Schuett, 2011; Dubach, Sajewicz, & Pawley, 1997; Groot, Bruins, & Breeuwer, 2003]. From these reports, a specific set of characteristics commonly observed within litters have been identified that appear indicative of FP. These features, however, appear to differ in relation to the phylogenetic position of the lineage in question (reviewed in Booth & Schuett (2011). In caenophidian snakes, a derived clade containing most of the extant species (Greene, 1997), FP results in the production of unusually small litters that are composed entirely of males with low offspring viability and large numbers of developmental failures (Reynolds et al., In press; Schuett et al., 1997; Booth & Schuett, 2011). Here, we detected these litter characteristics in two litters from wild-captured North American pitviper snakes belonging to the clade Caenophidia— the copperhead (Agkistrodon contortrix) and cottonmouth (Agkistrodon piscivorus). Microsatellite DNA analysis was then used to test the hypothesis that these resulted from FP. While long-term sperm storage has been documented in females of both species (Schuett, 1992; Smith, Schuett, & Schwenk, 2010), our present analysis excludes this as a competing hypothesis.

2. Methods

From a total of 22 litters from wild-collected pregnant A. contortrix, and 37 litters from wild collected pregnant A. piscivorus, two litters were selected for molecular analysis following the identification of litter characteristics indicative of FP (Booth & Schuett, 2011) (a single male offspring, multiple yolked ova). DNA was extracted from ethanol-preserved blood and screened at seven (A. contortrix) and eight (A. piscivorus) microsatellite loci, following protocols outlined by Booth & Schuett (2011). In order to calculate the probability that a male sired the progeny and contributed identical alleles as the mother, population allele frequencies were derived from adult A. contortrix (n = 63) and A. piscivorus (n = 45) collected within the source populations. Population inbreeding coefficient (FIS) was calculated using FSTAT [21].

3. Results and Discussion

Unambiguous microsatellite genotypes were obtained at seven loci in A. contortrix and eight loci in A. piscivorus. Despite maternal heterozygosity at six and four loci, respectively, and collectively high population allelic diversity and heterozygosity, homozygosity for one of the maternal alleles was observed uniformly across all loci in the progeny of both species. In the absence of unique paternal alleles in the progeny, the probability that a male contributed identical alleles as the mother and thus the progeny of these litters resulted from sexual reproduction was infinitesimally small (A. contortrix p = 7.989 x 10^-16; A. piscivorus p = 2.416 x 10^-8). This is supported by the rarity of multiple homozygous genotypes, as found in the progeny, within the populations from which the specimens were derived. No evidence was found supporting significant inbreeding within the population of A. contortrix (FIS = -0.011), whereas FIS was positive within the population of A. piscivorus (0.120), potentially reflecting female philopatric behaviour. Despite this elevated FIS within A. piscivorus, no individuals other than the respective mother possessed genotypes compatible with the progeny, nor did any individual captured possess a composite genotype exhibiting homozygosity across all loci. Combined with the litter characteristics (male-only progeny and high numbers of developmental failures), we are confident that our findings represent the first cases of FP in wild vertebrates.

The homozygous nature of the offspring in contrast to the respective maternal heterozygosity indicates an apomictic form of parthenogenesis, and probably involves terminal fusion automixis as recently inferred for long-term captive A. contortrix (Booth & Schuett, 2011) and A. piscivorus. This contrasts with obligate parthenogenetic vertebrates species (one blind snake, various lizards) recorded in nature, the majority of which use an apomictic form in which offspring develop directly from mitotic divisions of unreduced ova [reviewed in Avise (2008)]. The evolutionary and ecological significance of FP in wild-living squamates and other vertebrates hinges on whether parthenogens show reproductive competency (Reynolds et al., In press; Booth & Schuett, 2011). This is an assumption we will test with the copperhead parthenogen in this study if it attains adulthood. Hedrick (2007) hypothesized that the production of viable parthenogens would be extremely rare in outbred individuals because of the likelihood that individuals resulting from such a genome-wide reduction in heterozygosity would
suffer an elevated frequency of homozygosity at deleterious male-biased sex ratios often observed in these species (Fitch, 1960). It may, however, be envisioned that under circumstances where a female becomes isolated from a suitable mate, FP may permit the establishment of a population prior to the introduction of genetically diverse conspecifics. In the light of the growing evidence of widespread FP in captive squamates, confirmation under natural conditions removes the prevailing dogma that FP is strictly a captive syndrome, thus warranting future research into the proximate control of induction, reproductive competence and population genetics modelling. Kearney, Fujita, & Ridenour (2009) reviewed potential examples of this, which include the reduction of immune function associated gene diversity and the altered ability to contend with increased parasite load. While we cannot comment as to the current health of the wild-produced cottonmouth parthenogen (released shortly after birth with no apparent health issues), the copperhead parthenogen has remained healthy. The conditions under which we report these natural instances of FP questions the role of FP in nature and the conditions under which it may be considered adaptive. A long-standing hypothesis—a reproductive advantage under conditions of isolation from potential mates (Lampert, 2008; Neaves & Baumann, 2011)—is not supported in these instances given the population demography and significant male-biased sex ratios often observed in these species (Kearney, Fujita, & Ridenour, 2009) It may, however, be envisioned that under circumstances where a female becomes isolated from a suitable mate, FP may permit the establishment of a population prior to the introduction of genetically diverse conspecifics. In the light of the growing evidence of widespread FP in captive squamates, confirmation under natural conditions removes the prevailing dogma that FP is strictly a captive syndrome, thus warranting future research into the proximate control of induction, reproductive competence and population genetics modelling.

Acknowledgements

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References

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Seatrout Heart Infection by Cardicola Sp.: Are Small Fish in More Trouble?

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Abstract — Spotted seatrout, Cynoscion nebulosus (Cuvier, 1830), are important game fish in South Carolina estuaries and are thought to be negatively affected by parasites. Seatrout in South Carolina are heavily infected with Cardicola sp., a trematode whose eggs often penetrate the heart ventricle and become encapsulated in granulomas that are thought to potentially lead to heart dysfunction. Because of high prevalence and parasite burden in adult fish, we hypothesized that infection in smaller fish would lead to a greater proportion of tissue damage than in larger fish. Histological sections of spotted seatrout ventricle were taken from each specimen and three sections from each ventricle were chosen randomly and inspected for the presence of granulomas. All granulomas in a given field of view were counted in each section and the average calculated. The 10 largest (≥ 375 mm total length (TL)) and 10 smallest (≤ 325 mm TL) most infected fish were used for comparison of relative tissue damage. Two of the three sections of ventricle tissue were subsequently examined and six pictures were obtained at 400X magnification from each examined section and analyzed using ImageJ software. Analysis indicates that a higher percent of heart tissue is granulomatous in smaller infected fish.

Keywords — Cardicola laruei, Cynoscion nebulosus, parasitology, pathology, granulomas

1. Introduction

The blood fluke Cardicola laruei Short, 1953 (Aporocotylidae) (Fig. 1) commonly infects the spotted seatrout Cynoscion nebulosus (Cuvier, 1830) (Fig. 2) in South Carolina estuaries. C. nebulosus is an economically important recreational fish in the southeastern USA (Bortone 2003). C. laruei has recently been found to negatively impact the health of C. nebulosus (Cosmann et al; in prep.). Adult C. laruei are located in the lumen of the cardiac ventricle of the fish and lay eggs, many of which escape the fish via the gills or are trapped in the myocardium. Myocardium trapped eggs are encapsulated in granulomas generated by the host’s immune reaction (Figs. 3, 4, and 5). Aporocotylid infection may result in fish asphyxiation due to blockage of arterial flow (Bullard et al. 2004) and have been implicated in bluefin tuna fry mortality in mariculture conditions (Smith 1997). Granulomas caused by C. forsteri eggs in bluefin tuna have been associated with myocardial fiber hypertrophy (Colquitt et al. 2001). Whereas eggs may not be associated directly with fish host mortality, granulomas may place excess stress on the fish heart, potentially inducing heart failure (loc. cit.). Because C. laruei pathology appears to be associated with egg/granuloma intensity and because small fish have smaller hearts than larger fish, we hypothesized that smaller C. nebulosus were more negatively impacted than larger ones by C. laruei encapsulated eggs.

2. Materials and Methods

Fish were collected from the Charleston Harbor estuarine system during monthly trammel net surveys conducted by the South Carolina Department of Natural Resources Inshore Fisheries Division, who also provided biometric data for each specimen, including total length (TL) and weights. Eviscerated fish were weighed (EW) and hearts processed for histology following standard protocols. Sections 7 μm thick were stained with H&E. Ventricles were sectioned at least 200 μm apart to avoid overlapping granulomas. Ten of the most highly infected fish from each of two size classes (≤ 324 mm TL and ≥ 365 mm TL) were chosen for comparison. Two sections per heart were selected for microscopic examination and five pictures of each section were taken for a total of ten images per fish. Picture location was determined by haphazardly sighting a spot at 100X prior to proceeding to 400X for image capture within the larger field of view. Granuloma number and the percent area occupied by granulomas on each image were calculated using ImageJ. Data were averaged for each fish and standard errors calculated. In order to obtain a standard estimate of fish size for comparison purposes the relative weight (RW) of each fish was determined by dividing EW by TL. Regression analysis of EW and TL was performed to assure a linear relationship between weight and length. The Relative Impact (RI) was calculated by dividing the average percent area of granulomatous tissue for each fish by its RW. Data were assessed for normality using the Shapiro-Wilkes test and ANOVA was used to assess
differences in RI between the two fish size classes. Statistical analyses were performed using SYSTAT.

3. Results

Regression analysis indicated that the relationship between TL and EW was linear (p<0.001, R² = 0.937). No significant difference was found between either the average number of granulomas (Fig. 6) or the percent granulomatous area (not shown) relative to fish size. The relative impact of C. laruei on smaller fish was about two-fold that of larger fish (Fig. 7).

4. Discussion

Small and large C. nebulosis are unequally impacted in terms of percent granulomatous ventricle tissue when the size of the fish is accounted for: smaller C. laruei infected fish have about twice the relative percent of granulomatous heart tissue than larger fish (Fig 7). Neither the number of granulomas (Fig. 6) nor the percent of granulomatous tissue differs between the two size classes, indicating that there is no increase in egg density in the heart as fish age. Eggs in myocardium and other tissues have been reported in other blood fluke infections and have been linked to mortality (Herbert et al. 1995, Kirk and Lewis 1998, Colquitt et al. 2001), particularly for small or juvenile fish (Smith 1997, Iqbal and Sommerville 1986). Although it is not known if C. laruei causes mortality in either maricultured or wild C. nebulosis, the greater RI on smaller seatrout indicates that they may be subject to larger cardiac stress. A weaker cardiac output, likely the result of a reduced stroke volume haemodynamic stress. A weaker cardiac output, likely the result of a reduced stroke volume, can damage gills (Iqbal and Sommerville 1986). Although it

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References


Abstract – Historic biodiversity surveys focused on the Cape Hatteras and Cape Canaveral boundaries of the sub-tropical Carolinian Province. Consequently, the continental shelf molluscan fauna of South Carolina has been largely ignored. We document species richness from two samples taken in 60 and 80 meters water depth, southeast of Charleston, South Carolina. Exceptionally rich in micromolluscs, the samples yielded 166 and 185 species, respectively. The combined fauna contained 244 molluscan species, including 134 species previously unreported from South Carolina waters. Additionally, Episiphon didymus (Watson, 1879), Compressidens ophiodon (Dall, 1881), Nucinella woodii (Dall, 1898), Solenya occidentalis (Deshayes, 1857), Nuculana concentrica (Say, 1824), Limaria locklini (McGinty, 1955), Limatula subovata (Jefferies, 1876), Cerioidea planulata (Dall, 1886), Pleurolocaena sombrerensis (Dall, 1886), and Cyclostremiscus microstriatus (Rubio et al., 2011) appear to be additions to the Carolinian provincial fauna.

Key Words – South Carolina, continental shelf, molluscs

1. Introduction

Marine biologists have long recognized the abrupt change in zoogeographic provinces between temperate and subtropical faunas at Cape Hatteras, North Carolina. A similar break occurs off Cape Canaveral, Florida, between subtropical and tropical biotas. Consequently, the faunas immediately north and south of Cape Hatteras have been much studied, and the Florida transition likewise has a substantial documentation in the literature. Such studies document 880 species of shelled molluscs found immediately south of Cape Hatteras (Porter, 1974; Campbell, in preparation), 774 Floridian species found north of Cape Canaveral (Lee, 2009). With literature focus on provincial boundaries, South Carolina and Georgia species have been defined as “within range” and are largely ignored in compendia such as Abbott, 1974. South Carolina’s estuarine, intertidal, and shallow shelf faunas have received some fairly recent attention (Zingmark, 1978; Fox and Ruppert, 1985). Early efforts to list the marine molluscs of South Carolina include Gibbes (in Tuomey, 1848), and Turner (1883), but the most recently published comprehensive listing is Mazyck (1913). A review of South Carolina literature and on-line resources (Campbell, in preparation) yields only 385 documented marine shelled molluscan species. Porter (1974a) reported molluscs from two stations east of Charleston, South Carolina, and noted the near absence of literature from the area.

The senior author participated in several South Carolina Marine Resources cruises between 1978 and 1986, collecting the by-catch of dredging studies documenting the potential for scallop and Geryon crab fisheries, and personally funded a November, 1998 cruise which sampled a transect out to 200 meters water depth. Sorting and identification of the resulting species is ongoing.

2. Methods

In November, 11 to 13, 1998, we purchased ship time on the South Carolina Marine Resources research vessel, The Lady Lisa, for the purpose of collecting live bivalves for a DNA sequencing study of molluscan phylogeny. All samples were taken along Loran line 60500, which trends southeast of Charleston, South Carolina. Samples were obtained using a 30 centimeter diameter pipe dredge which yielded bulk sea bed samples of one to four liters of shell sediment. These were screened on shipboard and living specimens were preserved in ethanol for sequencing. The remaining shell sand was bagged and labeled, then later wet screened through nested sieves of mesh ranging from 8 mm down to 0.5 mm. The sieved samples were air dried and stored for analysis as time allowed. Most shell specimens were 0.5 mm to 5 mm in maximum dimension, and were sorted using an American Optical binocular dissecting microscope. Many molluscan survey studies discard all shell and sediment that pass through a 4 mm screen. Ninety percent of the species here documented would have been lost by that technique. This finer sieving not only samples adult shells of the numerous minute species, but also documents the juvenile stages of much larger species. Among the specimens recovered was a...
fresh hatched, 4 mm juvenile *Busycon perversum laeostoma*, whose adult forms can exceed 400 mm.

In conjunction with Fall, 2012 efforts to prepare the USC Upstate geology lab for renovation, effort was made to sort these samples and identify the species. Two samples proved to be exceptionally diverse, and are here reported. Sample 5 B was taken in 60 meters of water, sample 6 A in 80 meters. The USC Upstate–Campbell collections of South Carolina molluscs are being transferred to the Academy of Natural Sciences, Philadelphia. Processing the collection for transfer will continue adding new state species records.

### 3. Results

Each sample yielded between 2000 and 3000 identifiable molluscan specimens. Shell peeling and cracking by a variety of predators including fish, crabs, echinoids, and certain gastropods was intensive in these deposits. Fresh dead, broken shells were abundant, complete specimens were uncommon. Sample 5 B yielded 166 molluscan species, 6 A contained 185 species. The combined list documents 244 total species. Of these, 134 species have not previously been reported as occurring in South Carolina waters. Added to the 385 species in existing literature, the South Carolina total rises to 519 species, a 35 percent increase. Most of these new records are of species known from both North Carolina and North Florida, so replace “within range” notation with documented records. However, ten species, *Episiphon didymus* (Watson, 1879), *Compressidens ophiodon* (Dall, 1881), *Nucinella woodii* Dall, 1898, *Solemya woodii* (Say, 1824), *Limaria locklini* (McGinty, 1955), *Limatula subovata* (Jefferies, 1876), *Ctenoides planulata* (Dall, 1886), *Pleurolucina somberensis* (Dall, 1886) and *Cyclostremiscus microstriatus* Rubio, Rolan, and Lee, 2011 appear to be additions to the Carolinian provincial fauna.

### 4. Conclusions

It is obvious from the North Carolina and Florida data that the marine biodiversity of South Carolina is vastly under-documented. However, it is surprising that two small samples, each about two liters in original volume, could increase the documented fauna by 134 species. These results indicate that the known fauna of South Carolina molluscs is still in the early phase of a rarefaction curve. We can reasonably anticipate that hundreds of undocumented species remain for future studies to discover.

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**References**


Education Support to Control Type 2 Diabetes

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Abstract — This evidence-based practice project focused on the benefits of positive lifestyle changes and controlling the disease process to improve the patient’s quality of living. The clinical question was, “Do patients with Type II diabetes who receive patient education on diet, exercise, and glycemic control have better glycemic control and weight loss as opposed to patients without educational support?” Six articles were reviewed; three were Level II experimental studies, one was a Level III quasi-experimental study, one was a Level IV correlational and one was a Level VI qualitative study. In addition, two professional nurses were interviewed and the Cochrane Database was reviewed. Based upon the literature review of six nursing research studies, professional nursing interviews, and findings of the Cochrane Review the group defined three clinical practice guidelines. These included: hospital-based intervention should be provided to increase self-efficacy and confidence of persons receiving diabetes care; outpatient education programs should be provided for all diabetes patients to result in better exercise regimens, recognizing better food choices and regulating blood glucose levels; and nurses should have patients take part in the creation of educational topics so their participation and information retention will improve.

Keywords — type 2 diabetes, education support, nursing

1. Introduction

Patients with Type 2 diabetes frequently lack education post-diagnosis and fail to implement diabetes self-care regimens. As evidenced by nursing clinical experiences the effects of poor diet and sedentary lifestyle of patients with Type II diabetes have a negative impact on their overall health. Poor lifestyle choices leave these patients with serious health conditions like hypertension, neuropathy, kidney failure, and cerebral vascular accidents. This project will focus on the benefits of positive lifestyle changes and controlling the disease process to improve the patient’s quality of living. The clinical question was, “Do patients with Type II diabetes who receive patient education on diet, exercise, and glycemic control have better glycemic control and weight loss as opposed to patients without educational support?”

Population: Patients with Type II diabetes mellitus
Intervention: Patient education on diet, exercise, and glycemic control
Comparison: No patient education
Outcome: Better glycemic control, weight loss

2. Method

Six articles were reviewed; three were Level II experimental studies, one was a Level III quasi-experimental study, one was a Level IV correlational and one was a Level VI qualitative study. Additionally, two registered nurses were interviewed and the Cochrane database was searched, resulting in one review.

3. Findings

3.1 Findings in the Nursing Research Literature

Clark (2009) described the perceptions of newly diagnosed persons with diabetes on their disease and how their perceptions related to their self-efficacy before and after educational classes on diabetes care. Persons with an increase in positive perceptions demonstrated greater compliance and self-efficacy. These perceptions were effected by educational classes demonstrating that with more knowledge comes a better perception and better disease control. A study by Shi, Ostwald and Wang (2010) examined the effect of a hospital-based intervention focused on self-efficacy and glycemic control behaviors. The intervention was effective in improving glycemic control, glycemic control behaviors, and self-efficacy. A third research study compared diabetic patient results between patients receiving inpatient care and a study group receiving early discharge care from a nurse (Pick, 2009). The results showed that diabetes treatment can be managed outside the hospital environment with the right support group and healthcare providers. An experimental study that focused on the effects of a patient education program on knowledge, self-management behaviors and self-efficacy reported that the education program improved patients’ self-efficacy and self-management behaviors.
Gurkan, & Kose, 2008). New (2010) studied the effect of a co-created diabetes education program versus the standard diabetes self-management education and demonstrated that patients in co-created diabetes self-management education had improved diabetes self-care activities. Wong, Mok, Chan, and Tsang (2005) reported that diabetes treatment can be managed outside the hospital environment with the right support group and healthcare providers.

3.2. Professional Nursing Interviews

Professional nursing interviews were held with two nurses, one of whom is a certified diabetes educator (CDE) and the other a Family Nurse Practitioner. Three questions were asked:

1. How have you involved your diabetic patients in the teaching learning process to help them retain the skills/information?
2. In what way (if any) would you suggest changing the way diabetic information is taught to newly diagnosed diabetic patients and incorporated into their discharge plan of care in order to see more compliance with diabetic treatment regimens?
3. What is the most important aspect of nursing when helping diabetic patients to be self-efficient with their glycemic control?
4. In answer to the questions, the CDE stated that specific learning needs are identified in each outpatient by the CDE and that they conduct informal classes with free discussion. Games are used in the final class to evaluate knowledge. For inpatients, they use the “teach back” method to verify understanding of the information taught. The CDE would like to see more patients referred to their outpatient program and involve the staff nurses more in educating the diabetic patients as they are providing care; essentially the nurses would “teach as they do.” Lastly, the CDE stated that it is important to empower patients to be proactive, to call their health care provider as needed, and to have follow-up education by reading diabetes magazines and attending diabetes support groups (Jane Mauldin, personal communication). The Family Nurse Practitioner emphasized the importance of having a CDE and emphasized that it is essential that patients understand what they are doing and why they are doing diabetes management (Stephanie Jacobson, personal communication).

3.3 Cochrane Review Findings

The Cochrane Review examined the effects of interventions targeting health professionals or the way care is organized, with the aim of improving the management of people with diabetes in primary care, outpatient and community settings (Renders, Valk, Griffin, Wagner, van Eijk, Assendelft, et al., 2000). According to Renders, et al. there is evidence that patient-oriented interventions can lead to improved patient health. However, the effectiveness of these interventions on patient outcomes such as glycemic control, cardiovascular risk factors, and over all wellbeing is less clear. According to the review, nurses play a crucial role in patient-oriented interventions through patient education (Renders et al., 2000).

4. Conclusions

Based upon the literature review of six studies, professional nursing interviews, and findings of a Cochrane Review article, the group defined three clinical practice guidelines. These include: hospital-based intervention should be provided to increase self-efficacy and confidence of persons receiving diabetes care; outpatient education programs should be provided for all diabetes patients to result in better exercise regimens, recognizing better food choices and regulating blood glucose levels; and have patients take part in the creation of educational topics so their participation and information retention will improve.

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References

New, N. (2010). Teaching so they can hear: Using a co-created diabetes self-management


Early Upward Mobility and Length of Stay in Adult Critically Ill Patients

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Abstract — Registered nurses working with critically ill patients often observe numerous complications of prolonged bed rest. It is thought that ensuring early upward mobility will directly improve the patients’ overall health status as demonstrated by a decreased length of stay. The student group conducted an evidence-based practice project to answer the clinical question: Does early upward mobility decrease length of stay in adult critically ill patients? Five articles were reviewed on studies reporting the effects of beach chair positioning; increasing early upward mobility through the use of mandatory computerized mobility orders and an intensive care mobility protocol; instituting mobility teams; and interrupting daily dosages of sedatives along with having regular physical and occupational therapy. Additionally, a study described the actual measurement of activity by direct observation versus actigraphy. Based on the literature review findings, two professional nursing interviews, and Cochrane Review, the clinical intervention of early upward mobility was not indicated and is not recommended to reduce length of stay. However, early upward mobility was found to have positive clinical effects. Further research is needed to determine whether early mobility decreases length of stay in adult critically ill patients.

Keywords — early mobility, critical care nursing

1. Introduction

Registered nurses working with critically ill patients often observe numerous complications of prolonged bed rest. These complications increase strain on an already challenged and financially burdened health care system. It is thought that ensuring early upward mobility will directly improve the patients’ overall health status as demonstrated by a decreased length of stay. Therefore, the student group conducted an evidence-based practice project to answer the clinical question, “Does early upward mobility decrease length of stay in adult critically ill patients?”

Population: Adult critically ill patients
Intervention: Early upward mobility
Comparison: No early upward mobility
Outcome: Decreased length of stay

2. Method

Five articles were reviewed on studies reporting the effects of beach chair positioning; increasing early upward mobility through the use of mandatory computerized mobility orders and an intensive care mobility protocol; instituting mobility teams; and interrupting daily dosages of sedatives along with having regular physical and occupational therapy. Additionally, one study described the actual measurement of activity by direct observation versus actigraphy.

3. Findings

3.1 Findings in the Nursing Research Literature

One article reported a Level II or experimental study, three of the articles reported Level III or quasi-experimental studies, and one reported a Level IV descriptive study. The following represent a summary of the findings. There was one study specifically reporting a decreased Intensive Care Unit (ICU) and hospital length of stay (LOS) with implementation of a mobility team using a mobility protocol initiated early in physical therapy (Morris, Goad, Thompson, Taylor, Passmore, Ross, &...Haponik, 2008). A related study reported that patients who received physical and occupational therapy in the earliest phases of critical illness as well as daily interruption of sedatives had a shorter duration of ICU-associated delirium and spent two to four more days alive and breathing without assistance than did the control group (Schweickert, Pohlman, Pohlman, Nigos, Pawlik, Esbrook, &...Kress, 2010). While the beach chair position intervention had a significant effect on reducing the occurrence of ventilator-assisted pneumonia (VAP) (Caraviello, Nemeth, & Dumas, 2010), there was no significant effect on overall patient length of hospital stay or on length of required ventilation days. Creating a mandatory entry of computerized mobility orders for surgical ICU patients and a nursing protocol for carrying out ICU mobility orders increased the number of mobility orders...
entered and overall patient activity; however, there were no significant changes with respect to length of stay or ICU length of stay (Hildreth, Enniss, Martin, R, et al., 2010). Patients whose typical therapeutic activity was more accurately measured using direct observation vs. actigraphy had physiologic stability; however, they continued to experience infrequent activity and short durations of therapeutic activity (Winkelman, Higgins, & Chen, 2005).

3.2. Professional Nursing Interviews

Two professional nurses were interviewed and asked the following questions:

1. What do you see as possible benefits to upright early mobility?
2. What do you see as possible negatives of early upright mobility?
3. Do you recommend early upright mobility, why?

Responses supported the use of early mobilization. For example, one Master’s prepared nurse with 30 years critical care nursing experience stated that bedside nurses impact patient’s outcome by initiating early mobilization because early mobilization decreases the length of stay and decreases cost. The second nurse, a bachelor’s prepared nurse representative for a hospital bed company stated that early mobilization increases quality of life; every one day in bed from being immobilized leads to seven days of physical therapy.

3.3. Cochrane Review Findings

A Cochrane Review article entitled, “Very early versus delayed mobilization after stroke” determined that early mobilization may:

- slightly reduce the length of stay in hospital;
- slightly increase the number of patients who go home instead of to a nursing home or another hospital; and
- slightly reduce the cost of care to the health system; and
- not lead to any difference in function or harm.

4. Conclusions

Based on the literature review findings, professional nursing interviews, and Cochrane Review, the clinical intervention of early upward mobility was not indicated. Early mobility is not recommended to reduce length of stay. However, early mobility was found to have positive clinical effects and measurement of mobility is best conducted using direct observation rather than actigraphy. Further research is needed to determine whether early mobility decreases length of stay in adult critically ill patients.

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References


Preventing Cervical Cancer in African-American Women

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Abstract — Cervical cancer in African-American women has increased over the years due to a lack of screening and health education. The purpose of this evidence-based practice project was to provide guidelines to stop the progression of cervical cancer in African-American women by focusing on promoting cervical screenings, increasing compliance in treatment and management for women that have been diagnosed with this disease, promoting awareness and educating women who have been ill-informed. The clinical question was, “Can screenings decrease the incidence of cervical cancer in African-American women?” Three Level V quantitative articles reporting descriptive research were found and one Cochrane Review report. Results were that screenings and promotion of health management can decrease the incidence of cervical cancer in African-American women if the women are educated on the benefits of Pap smear screening. Many health care professionals are not aware of African-American women’s personal influencing factors related to routine screenings such as hesitance to discuss genitalia with unfamiliar individuals and past negative experiences with healthcare providers and victims of sexual assault. It is recommended that healthcare providers should gain better insight on these contributing factors in providing community prevention programs to promote awareness of cervical cancer.

Keywords — cervical cancer, African-American women

1. Introduction

Cervical cancer in African-American women has increased over the years due to a lack of screening and health education. The purpose of this clinical project was to discuss ways to stop the progression of cervical cancer in African-American women by focusing on promoting cervical screenings, increasing compliance in treatment and management for women that have been diagnosed with this disease, promoting awareness, and educating women who have been ill-informed. The clinical question was, “Can screenings decrease the incidence of cervical cancer in African-American women?”

Population: African-American young adult and middle-aged women
Intervention: Attendance at cervical cancer screenings/pap smear appointments
Comparison: No alternative intervention
Outcome: Lower incidence of cervical cancer

2. Method

The objective of the evidence-based practice project was to understand the barriers for African-American women that hinder them from being screened and treated for cervical cancer. To determine this information the group researched the lack of education and motivation to be screened and treated for cervical cancer. The literature review for this project was conducted using three different articles. The first article, Interactive Model of Client Health Behavior and Cervical Screening of African-American Women discussed the significance of African-American women’s use of Pap smear screening services and how well the data collected correlates with the usefulness of the Interaction Model of Client Health Behavior (Ackerson, 2011). The second, Personal influences that affect motivation in Pap smear testing among African-American Women, addressed influences that contribute to African-American women not receiving routine pap smears (Ackerson, 2010). The third article, Self-Reported Cancer Screening Rates Versus Medical Record Documentation: Incongruence, Specificity, and Sensitivity for African-American Women, explored the levels of incongruence, specificity, and sensitivity between self-reported screening and medical record documentation of cancer screening rates (Powe & Cooper, 2008).

3. Findings

3.1 Findings in the Nursing Research Literature

Three Level V quantitative descriptive studies were found. One evaluated the usefulness of the Interactive Model of Client Health Behavior (IMCHB) and cervical screening of African-American women in determining contributing factors that may place a woman at risk for avoiding routine cervical cancer screening. The model was used to compare women who routinely used cervical cancer screening and those who did not.
receive screening. The non-routine use participants were negatively influenced by a history of trauma. The researchers’ conclusion was that this model can provide a focus for the provision of individualized nursing interventions designed to promote positive health outcomes based on a client’s unique characteristics. A second article described personal influences that contribute to African-American women not receiving routine Pap smears. The researcher identified three major influences that affected women’s motivation in obtaining routine Pap smears: social influences, previous healthcare experiences, and cognitive appraisal associated with beliefs and perceptions of vulnerability. The researchers proposed that these assessments can better help serve and educate women of color and increase their chances of having routine cervical screenings. The third article explored the levels of incongruence, specificity, and sensitivity between self-reported screening and medical record documentation of several cancers, including cervical cancer. One hundred and sixteen African-American women were interviewed and completed the Patient Demographic Data Questionnaire (PDQ) and the Medical Record Abstraction Form (MRAF). There was a significantly different percentage of pap testing identified using self-reports versus medical records. In self-reported women, 96% reported having a pap test in their lifetime, 72% in the past year, 26% in the past five years, and 12% more than five years ago. However, according to the medical records only 56% had a pap test in their lifetime, 39% in the past year, 25% in the past two to five years and 13% more than five years ago.

3.2 Cochrane Review Findings

From the Cochrane Library, an article titled Interventions Encouraging Sexual Behaviors Intended to Prevent Cervical Cancer (Framptom, Harris & Shepherd, 2011) assessed the effectiveness of behavioral interventions for young women to encourage safer sexual behaviors to prevent the transmission of sexually transmitted infections and cervical cancer. The purpose of the review was to identify which behavioral strategies have been tested and which are most effective. The behavioral interventions included safer sex skills, and informing the women of their resources. There were no significant effects of abstaining or reducing sexual activity, but some women agreed to increase their use of condoms. The summary states that young women are at increased risk for contracting sexually transmitted infections including types of human papillomavirus (HPV) which can cause cervical cancer. Overall, there was a lack of evidence that demonstrating which behavioral methods would be most effective. The review reported that abstinence is the key to preventing sexually transmitted infections, HPV and cervical cancer.

4. Conclusions

Based on research findings and the Cochrane Review, screenings and promotion of health management can decrease the incidence of cervical cancer in African-American women if the women are educated on the benefits of Pap smear screening. Additionally, many health care professionals are not aware of African-American women’s personal influencing factors related to routine screenings. For example, some women are rather insecure when discussing their genitalia with unfamiliar individuals. Past negative experiences with healthcare providers and victims of sexual assault are other clinical concerns that were reported in the literature. The reviewed literature and Cochrane Review, found that personal influencing factors and socioeconomic resources are areas that contribute to women avoiding routine Pap smear screenings. It is recommended that healthcare providers should gain better insight on these contributing factors in providing community prevention programs to promote awareness of cervical cancer.

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References


Thoughts, Feelings, and Beliefs about Mammography Screening Held By African-American Women

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Abstract – This descriptive qualitative research study explores thoughts, feelings, and beliefs about screening mammography held by African-American women aged 35 and older who have previously participated in a breast health forum entitled, “Save Our Breasts”. Purposive sampling is being utilized to invite African American women who will be invited until data saturation is reached. Individual interviews using open-ended questions are being conducted to obtain narrative data representing the thoughts, feelings, and beliefs of the women regarding their decision whether or not to have screening mammograms. Content analysis methods are being employed to determine common themes that emerge from the data. The themes and supporting data will be compared to the literature on susceptibility to and fear of breast cancer, breast cancer fatalism, and spirituality/religiosity. Preliminary results revealed themes that suggested personal responsibility and religious influences were motivating factors for having a mammogram rather than family history. When comparing quantitative and qualitative results, the qualitative findings were the perception of more barriers and fewer benefits of mammography screening in addition to the impact of personal responsibility and spirituality on fatalism. Susceptibility and fear require further analysis.

Keywords – Breast cancer, mammography, African-American women

1. Introduction

Breast cancer is the most common cancer in African American women under age 45 (AAW) (American Cancer Society (ACS), 2012). Breast cancer is the second most common cause of cancer death among AAW. The breast cancer mortality rate is higher in AAW than that of all U.S. ethnic groups and AAW are more likely to die from breast cancer at every age (ACS, 2012). In the period 2003-2007 AAW had a 39% higher death rate than European American women (EAW). This difference in mortality rate represents over one-third (37%) of the overall cancer mortality disparity between AAW and EAW. African American women have the lowest survival rate of any racial or ethnic group, indicating that they have the greatest probability of dying of breast cancer (ACS, 2011). The five-year survival rate is 90 percent for EAW compared to 78 percent for AAW (ACS, 2012). This survival disparity is attributed to both later stage at detection and poorer stage-specific survival among AAW (ACS, 2011).

Gaps exist in research aimed at culturally appropriate interventions for AAW intended to reduce barriers and increase mammography screening. Gibson (2008) completed an integrative review on breast cancer screening barriers in AAW and interventions to reduce those barriers (2008). Specific barriers include those that are emotional, spiritual/religious, and fatalistic (Gibson). It is important that nurses, to increase the numbers of screening mammograms by AAW, should recognize the positive and negative effects of culturally specific beliefs and myths (Gibson & Hendricks, 2001; Kline, 2007). One of the barriers reported in the literature is fatalism. Mayo, Ureda, and Parker (2001) reported that fatalism was associated with noncompliance with mammography in AAW. Breast cancer fatalism is the belief in the inevitably of death once diagnosed with breast cancer. Spirituality has been associated with health, and is an important component in the lives of many AAW (Holt, Lukwago, & Kreuter, 2003), while religion and spirituality are associated with health seeking behaviors by AAW (Dessio, Wade, Choa, Kronenberg, Cushman, & Kalmuss, 2004). The literature is unclear as to the influence of spirituality/religiosity on mammography screening intention in AAW. It is also unclear whether there is a difference between fatalism and spirituality/religiosity. Additionally, fear has been reported as a predominant emotion (Adams, Becker, Stout, Coward, Robertson, Winchell, & Carrington, 2004) and a barrier to mammography screening (Gibson, 2008).

2. Objectives

1. Conduct individual interviews with African American women over 35 who have previously participated in the “Save Our Breasts” breast health forum.
2. Utilize descriptive qualitative research methodology with open-ended questions to
obtain narrative data representing the thoughts, feelings, and beliefs of the women regarding their decision whether or not to have screening mammograms.
3. Use purposive sampling to invite a sufficient number of African American women until data saturation is reached.
4. Use content analysis methods to determine common themes that emerge from the data.
5. Compare the themes and supporting data to the literature on susceptibility to and fear of breast cancer, breast cancer fatalism, and spirituality/religiosity.

3. Quantitative Research Results

After the “Save Our Breasts” Breast Health Forum, African-American women over 35 perceived there were:
1. Fewer barriers and greater benefits to having mammograms, greater susceptibility to breast cancer, more fear of breast cancer, and less breast cancer fatalism.
2. There was a negative relationship between spirituality/religiosity and breast cancer fatalism that was not significant.

A descriptive qualitative research design was used. A purposive sample of 55 African-American women 35 years and older from churches and community organizations was invited to participate. Women were invited to share stories on theirs or their loved ones experiences with or feelings about mammograms and spirituality/religiosity. Ten open-ended questions were asked of the women. Individual, taped, open-ended interviews are being used to obtain narrative data. Twenty-four African-American women from upstate churches and community centers responded or returned phone calls. Three interviews have been conducted thus far. Content analysis was performed to determine common themes among participants.

4. Results

4.1 Descriptive Characteristics of the sample

All the women identified themselves as being African-American or Black. Interviews were completed and transcribed for three women. The ages were 44, 50, and 60 with the mean of 55. Two identified themselves as Baptist and one was non-denominational. All participants were college educated. The income levels ranged from less than $10,000 per year to $49,000 per year. The date of last mammogram was 2011 for two participants and 2012 for one participant.

4.2 Qualitative Results

Results suggested the behaviors of the technicians were a positive aspect when undergoing a mammogram. Although all participants described mammograms as being painful, participants viewed the technicians as pleasant, compassionate, and gentle, which aided their comfort level during the procedure. Personal responsibility and religion were motivating factors for undergoing a mammogram. One participant reported, “I want to keep myself in good health; stay on top of things. God has given doctors the technology to help us. How can I say I love God and I won’t take care of myself?” Barriers that prevented mammography screening included lack of insurance and a primary care physician. Familial history of cancer revealed some interesting themes. Participants reported that having a family member with cancer did not necessarily influence their decision to have a mammogram. When asked if religion influences their decision to have a mammogram, one participant stated, “God gives us wisdom to protect your body. I’d much rather know in advance so you keep track of it...nip it in the bud...” Another participant stated “...according to what God says we are obligated...we are created in his image, his likeness...we must do what we can to protect that...our responsibility...mammograms are our responsibility...our duty...You have to do you part: God, yourself, and the doctors all work together”.

4.3 Comparison of Quantitative and Qualitative Results

Results reveal participants viewed more barriers and fewer benefits of mammograms when compared to the results of the quantitative study. Participants reported barriers such as discomfort, lack of insurance, and lack of primary care physician as obstacles to mammography screening. Benefits to mammography screening included the positive behavior of the technicians and prevention. Participants viewed less breast cancer susceptibility and were less fearful when compared to the quantitative study. There was a negative relationship between spirituality/religiosity and fatalism in the quantitative study that was not supported by the qualitative results.

Conclusions

Preliminary results revealed themes that suggested personal responsibility and religious influences were
motivating factors for having a mammogram rather than family history. Participants discussed the need to keep oneself in good health as God would want. When comparing quantitative and qualitative results, the qualitative findings included perceptions of more barriers and fewer benefits of mammography screening in addition to the impact of personal responsibility and spirituality on fatalism. Susceptibility and fear require further analysis as the negative relationship was not supported.

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References
Online Vs. Group Teaching and Patient Compliance in Adolescents with Type I Diabetes

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Abstract —This evidence-based practice project was performed to determine best practice for teaching adolescents with Type I diabetes. Specifically, the purpose of this clinical project was to compare the use of Internet education and group education in managing Type I diabetes in adolescents. The clinical question was: In adolescents with Type I diabetes, does Internet education or Group Education improve patient compliance with healthy lifestyle and blood glucose control? Four studies were reviewed including one Level II experimental study, two Level III quasi-experimental studies, and one Level VI qualitative study. Other evidence was obtained from interviews with two nursing professionals and the Cochrane Database. The nursing research literature revealed that there was not an extensive knowledge base regarding this topic. Based on this, the Cochrane Review and professional nursing interviews, there was no difference found in effectiveness between online and group teaching. The literature and professionals suggested that education programs should be tailored to meet the preferences of the participant; nurses should consider the option of providing both group and Internet-based therapies to manage and teach diabetes care to adolescent patients; and new technology can be used to reach adolescents managing Type 1 diabetes.

Keywords — teaching, adolescents, compliance, Type 1 diabetes

1. Introduction

Diabetes in the adolescent years can be difficult and stressful. This evidence-based practice project was performed to determine best practice for teaching adolescents with Type I diabetes. The purpose of the project was to compare the use of Internet education and group education as it affected patient compliance with recommended healthy lifestyle as evidenced by blood glucose control. The clinical question was, “In adolescents with Type I diabetes, does Internet education or Group Education improve patient compliance with healthy lifestyle and blood glucose control?”

Population: Adolescents with Type I diabetes
Intervention: Internet education
Comparison: Group education
Outcome: Blood glucose control

2. Method

Four research studies were reviewed. The first was designed to determine whether an Internet intervention aided in the management of diabetes in adolescents. The second studied the effects of group interventions on HbA1c levels while the third measured the effect of a group educational program given on a schooner on attitudes about diabetes and self-care behaviors. The final study was a qualitative phenomenological study of parents' experiences supporting self-management in their adolescents. In addition, two professional nurse diabetes educators were interviewed and the Cochrane Database was searched.

3. Findings

3.1 Findings in the Nursing Research Literature

The review of the nursing research literature revealed that there was not an extensive knowledge base regarding this topic. The nursing research articles found included one Level II experimental, two Level III quasi-experimental studies, and one Level VI qualitative study. The purpose of the longitudinal experimental study by Mulvaney, Rothman, Osborn, Lybarger, Dietrich, and Wallston (2011) was to identify an Internet intervention that aids in the management of diabetes in adolescents. The evidence supported the use of the Internet intervention, although it was supported more strongly in girls than in boys. In one quasi-experimental study the researchers studied the effects of group interventions on HbA1c levels. The female participants showed a significant decrease in HbA1c levels while males did not show a significant decline (Loding, Wold, & Skavhaug, 2008). A second quasi-experimental study was conducted on the effect of a group educational program given on a schooner on attitudes about diabetes and self-care behaviors (Viklund, Rudberg, & Wikblad, 2007). Participants in the group used insulin pumps more and felt less helpless about having diabetes. HbA1C levels were not shown to improve; therefore, one cannot
conclusively determine whether the changes were the result of the intervention or preexisting differences of higher self-esteem, better social network, and more frequent glucose monitoring in participants compared to non-participants between the two groups. A qualitative phenomenological study by Dashiff, Riley, Abdullatif, and Moreland (2011) of parents’ experiences supporting self-management found that negative experiences resulted in poor blood glucose control for the adolescents. The researchers stated that “transitioning care to a middle-adolescent with type I diabetes mellitus is a delicate balancing act for a parent that involves promoting self-management, without competing with an adolescent’s need for autonomy.” Negative experiences, including “nagging” from parents, resulted in poor blood glucose control for the adolescents. While the parent needs to guide the adolescent and promote self-management, the parent needs to also allow the adolescent to be independent for effective blood glucose management (Dashiff, Riley, Abdullatif, and Moreland, 2011).

3.2. Professional Nursing Interviews

Three questions were asked of two nursing professionals, both of whom work closely with adolescents with Type I diabetes:

1. What do you think is the best way to teach children/adolescents about diabetes management?
2. Have you had any experience with online interventions for diabetes management in children/adolescents? If so, was it an effective teaching method?
3. Have you ever taught diabetes education in a group setting? If so, was it an effective teaching method?

The first nurse stated that “individual teaching is always the best;” on-line interventions are becoming more popular and can be effective; “group settings are great for pump training, nutrition and carbohydrate counting;” and groups are good for families and children (B. Weir, personal communication). The second reported that technology is the most effective teaching method for adolescents; text messaging can also be used and is successful; group settings are the best way to educate diabetics; and people learn from each other and can relate to each other (K. Pickett, personal communication).

3.4 Cochrane Review Findings

A Cochrane Review article was by Renders, Valk, Griffin, Wagner, van Eijk, and Assendelft (2000) discussed interventions to improve the management of diabetes mellitus in primary care, outpatient and community settings. The authors concluded that interventions should include:

- holistic care, using a combination of therapies;
- interventions that require the accountability of the patient;
- patient-centered care; and
- education and assistance by nurses in managing care.

Conclusions

The review of the literature revealed that there was not an extensive knowledge base regarding this topic. Based on the nursing research articles reviewed, Cochrane Review and professional nursing interviews the group concluded that there was no difference in effectiveness between online and group teaching. The literature and professionals suggested that education programs should be tailored to meet the preferences of the participant; nurses should consider the option of providing both group and Internet-based therapies to manage and teach diabetes care to adolescent patients; and new technology can be used to reach adolescents managing type 1 diabetes. In essence, group education can be effective in certain settings or topics; however individualizing care that is catered to the needs of each patient is essential when caring for adolescents with Type I diabetes.

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References


Actions Ontology System for Action Rules Discovery in Mammographic Mass Data

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Abstract — Actionable knowledge is a golden nugget within the data mining research field. Action rules describe possible transitions of objects in an information system — from one state to another more desirable state, with respect to a distinguished attribute. In this paper we propose an improved method for generating action rules by incorporating an additional ontology layer on top of the information system. It contains nodes of higher-level actions knowledge, which are linked with individual terms at the lower levels. The system shows the likely changes within classification attributes, with respect to a decision attribute of our interest. We experiment with Mammographic Mass DataSet in attempts to reclassify tumors from malignant to benign. In addition to medical domain, application areas include financial, and industrial domains.

Keywords  — actionable knowledge, action rules, ontology, mammography

1. Introduction

An action rule is a rule extracted from a decision system that describes a possible transition of objects from one state to another with respect to a distinguished attribute called a decision attribute (Ras and Wieczorkowska, 2000). We assume that attributes used to describe objects in a decision system are partitioned into stable and flexible. Values of flexible attributes can be changed. This change can be influenced and controlled by users. Action rules mining initially was based on comparing profiles of two groups of targeted objects — those that are desirable and those that are undesirable (Ras and Wieczorkowska, 2000). An action rule was defined as a term \((\omega \land (a \rightarrow \beta)) \Rightarrow (p \rightarrow q)\), where \(\omega\) is a conjunction of fixed condition features shared by both groups, \((a \rightarrow \beta)\) represents proposed changes in values of flexible features, and \((p \rightarrow q)\) is a desired effect of the action. The discovered knowledge provides an insight of how values of some attributes need to be changed so the undesirable objects can be shifted to a desirable group. How to identify an action which triggers the desired changes of flexible attributes and which is not described by values of attributes listed in the decision system is a difficult problem. In this paper, we propose locating such actions in an ontology (Mizoguchi, 2003) layer. We therefore call this layer - actions ontology.

Clearly, there has to be a link between the actions and the changes they trigger within the values of flexible attributes in the decision system. Such link can be provided either by an ontology (Mizoguchi, 2003) or by a mapping/linking actions with changes of attributes values used in the decision system. For example, one would like to find a way to improve his or her salary from a low-income to a high-income. Another example in business area is when an owner would like to improve his or her company’s profits by going from a high-cost, low-income business to a low-cost, high-income business. Action rules tell us what changes within flexible attributes are needed to achieve that goal.

2. Previous Work

Action rules have been introduced in (Ras and Wieczorkowska, 2000) and investigated further in (Tsay and Ras, 2006), and (Ras et al., 2005). Paper (He et al., 2005) was probably the first attempt towards formally introducing the problem of mining action rules without pre-existing classification rules. Authors explicitly formulate it as a search problem in a support-confidence-cost framework.

3. Action Rules

Let \(S = (X, At, V)\) be an information system, where \(V = \cup \{V_a : a \in At\}\). By an atomic action set we mean an expression \((a, a_1 \rightarrow a_2)\), where \(a\) is an attribute and \(a_1, a_2 \in V_a\). If \(a_1 = a_2\), then \(a\) is called stable on \(a_1\). Instead of \((a, a, a_1 \rightarrow a_2)\), we often write \((a, a)\) for any \(a_1, a_2 \in V_a\).

Consider several actions, denoted \(A_1, A_2, …, A_n\). An action can influence the values of classification attributes in \(At\). We assume here that \(At = \{d\} = At_1 \cup At_2 \cup … \cup At_m\). The influence of these actions on classification attributes in \(At\) is specified by the actions ontology.

Expressions \((a, a_1), (b, b_2), (c, c_1 \rightarrow c_2), (d, d_1 \rightarrow d_2)\) are examples of atomic action sets.
Expression \((c, c_i \rightarrow c_j)\) means that the value of attribute \(c\) is changed from \(c_i\) to \(c_j\). Expression \((a, a_j)\) means that the value \(a_j\) of attribute \(a\) remains unchanged. Expression \(r = [(a, a_j) \land (c, c_i \rightarrow c_j)] \Rightarrow (d, d_i \rightarrow d_j)\) is an example of an action rule. The rule says that if value \(a_j\) remains unchanged and value \(c\) changes from \(c_i\) to \(c_j\), then it is expected that the value \(d\) will change from \(d_i\) to \(d_j\). We recall that \(d\) is the distinguished (decision) attribute, which the user is interested in. We extract candidate action rules by using algorithm ARD (Ras and Dardzinska, 2008).

4. Action Rules Discovery through Actions Ontology

An ontology (Mizoguchi, 2003), which is a system of fundamental concepts, that is, a system of background knowledge of any knowledge base, explicates the conceptualization of the target world and provides us with a solid foundation on which we can build sharable knowledge bases for wider usability than that of a conventional knowledge base. From knowledge-based systems point of view, it is defined as “a theory(system) of concepts/vocabulary used as building blocks of an information processing system” by Mizoguchi (2003). Ontologies are agreements about shared conceptualizations. A very simple case would be a type hierarchy, specifying classes and their subsumption relationships.

Actions ontology associated with \(S\) is used to identify which candidate action rules, extracted by the algorithm ARD (Ras and Dardzinska, 2008), are valid with respect to our actions and hidden correlations between classification attributes and the decision attribute.

5. Experiment

We conduct an experiment with a Mammographic Mass Data Set, donated by Prof. Dr. Rüdiger Schulz-Wendtland, Institute of Radiology, Gynaecological Radiology, University Erlangen-Nuremberg, Erlangen, Germany (Frank and Asuncion, 2010).

Mammography is the most effective method for breast cancer screening available today. This data set is used to predict the severity (benign or malignant) of a mammographic mass lesion from BI-RADS attributes and the patient’s age. It contains a BI-RADS assessment, the patient’s age and three BI-RADS attributes together with the ground truth (the severity field) for 516 benign and 445 malignant masses that have been identified on full field digital mammograms collected at the Institute of Radiology of the University Erlangen-Nuremberg. The dataset contains 961 instances, and has 6 attributes (1 goal field, 1 non-predictive, 4 predictive attributes).

We extract action rules on the Mammographic Mass Data Set. We designate as flexible – attributes: 3. Shape; 4. Margin; and 5. Density; assuming that we have control over changing the values of these lesion properties. In other words, we have certain treatment or drugs available to be able to alter them. We designate as stable – attribute 2. Age; because we are unable to change the age of a patient. We designate attribute 6. Severity - as our decision (class) attribute. In this way, the action rules we extract suggest changes in flexible attributes, in order to re-classify a mammographic mass lesion from class: malignant to class: benign.

By using algorithm ARD (Ras and Dardzinska, 2008), we obtain 64 action rules. Several are listed below.

Action Rules:

\[
\begin{align*}
\text{r1} & \quad (5 \rightarrow 1) \Rightarrow (1 \rightarrow 0) \quad \text{sup=114} \quad \text{conf= 74.19673751853682} \\
\text{r2} & \quad (4 \rightarrow 1) (4 \rightarrow 2) \Rightarrow (1 \rightarrow 0) \quad \text{sup= 93} \quad \text{conf= 74.35459261519682} \\
\text{r3} & \quad (4 \rightarrow 1) (4 \rightarrow 2) \Rightarrow (1 \rightarrow 0) \quad \text{sup= 149} \quad \text{conf= 70.11135057471263} \\
\text{r4} & \quad (4 \rightarrow 1) (4 \rightarrow 2) \Rightarrow (1 \rightarrow 0) \quad \text{sup= 93} \quad \text{conf= 74.35459261519682}
\end{align*}
\]

To clarify, let us consider for example, action rule 4 above. By \(r4 = \text{Margin}(5 \rightarrow 1) \& \text{Shape}(4 \rightarrow 2) \Rightarrow \text{Class}(1 \rightarrow 0)\) we mean that: IF Margin is changed from value 5 (spiculated) to -> value 1 (circumscribed) AND Shape is changed from 4 (irregular) to -> 2 (oval) THEN class of tumor (severity) is changed from 1(malignant) to -> 0 (benign). The support of this action rule is = 93 instances in the dataset, and our confidence in this rule is = 74%.

Based on the rest of the action rules above, the following are desirable influences \(I_{ij}\) we would like to have on objects in the system \(S\):

\[
\begin{align*}
I_1 & : \text{A change in the margin from spiculated to circumscribed} \\
I_2 & : \text{A change in the margin from spiculated to circumscribed AND a change in shape from irregular to oval} \\
I_3 & : \text{A change in the margin from spiculated to circumscribed AND a change in shape from irregular to round}
\end{align*}
\]
The actions we are willing or able to undertake, in order to trigger these desired influences on the tumors (objects) are defined or specified by experts; assuming that we have control over changing the values of these lesion properties. For example, action $A_1$ may involve administering certain treatment; action $A_2$ may be to take particular drug. These actions, along with the changes they trigger within the flexible (classification) attributes are included in an Ontology Layer placed on top of the DataSet, resulting in an intelligent Mammographic Mass Information System.

Conclusions

We have introduced an ontology based information system, which is a couple consisting of: the information system $S$, and the ontology $O$. The ontology contains the actions, and the influence $I_{i,j}$ they have on $S$. Actions ontology is used as a postprocessing tool in action rules discovery. The influence $I_{i,j}$ shows the correlations among classification attributes triggered off by actions. If the candidate action rules are not in agreement with the actions, then they are not classified as action rules. However, if the actions ontology does not show all the interactions between classification attributes, then still some of the resulting action rules may fail when tested on real data. We have applied the proposed system to a Mammographic Mass DataSet. We discoverd 64 action rules, and associated actions suggesting ways to re-classify tumors from class: malignant to class: benign. The proposed system can be applied with other medical datasets, such as: diabetes or heart disease; as well as financial, and industrial data.

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References


Ontology Database System and Triggers

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Abstract — An ontology database system is a basic relational database management system that models an ontology plus its instances. To reason over the transitive closure of instances in the subsumption hierarchy, an ontology database can either unfold views at query time or propagate assertions using triggers at load time. In this paper, we present a method to embed ontology knowledge into a relational database through triggers. We demonstrate that by forward computing inferences, we improve query time. We find that: first, ontology database systems scale well for small and medium sized ontologies; and second, ontology database systems are able to answer ontology-based queries deductively; We apply this method to a Glass Identification Ontology, and discuss applications in Neuroscience.

Keywords — ontology, relational database, query

1. Introduction

Researchers are using Semantic Web ontologies extensively in intelligent information systems to annotate their data, to drive decision-support systems, to integrate data, and to perform natural language processing and information extraction. Researchers in biomedicine use ontologies heavily to annotate their data and to drive decision support systems that translate to applications in clinical practice (Shah et al., 2009).

An ontology defines terms and specifies relationships among them, forming a logical specification of the semantics of some domain. As such, they offer the promise of facilitated information sharing, data fusion and exchange among many, distributed and possibly heterogeneous data sources.

However, the uninitiated often find that applying these technologies to existing data can be challenging and expensive. What makes this work challenging in part is: to have systems that handle basic reasoning over the relationships in an ontology in a simple manner, that scales well to large data sets. In other words, we need the capabilities of an efficient, large-scale knowledge-based system (such as Semantic Web Ontology), but we want a solution as simple as managing a regular relational database system, such as MySQL. We argue that: when used in the proper context, regular databases can behave like efficient, deductive systems.

In this paper, we present an easy method for users to manage an ontology plus its instances with an off-the-shelf database management system like MySQL, through triggers. We call these sorts of databases "ontology databases".

2. Related Work

Knowledge-based systems (KBs) use a knowledge representation framework, having an underlying logical formalism (a language), together with inference engines to deductively reason over a given set of knowledge. Users can tell statements to the KB and ask it queries (LePendu et al., 2009). Reasoning - researchers in logic and databases have contributed to the rich theory of deductive database systems (Gallaire and Nicolas, 1990). Researchers are studying how to bring database theory into the Semantic Web (Motik et al., 2007), but more work is needed in that regard.

3. Ontology Database System

We can perform rudimentary, rule-based reasoning using either views or triggers. For example, suppose we assert the statement (a rule): All sisters are siblings. Then we assert the fact: Mary and Jane are sisters. Logically, we may deduce using modus ponens (MP) that Mary (M) and Jane (J) are siblings. The notation \( \{x/M, y/J\} \) denotes that the variable x gets substituted with M, y with J, and so on, as part of the unification process.

If sibling and sister facts are stored in two-column tables, then we can encode the rule as the following SQL trigger:

```
CREATE TRIGGER subproperty_sisters_siblings
ON INSERT (x, y) INTO sisters
FIRST INSERT (x, y) INTO siblings
```

The deduction is reflected in the answer a query such as Who are the siblings of Jane?. The answer returned, in both cases, is: Mary. We use the decomposition storage model (Abadi et al., 2009), because it scales well and makes expressing queries easy. Arbitrary models result in expensive and complicated query rewriting, so we would not consider them. We view the decomposition storage...
model as a fully partitioned vertical storage model, where the single table is completely partitioned along every type and every predicate. In other words: each type and each predicate gets its own table. When taken to this extreme, query rewriting becomes simple, because each table corresponds directly to a query predicate.

Subsumption - ontology engineers often specify subclass relationships in Semantic Web ontologies, which form a subsumption hierarchy. We implement subsumption through triggers.

Domain and Range Restrictions - another important feature of Semantic Web ontologies are domain and range restrictions. These restrict the possible set of instances that participate in property assertions. For example, Only person(s) may participate in the sisters relationship. Restrictions are formalized using modal logic. They correspond to integrity constraints.

```
CREATE TABLE Sisters(
  subject VARCHAR NOT NULL,
  object VARCHAR NOT NULL,
  CONSTRAINT fk-Sisters-Subject-Person
  FOREIGN KEY (subject)
  REFERENCES Person(id) ...)
```

4. Experiment

We apply our proposed trigger-based ontology database system method to a Glass IdentificationOntology. Next, we discuss its application for a Neural ElectroMagnetic Ontology.

4.1 Glass Identification Ontology

The Glass Identification Dataset (Frank and Asuncion, 2010) is donated by the Central Research Establishment, Home Office Forensic Science Service, Reading, Berkshire, England. The study of classification of types of glass was originally motivated by criminological investigation. At the scene of the crime, the glass left can be used as evidence, if it is correctly identified.

Applying the decomposition storage model (Abadi et al., 2009), we obtained a table for each glass type, i.e. FloatProcessedBuildingWindow, BuildingWindow, Glass, Container, and so on. We implement the subclass relationships in Glass Ontology, which form a subsumption hierarchy, through triggers. We implement domain and range restrictions as foreign key constraints. These restrict the possible set of instances that participate in property assertions. For example, Only Windows may participate in the Glass - BuildingWindow relationship. Restrictions correspond to integrity constraints. Evaluation shows that the proposed trigger method increases the disk space required by roughly three times. In other words, our proposed method improves query speed, by costing more space. The proposed approach scales well to very large datasets, and medium-sized ontologies.

4.2 Neural ElectroMagnetic Ontology

Our ontology database system can be applied to a Neural ElectroMagnetic Ontology (NEMO) (Dou et al., 2007). NEMO records experimental measurements from brainwave studies, which classify, label, and annotate event related potentials (ERP) using ontological terms.

We show that our proposed method is useful for answering queries that take subsumption into account - answering queries deductively. In other words, we are able to answer Ontology-Based Queries. For example, the following query requires taking the subsumption hierarchy into account:

```
Return all data instances that belong to ERP patter classes, which have a surface positivity over frontal regions of interest and are earlier than the N400.
```

Preliminary results indicate that neuroscientists are attracted by the ability to pose queries at the conceptual level, without having to formulate SQL queries; which, would require taking complex logical interactions and reasoning aspects into consideration. Those high-level, logical interactions are modeled only once by specifying the ontology.

Conclusions

We present an ontology database system, a tool for modeling ontologies plus large numbers of instances using off-the-shelf database management systems such as MySQL. An ontology database system is useful for answering ontology-based, scientific queries that require taking the subsumption hierarchy and other constraints into account (answering queries deductively). Furthermore, our trigger implementation method scales well with small and medium-sized ontologies, used with very large datasets.

The proposed method pre-computes inferences for the subsumption hierarchy, so larger and deeper ontologies will incur more costly up-front penalties. However, the query answering time is significantly improved at the end.

Mapping rules between ontologies also can be implemented as trigger-rules, giving us an efficient and scalable way to exchange data among a distributed ontology database systems.
With Ontology Database Systems, it is possible to integrate two knowledge bases. The key idea is to map ontology terms together, then to reason over them as a whole, which comprises a merged ontology. As a direction for the future with this work, we can perform ontology-based integration for relational databases.

References


Cloud Computing Framework

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Abstract — Cloud computing is now a major part of communication between end systems that has the potential to solve many of the distributed computing related issues. While academia and industry are finding ways to levy cloud computing power to increase the data processing capability of an organization, while decreasing the financial burden associated with data processing; however, there are no cloud computing systems that can be used to teach cloud computing concepts. We present a cloud computing framework that can be used to teach cloud computing concepts. We provide some initial results from an implementation of our framework that shows that our cloud framework is robust.

Keywords — cloud computing, distributed computing, cloud computing services, cloud computing framework

1. Introduction

Cloud computing has appeared to be, as many previous computing concepts, a solution to all computing issues. That is, using the cloud to either store data (e.g., Google Drive) or as a data processing system alternative (e.g., enterprise resource processing system), cloud computing can be an invaluable resource for the business computing. Businesses can use the cloud to gain access to various services instead of purchasing hardware and software; the organization can rent the services that they need instead of purchasing a service and thereby saving money and valuable resources [3]. While one may think that cloud computing would eliminate jobs in companies this may not be the case. There will be a need for persons with skills o either manage the service within the organization (i.e., Service User) as well as persons with the skills to develop and manage the cloud (i.e., Service Provider). In fact, cloud computing may be a catalyst in some organizations in which a subsidiary company is formed as a result of the cloud service (e.g., AT&T).

Then there are the normal data processing issues such security, privacy, data processing, performance, and so forth that are compounded by the cloud. These issues are can be seen as opportunities for academia and industry. That is, students and employees who have skills in cloud computing concepts (e.g., usage, implementation, and development) will be in demand.

We present a cloud computing framework that can be used in academia and industry to teach and/or conduct research in cloud computing. Our framework is based on the Simple XML Messaging Framework (SimpleXM) [2]. SimpleXM exchanges messages by using email to transmit data as XML messages. SimpleXM uses two types of messages: Request Message and Reply Message. Similar to SimpleXM, our framework encodes messages using XML. Our framework is developed using Java, which allows the framework to run on multiple platforms (e.g., Unix, Windows, MAC, OS390) thereby allowing machines running on different platform to conduct research across platforms. Our framework includes encryption to secure messages that are being transmitted to and from the cloud. We also present some results from an initial implementation of the framework that show our cloud framework is robust and secure.

2. Cloud Framework

The cloud framework is based on a Simple XML Messaging Framework (SimpleXM) [2]. SimpleXM exchanges messages by using email to transmit data as XML Messages. SimpleXM uses two types of messages: Request Message and Reply Message. Our framework uses the notion of a Request and Reply Message. Furthermore, we do not use email to transmit messages; we use sockets for our communication channels.

The cloud framework consists of three components: Cloud Supervisor (CloudSuper), Cloud Service Provider (CloudSP), and Cloud User (CloudU). See Figure 1. The CloudSuper manages the services provided by the cloud. CloudSP represents the services that are offered by the cloud. These services can be running on the same machine or different machines. The CloudU represents the users of the cloud. To use the cloud (CloudU) or to provide services in the cloud (CloudSP), a unique identification number must be assigned. These identifications are provided by way of either the GenerateUserId or the GenerateUserld.
GenerateServiceProvderId services, respectively. Our framework is developed in Java 7 and uses Triple Data Encryption Algorithm (Triple DES) encryption to encrypt messages that are exchanged between the CloudU and the CloudSP. Triple DES encryption is implemented in Java by using the Bouncy Castle Crypto API [1].

The CloudU decrypts the EReply message to produce the Reply message.

We ran this same experiment with each of the five CloudU machine submitting multiple request messages at the same time to the CloudS. We ran four experiments in which all five machines submitted 25, 50, 75, and 100 Request messages, respectively.

3.2 Empirical Results

Figures 1, 2, 3, and 4 show the runtime for each experiment. In each graph, there appears to be some instances where several machines take a little more time to process a message. This could be the result of some threads taking additional time to start back running or the machine could be involved in processing system requests. Overall, the running time appears to level off at a consistent execution interval in each experiment. This occurs as the number of messages increase, which provides evidence that our framework is robust. Clearly, the framework encryption is working correctly as the messages are successfully processed by the CloudU and CloudSP components.

3. Experiment

3.1 Overview

Two students did an independent study in which they implemented a prototype of the cloud framework that ran the GenerateUserId service. That is, the CloudU requests a user id to use the services offered by the cloud. The experiment that was conducted uses five machines to represent five CloudU’s. A sixth machine was used to represent the CloudSP. The students’ goal is to test 1) the security of the messages (i.e., encryption and decryption of request/reply messages) and 2) the robustness of the framework.

The experiment has a CloudU to generate a Request message that has an average size of 2284 bytes. We encrypt this message to produce an Encrypted Request (ERequest) message that has an average size of 2289 bytes. The ERequest message is transmitted to the CloudSP. The CloudSP decrypts the ERequest message and then processes the request using the GenerateUserId service. Then, CloudSP generates a Reply message that includes the Request message and the output information from GenerateUserId service, i.e., cloud id and miscellaneous system information. The Reply message has an average size of 3162 bytes. The Reply message is then encrypted to produce an Encrypted Reply (EReply) message which has an average size of 3168 bytes. The EReply message is then transmitted to the CloudU.
4. Conclusions

We have presented a cloud framework that was developed via two independent studies. We have presented an implementation of the cloud that provides evidence that the cloud framework is robust and successfully encrypts the messages that are processed in the cloud.

Future works include a full implementation of this framework. We also plan to use this framework to implement Web Services. Additional experiments will be conducted using more machines as well as a higher number of messages.

References


Abstract — This project investigated the correlation between the implicit associations of homosexuality and self-reported attitudes. The effects of priming on manipulation of implicit associations was also investigated. An implicit association is a cognitive relationship between two ideas (e.g., good and homosexuality) that operates without a person’s intention or control. The Implicit Association Test (IAT) measures how strongly a person associates certain categories on an unconscious level. IAT is commonly used to identify a person’s subconscious bias or possible bias he/she may not be willing to admit publicly. Our subjects received positive, control, and negative primes before taking an IAT about homosexuality. Our results showed that priming influenced the implicit associations in the predicted direction, i.e. participants who received negative prime showed more negative associations whereas those who received positive primes showed more positive associations. We also observed that self-reported explicit attitudes were greatly underestimated when compared with the measured implicit association. Here we also report a negative correlation between the education level of the participants and antigay bias measured by the IAT (i.e., participants with lower education levels had the greatest amount of bias). Our research suggests that priming may influence people’s attitudes. We also show that the participants either underestimated (i.e., self-deception) or under reported (i.e., other-deception) their degree of negative gay attitudes.

Keywords — IAT, social desirability, bias, attitudes toward homosexuality, priming

1. Introduction

Gay rights and same sex marriage are significant social issues in the United States today. The gay community often reports being stigmatized by the general population, whereas the general population reports increasingly positive attitudes towards gays even when it is against their religious beliefs. With our research we measured if implicit associations of homosexuality correlate with these self-reported attitudes. An implicit association is a cognitive relationship between two ideas (e.g., good and homosexuality) that operates without a person’s intention or control (1). According to social scientists, almost everybody has negative stereotypes and prejudice. Even those who believe strongly that they treat people as equals may have some hidden biases that influence his/her actions (2). Anthony Greenwald, Debbie McGhee, and Jordan Schwartz created a testing procedure used to determine unexpressed attitudes of certain groups (3). This test is referred to as the Implicit Association Test (IAT). The test measures the strength with which a person associates certain categories on an unconscious level. The IAT has been shown to identify a person’s subconscious bias or possible bias he/she may not be willing to admit publicly (4). This test uses one’s reaction time to certain groupings and the reaction times are then compared to determine that person’s bias. Faster reaction times are assumed to reflect stronger implicit associations; likewise, slower reaction times are assumed to reflect weaker implicit associations (3).

Previous research (3) has shown that on socially neutral topics (e.g., Coke vs. Pepsi, flowers vs. birds), the IAT produces results that highly correlated with explicit attitudes on those topics. However, the IAT results often deviate from explicit attitudes when it comes to socially sensitive topics (e.g., blacks vs. whites, Christians vs. Muslims). This deviation between implicit and explicit measures is likely due to social desirability bias, which is the finding that when people self-report they often present inaccurate data on sensitive topics (i.e., to present themselves in the best possible light). Inaccurate reporting can be a result of either self-deception or other-deception (5). Measuring implicit associations minimizes data skewing that result from self or other deceptions.

Implicit associations are thought to develop due to your personal experiences. Even though these associations take years to develop, priming, an experimental technique has been shown to modulate these associations for a short period. Priming is the presentation of a stimulus that increases a subconscious sensitivity toward a certain subject resulting in a change of behavior or cognition (i.e., implicit associations). Because priming is understood to occur subconsciously, it relies on implicit associations and has been found to influence a person’s decision making (6). Priming studies can create a social analog of exposure to media, cultural values, beliefs, and attitudes (7).
individuals who are primed, researchers can test for the competing influences (8). In this paper we report the effects of negative and positive priming on implicit associations of homosexuality.

2. Method

2.1 Participants

A total of 60 people were tested. There were twenty people in each priming group, 10 males and 10 females. The age of the participants ranged between 18-67. The participants represented a variety of ethnicities and educational background. Each participant signed an Informed Consent form before taking the test.

2.2 Materials

A survey that asked questions regarding demographic information (e.g., age, religion, etc.) and attitudes towards homosexuality was used. Also, there were three priming paragraphs (one for each condition) that reported either positive, neutral, or negative information concerning homosexuality. Finally, a laptop computer that used IAT software was used.

2.3 Procedure

After filling out the informed consent form, participants were assigned to one of three conditions: Positive, Neutral, or Negative. For all three conditions, participants were asked to read two short paragraphs. The paragraphs contained either positive, neutral, or negative statistics about homosexuality, depending on the group. After reading the prime specific to their group, the participants were trained on how to take an IAT. The test required the participants to match a given probe which contained either a word or a picture with its correct category. For example, Figure 1 (left panel) illustrates one of the training phases for the IAT and the correct choice would be to choose “d” on the keyboard. Figure 1 (right panel) illustrates another training phase in which “k” would be the correct choice.

The testing IAT trials are illustrated in Figure 2 in which the previously trained categorization tasks were combined. For example, in the left panel good and gay are paired with the same response key (i.e., d) while bad and straight are paired with the same key (i.e., k). In the left panel, “d” is the correct answer since nice is a good word and in the right panel, “k” is the correct answer since the picture depicts a gay couple. Within the testing phases, the pairing of good and gay or good and straight was randomly determined, but in a later phase, the pairing was reversed so that all participants were presented with an equal number of good/gay and good/straight pairings.

3. Results

Collapsing across all conditions, 77% of the participants showed negative implicit bias towards gays and lesbians (Figure 3a). Yet, according to self-reported explicit attitudes, only 10% of the participants reported anti-gay attitudes (Figure 3b).

The effects of the priming stimuli are shown in Figure 4. Although the trend indicates that the more positive the prime, the less negative implicit bias, the conditions were not significantly different ($F(2,57) = 0.74, p = .48$).

As mentioned above, very few participants explicitly stated that they had a negative attitude towards homosexuals, yet the vast majority of the participants did have a negative anti-homosexual bias when measured with the IAT. Although these results may seem to be inconsistent with each other, Figure 5 suggests otherwise. When the participants were broken down into categories from their explicit ratings, there is a clear relationship with the IAT scores. Those participants who stated the most negative gay attitudes did have the greatest amount of negative, implicit bias, followed by the neutral and positive explicit ratings, respectively.

Finally, we found a relationship between the participants’ education level and the degree of negative gay implicit bias: The greater the education level, the less negative bias the participant displayed (see Figure 6).

4. Conclusions

The relationship between the presented prime and IAT results may show that media can have a powerful effect on people’s perceptions. Even though our experiments were focused on implicit associations towards same-sex couples, this principle can be applied to many different topics that are prevalent in society. Our research shows that the types of materials individuals are exposed to may shape their worldview and their behavior. Our results that the participants either underestimated (i.e., self-deception) or under reported (i.e., other-deception) their degree of negative gay attitudes. Similar findings have been observed in other studies such as studies with white participants and their attitudes regarding race (9).
and to the general population regarding gay rights (10).

The positive association between educational attainment and socially tolerant attitudes has been a controversial topic in social psychology. Whereas some social psychologists propose that education increases socially tolerant attitudes, others argue that this association is superficial. The first group of researchers supports the theory that education alters individuals’ beliefs and attitudes toward nonconformist, nontraditional, or out-group individuals. The second group argues that rather than truly being liberalized, well-educated respondents conceal their undesirable attitudes for social approval. These researchers claim, education teaches individuals the dominant social norms, and applies social pressures for conformity (11). Our results support the liberalizing effect of education on socially tolerant since the highest education group had minimal anti-gay implicit associations.

For future experimentation, we believe it is important to find techniques that can have a long term effect. The effects of priming are relatively short lived. One possibility is for participants to have several, repeated presentations of the priming stimulus.

Acknowledgements

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References

4. Project Implicit: https://implicit.harvard.edu/implicit
Figure 1. Two training phases of the IAT are shown. In one phase, participants categorized pictures as straight or gay and in the other, they categorized words as good or bad.

Figure 2. The critical testing phase in which good/gay or good/straight were paired with the same response key is shown. Half of the participants started with good and gay for the same response and the reverse is true for the other half. Further, these pairings were reversed for each participant in later phases.

Figure 3. a. IAT results from all participants show an overall anti-gay bias. Approximately, 23% of the participants showed pro-gay bias ($t(59) = -4.48, p < .001$). b. Participants reported mostly positive explicit attitudes towards gays ($t(59) = 6.21, p < .001$).
Figure 4. The degree of anti-gay bias as measured with the IAT is shown as a function of the priming condition.

Figure 5. We found a significant relationship between the explicit attitudes and IAT scores ($F(2, 57) = 3.70, p = .031$). People who reported low tolerance towards gays and lesbians showed higher level of bias in the IAT.

Figure 6. A negative correlation between the highest level of education obtained and implicit bias was observed. Regardless of the reported explicit attitudes PhDs/MDs showed the lowest level of implicit bias ($F(3,56) = 3.17, p = .031$).
Treating Depression in Children: Is Talking About it Enough?
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Abstract — Caretakers are the “first line of defense” for recommending effective interventions for children suffering from depression, but will they realize when a problem is serious enough to warrant more than talking to non-professionals? Using a vignette methodology, the present study found that participants were more likely to recommended talking to their spouse or the vignette character than counseling and thought that the problem would more likely recover spontaneously for the 10-versus 22-year-old character.

Keywords — Depression, Children, Young Adults

1. Introduction
Approximately, one in every 22 children (Klerman & Weissman, 1989) and one in every six young adults aged 19 or older (Dopheide, 2006) suffer from depression. We now realize that mental health concerns that were once thought to be exclusive to adulthood, including depression and suicidal behavior, can and do occur much earlier in the lifespan. Therefore, it is important that parents and other caregivers are able to not only recognize signs of depression in younger individuals, but to also pursue appropriate intervention services. This is especially true since children typically are not responsible for their own healthcare needs. While antidepressant medications are one of the most effective and frequently prescribed treatments for depression in adults, there is very little evidence for their effectiveness in children 11 years or younger. Instead, the evidence indicates that both family- and individually-based counseling are effective interventions for children under 8 years old (Dopheide, 2006). Furthermore, one of the problems faced by those responsible for attending to children’s healthcare needs is that many of the symptoms of depression are similar to the more typical developmental issues faced by children. Therefore, when responding to these childhood concerns, caregivers often rely on less direct methods of intervention including talking to other non-professionals, internet-based research, and seeking advice from pediatricians and other primary care providers (Murphy, 2004).

2. Method and Design
To more closely examine the difficulty in effectively responding to depression in children and young adults, the current study asked participants to role-play the part of a parent of either a 10- or 22-year-old individual, named Sam or Samantha who was described as experiencing a difficult life transition and subsequent depressive symptoms. The symptoms met the DSM-IV criteria for depression (American Psychiatric Association, 1994) and were appropriately characterized for younger individuals. Two different age groups, younger adults (i.e., college students) and middle-aged adults who were mothers read one of four short vignettes. There were slight variations in the vignettes in order to ensure that the descriptions were age appropriate (for example, 10-year-old Sam entering middle school and 22-year-old Sam recently graduated from college). However, the depressive symptoms were identical for all four scenarios. It was expected that participants would rate the severity of the problem described in all four scenarios equivalently. Therefore, there was a 2 (age of character: 10 vs. 22) x 2 (gender of character: male vs. female) x 2 (participant: student vs. mother) factorial design.

3. Hypotheses
Based on findings from previous research, it was hypothesized that talking to a variety of different people about the problem and seeking counseling would be the most likely recommended courses of action. Chea, Garris, Keen, Lehman, & Griffin (2012) found that talking to a friend (originally included as a filler item) and seeking counseling were more often recommended than was drug therapy as interventions for depression in young (aged 26) and elderly (aged 72) adults. Therefore, in the present study, we included additional “talk-based” interventions to determine whether this previous finding would extend to our vignettes.

4. Results
As expected, a 2 x 2 x 2 ANOVA indicated that there were no significant effects on a measure of
problem severity; all participants rated the character’s life transition (regardless of the scenario) as a moderately severe problem ($M = 6.71$). However, on a measure of spontaneous recovery, there was a main effect for character age ($F(1, 181) = 50.87, p = .002$) indicating that participants viewed the problem as more likely to improve on its own for the 10-year-old compared to the 22-year-old ($Ms = 5.42$ vs. $3.47$).

In order to determine whether there were differences in participants’ recommended interventions in response to the problem, a $2$ (character age) x $2$ (character gender) x $2$ (participant) x $9$ (recommended intervention) within-subjects ANOVA was conducted. As expected, participants rated talking to someone and seeking counseling significantly higher than drug therapy.

As can be seen in Figure 1, the results revealed a main effect for recommended intervention ($F(8, 1440) = 87.73, p = .000$), such that participants were most likely to suggest talking to their spouse and talking to the fictional character about the problem, followed by talking to family members and seeking counseling. An internet research-based intervention was the next most likely recommendation, followed by talking to their doctor and talking to friends. Finally, taking antidepressant or sleep medications were the least likely recommended interventions.

As can be seen in Figure 2, the results also indicated a Character Age x Recommended Intervention interaction ($F(8, 1440) = 6.85, p = .000$). Simple $t$-tests indicated that our participants were more likely to recommend talking to their spouse ($t(181) = 2.88, p = .004$), talking to the fictional character ($t(181) = 2.87, p = .005$), and conducting internet research ($t(181) = 3.14, p = .002$) for the 10-year-old compared to the 22-year-old. Alternatively, taking antidepressant ($t(181) = 3.54, p = .001$) and sleep medications ($t(181) = 2.07, p = .04$) were more likely to be recommended for the 22-year-old compared to the 10-year-old. There were no age-based differences for any of the other recommended interventions.

5. Conclusions

As can be seen from our results, the fictional character’s life transition was seen as equally problematic whether the scenario described the problems associated with a 10-year-old’s versus a 22-year-old’s life transition. While our participants may not miss the seriousness of the problem, they were more likely to suggest differential resolutions for the problem based on the age of the individual. Participants viewed the 10-year-old’s problem as more likely to spontaneously recover, suggesting that children’s depressive symptoms may more likely be dismissed as issues that will resolve on their own. It is important to recognize that talking about the problem with others may not be enough and, in doing so, taking that crucial next step to obtaining professional help may be overlooked. For a child, parents and other caretakers are the “first line of defense” for taking action; recommending effective interventions is vital.

References


Figure 1: Main Effect for Recommended Action

\[ F(8, 1440) = 87.73, p = .000 \]

Figure 1. Main effect for likelihood of recommending each course of action.

Figure 2: Character Age x Recommended Action Interaction

\[ F(8, 1440) = 6.85, p = .000 \]

Figure 2. Likelihood of recommending a course of action by the age of the character.
Factors that Lead to the Successful Completion of a College Degree by Individuals With Disabilities

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Abstract – As the number of students with disabilities continues to increase, it is essential that postsecondary institutions provide services that will support them in completing their degrees. The current study explored the skills, services, and accommodations that are assisting students with disabilities successfully earn a college degree. Almost all of the study participants reported that they had accessed services through an office of disability at their institution. They also identified extended time on exams, priority registration, distraction-free testing environments, notetaking assistance, textbooks in accessible formats, and taping of lectures as helpful accommodations.

Keywords – Postsecondary education, disabilities, college students, graduation, accommodations

Introduction

The number of students with disabilities in post-secondary programs has significantly increased over the last two decades. In 1995-96, only 6% of students enrolled in post-secondary institutions identified themselves as having a disability (Henderson, 1995). In contrast, approximately 11% of students enrolled in post-secondary institutions identified themselves as students with disabilities in 2007-2008 (National Center for Education Statistics, 2009). Gender and ethnicity of students with disabilities mirrored the general student population (National Center for Education Statistics, 2009). On the other hand, college students with disabilities tended to be older, and students with disabilities were less likely to be considered full-time students in comparison to their nondisabled peers (National Center for Education Statistics, 2009).

Despite an enrollment increase, many college students with disabilities have not successfully completed their education (Barber, 2012; Barnard-Brak, Lechtenberger, & Lan, 2010; Hadley, 2011; O’Neill, Markward, & French, 2012). Students with disabilities that have dropped out often report a gap in the support and services available to them in post-secondary education programs in comparison to P-12 education programs (Barnard-Brak et al., 2010). The role of students with disabilities in post-secondary education settings changes dramatically from passivity and participation to active responsibility. The students with disabilities must disclose their disability and actively seek out available services when they enroll in post-secondary education programs, whereas in high school, students with disabilities are supported by multidisciplinary teams that monitor the effectiveness of accommodations and ensure the student is successful in their education (Office for Civil Rights, 2011). Some students with disabilities navigate the transition from a passive role to an active role more successfully than other students. Additional barriers to success include: lack of understanding and knowledge by university personnel, students seeking services too late, and reluctance of students to disclose information about their disability (Barnard-Brak et al., 2010).

However, little research has explored the factors and skills that have assisted individuals with disabilities in successfully completing their postsecondary education (Madaus, 2006; Barber, 2012). Last year, a research report published by John J. Heldrich Center for Workforce Development and the Kessler Foundation overviewed the experience of twenty college completers with disabilities (Barber, 2012). All twenty had accessed services from an office of disability or special services. The completers reported that the most important factor associated with success was a personal relationship with a faculty member or a staff member from an office of disability or special services. The completers also believed that understanding their disability gave them the confidence to disclose their disability and advocate for their needs.

2. Purpose

The purpose of this project was to investigate the factors, skills, and services that contribute to the successful completion of a post-secondary education program by individuals with disabilities. The data collected may be useful in assisting public K-12 schools to adequately prepare students with disabilities for higher education. Additionally, this data may expand the existing knowledge base and assist postsecondary institutions in reviewing
and/or expanding current services and training opportunities for students with disabilities.

3. Method

Potential participants were recruited via an email distributed over several listservs for higher education professionals involved in the delivery of services to students with disabilities. Listserv members were asked to forward the information about the study to academically successful students with disabilities that had successfully completed at least one-half of their program of study and were scheduled to graduate on or before May 2014.

The participants were self-selected through voluntary response to the recruitment email. In addition to demographic information, participants were asked to share information about their level of perceived preparedness when they began college, satisfaction with their overall academic experience in college, services and accommodations that have contributed to their success, and why they think they have been successful in college. In the upcoming months, the researchers will lead in-person focus-groups at three University of South Carolina campuses (Union, Aiken, and Columbia) to qualitatively explore why individuals with disabilities preparing to graduate think they have been successful in college, what knowledge and skills could have helped them transition more successfully from high school to postsecondary education, and how they successfully navigated the change in role between P-12 and postsecondary education.

4. Results

As of February 28, 2013, 87 individuals with disabilities from 20 different states had completed the online survey. Seventy (80.4%) elected to complete the demographic portion of the survey. Of the individuals who provided demographic information, 50 (71.4%) of the survey completers were female, and 20 (28.6%) were male. Of the 67 individuals who responded to the question, six (8.96%) attended a two-year institution or community college, and 61 (91.04%) attended a four-year college or university. Sixty-eight participants reported a wide range of disabilities. The three most commonly reported disabilities were learning disabilities (n = 34), attention deficit disorder/attention deficit hyperactivity disorder (n = 21) and physical disabilities (n = 13). Other reported disabilities included: psychiatric disorder (n = 8), health impairment (n = 7), auditory processing disorder (n = 7), speech impairment (n = 6), traumatic brain injury (n = 5), other (n = 5), deafness or hard of hearing (n = 4), blindness or visual impairment (n = 2), autism (n = 2), and prefer not to answer (n = 1). In addition, seven participants reported that they had multiple disabilities.

Participants were asked if they felt adequately prepared when they first entered college. Thirty (35.3%) felt prepared, 12 (14.1%) did not feel prepared, and 43 (50.6%) felt somewhat prepared. Participants who reported that they did not feel adequately prepared were asked what skills or information they were lacking. The most commonly reported missing skills or information were: time management (n = 30; 46.2%), study skills (n = 28; 43.1%), knowledge of how disability affects academic performance (n=27; 41.5%), notetaking skills (n = 25%; 38.5%), and adequate writing skills (n = 22; 33.8%).

The vast majority (n = 70) reported that they had sought accommodations or accessed services from an office of disability during their course of study. The participants reported that they had learned about resources and services available at their school/institution for students with disabilities through a variety of sources, including parents, friends, doctors, high school teachers, college websites, college professors, and guidance counselors. Students were then asked what services and skills contributed to their success in their education. The two most common responses were accessing service/support from an office of disability and self-discipline. Figure 1 highlights other services and skills that were perceived as helpful. Students were then asked which accommodation, if any, was the most helpful. The most common response was extended time on exams (n = 20). Other accommodations reported as the most helpful were distraction-free testing environment (n = 8), tapeing lectures (n = 6), priority or early registration (n = 6), and notetaking assistance (n = 6). Participants also identified additional accommodations that were helpful. The five most commonly identified additional accommodations were extended time for exams (n = 30), priority or early registration (n = 23), distraction-free testing environment (n = 18), notetaking assistance (n = 15), and textbooks in accessible formats (n = 13).
The findings of this project indicate that services and accommodations often provided by an office of disability play an important role in success of students in postsecondary settings. Frequently utilized accommodations such as extended time on examinations and priority registration were identified as very helpful. In addition to ensuring that students with disabilities have adequate skills in core subjects such as mathematics and writing, P-12 schools, colleges, and universities can support student success in postsecondary education settings by teaching key compensatory skills needed to access all areas of the core curriculum such as time management, study skills, and notetaking skills. Students also need to learn how their disability affects their academic performance as well as how to effectively communicate their needs to others and seek the resources they need.

Acknowledgements

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References


Best Practices in Nonprofit Transparency: A Comparative Study of Upstate South Carolina and the United States

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Abstract – Accountability is a cornerstone of successful nonprofit organizations. Although definitions vary, it is often defined as the means by which nonprofit organizations are held responsible for their actions. (Edwards, 1996) Transparency is one core component of accountability. It often involves making information about the nonprofit organization available for public scrutiny. This research study examines the use of transparency by 501c3 nonprofit organizations in Spartanburg, South Carolina and compares that to other nonprofits organizations throughout the United States. The results indicate that 501c3 nonprofit organizations in Spartanburg should better align their transparency reporting to best practices standards.

Keywords – accountability, transparency, nonprofit, best practices

1. Introduction

“Being transparent with relevant information is how nonprofits demonstrate accountability.” (GuideStar, 2009)

Nonprofit organizations have a legal and ethical obligation to be transparent and accountable. (SCANPO, 2007) The more open and trustworthy organizations are, the more they will be viewed by the public, donors, and funders as deserving of their support. Operating in a transparent manner is one of the best ways to develop and maintain trust with the public. The most recent survey by GuideStar USA, Inc. (2009) suggests that a majority of nonprofits in the United States disclose some information on-line but few adhere closely with published best practices. (Gandia, 2011; McCarthy, 2007; Nezhina, 2010; Saxton, 2011). The purpose of this research study is to compare nonprofits in Spartanburg, South Carolina to nonprofits across the United States and make best practice recommendations where appropriate.

2. Methodology

In order to compare best practices in nonprofit transparency between Spartanburg, South Carolina (local) and the United States (national), a sample size of 287 organizations were randomly selected from 905 possible organizations. The sample size was determined by using the finite population correction factor. (Lind, 2010) GuideStar, an online watchdog nonprofit organization based in the United States, was used to identify the local organizations. (GuideStar USA, Inc. (2009) A data collection template using Microsoft Excel was developed for documenting program information, board and staff members, letter of determination, annual reports, audits, and privacy policies.

Chi-squared statistics were used to test the null hypothesis that there was no difference between transparency reporting in Spartanburg, South Carolina and United States nonprofits at the .05 significance level with a critical value of 3.841.

3. Results

Using chi-square test statistics the null hypothesis was rejected in the following areas (p-value < 0.001). On-line transparency (local versus national) was found to be:

- Programs/services (27% vs. 93%);
- Board list (28% vs. 73%);
- Staff list (19% vs. 70%);
- Annual report (13% vs. 43%);
- Audited financial statements (6% vs. 13%);
- Privacy policy (8% vs. 37%)

Researchers failed to reject the null hypothesis regarding the on-line reporting of IRS letters of determination (9% vs. 3%, p-value 0.01).

4. Conclusions

Many nonprofit governance practices have transparency as one of its main guiding principles. Some of the transparency principles are required
by law while others represent the belief that they should be used as a matter of good accountability practices. GuideStar USA, Inc. (2009) represents the leading standards for transparency and recommends that nonprofits should regularly update their websites by posting: program and evaluative information; names, titles and biographical information on board members and key staff; annual reports; audit statements; and the IRS letter of determination. The South Carolina Association of Nonprofit Organizations, the South Carolina nonprofit advocacy group, recommends that “organizations prepares and makes available to the public annually a report that includes information about the mission, programs, basic financial data, board and staff members and volunteers.” (SCANPO, 2007, p. 11)

It was concluded that nonprofit organizations in Spartanburg, South Carolina were statistically different, i.e., less transparent, in most cases when compared to other nonprofits throughout the United States (on-line reporting of programs, board and staff members, annual reports, audited financial statements, and privacy policies). There was no evidence of a difference in transparency between Spartanburg and United States nonprofits with reporting on-line letters of determination.

Non-profits in Spartanburg especially, but nonprofits throughout the rest of the United States as well should better align their on-line reporting with current best practices in transparency.

For an on-line example of best practices, nonprofits may review the Nonprofit Leadership Alliance (NLA) home webpage at www.nonprofitleadershipalliance.org. The NLA annually posts on-line their by-laws, annual reports, conflict of interest statements, audited financial statements, IRS Form 990, and provides links to the nonprofit watchdog groups GuideStar (www.guidestar.org) and Charity Navigator (www.charitynavigator.org). One of the nine competencies identified by the NLA for emerging nonprofit professions is: Financial Resource Development and Management - Transparency and accountability as critical values in nonprofit organization.

Thanks also to: Dr. Frank Rudisill, USC Upstate, Dean of the Johnson College of Business and Economics for his statistical assistance and Dr. Ron Romine, USC Upstate, Professor Emeritus, Political Science, Department of History, Political Science, Philosophy, and American Studies for his financial assistance.

References


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Writing Ezra Pound: An Imitation of “Hugh Selwyn Mauberley”

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Abstract — Our paper and project chronicles our attempts to understand the difficult poem by Ezra Pound, “Hugh Selwyn Mauberley.” After spending some time analyzing the thirteen sections of the poem, we decided that the best way to understand (and appreciate) the poem and the author would be to imitate the poem. Imitating the poem has allowed us to consider the work of each section of the poem, as well as determine Pound’s original purposes in writing the poem in such sections. We also incorporated other modernist voices into our work in order to pay some homage to the work of the other poets we were reading and discussing. As the authors of a new text, “Tate Rowan Blankenship,” we feel we have developed a new appreciation for Pound’s contribution to modernism and American poetry.

Keywords — creative writing, Ezra Pound, modernism

1. Introduction

As we began our independent study this spring, we decided to make the work of our meetings both creative and analytic. Toward that end, we wanted the course artifacts to be those that helped interrogate the work at hand, as well as showcase our understanding of the work. We both entered into the study with a decided antipathy toward the modernist poet, Ezra Pound, particularly in his decided tendency to create difficult poems which created distance between the poet and reader. As we approached the reading of his long poem, “Hugh Selwyn Mauberley,” we felt a distinct sense that we needed to dig deeper. We knew that through the persona of Hugh Selwyn Mauberley, Pound felt he was critiquing his modern world—post WWI America, and, in the case of this poem, London. In the poem, which is divided into thirteen sections, Pound suggests that real artists and their art had been overlooked in favor of marketable art. After considering the many deaths and atrocities of WWI, he believes that the modern world deserves more than the art which he observed around him. Thus, our imitation of Pound’s poem called “Tate Rowan Blankenship” attempts to do two things. First, we wanted to learn more about the poem by looking closely at the work of each section. What was the poet saying? Why was the section composed in this manner? The sections arranged in this manner? Second, we wanted to translate our own world through the lens of Pound’s questioning: What is art? Who are the true artists? Why aren’t true artists recognized?

2. The Poem

As we began to write the poem, we found ourselves constantly referring to both Pound’s words, as well as those of other modernists whom we were reading. Thus, our completed poem contains the same collage-like effect as Pound’s. We have also included foreign phrases, references to popular culture, and allusions to Pound and other poets such as Robert Frost and T. S. Eliot. Because modernists also enjoyed using mythic elements to stitch together some level of continuity to their world, we decided to use references to modern epics such as Star Wars and The Wizard of Oz to create the same effects as Pound does in his work. In his first section of “Hugh Selwyn Mauberley,” Pound tries to introduce his persona. In our poem, we aim to do the same kind of thing:

J. F. K.
To be initialized in a world repulsed
by the thought of remembering
the first letter
of your first name
must be incredible.
This world called me to it,
to the River.
“Sing us one of those,”
The people called on us,
you and I.
Tears became the River.
With our song
we captivate those who
took us and our songs
captive.
Pretentious.
I am a writer, and I speak as a writer.
I see and perceive my world as a writer,
but when the final hour comes, I’ll be a writer
no more.

As we continued in our writing, we attempted to match poetic movements within sections,
eventually creating critiques of modern movements, as Pound does in his work. In one of our sections, for example, we use Facebook statuses to simulate one of our own unique forms of low culture writing:

_Have you ever seen a big white ball of fluff slide across a patio?_
My Luke is sick with a sore throat today;
It seems to thrive here.

_Help me decide—is this shade too small?_
I'm on a bus headed to CCU with 34 eighth grade boys--
I dare you not to laugh.

_I'm so excited to hang up my fruit!_
Codename: Sailor AWESOME
_I am pretty sure I have experienced_ the 7th layer of hell in the last 12 hours.

Don't forget the BABEL manual for submarine maintenance and the cocktail shakers.
That's the lowest ferritin level I've ever seen—I mean, EVER.
Fall seven times, stand up eight.

Just keep swimming, swimming, swimming...
I want to have the attitude of Christ, but I get so mad!
The smell of this hand sanitizer--well, it really makes me want a drink.

### 3. Conclusions

As we complete our revisions of our poem, we have realized a few lessons about the creating process, particularly in such a joint creative endeavor. Because the poem contains sections and has a kind of collage effect, we were able to blend our different poetic styles more seamlessly than if we had merely written a short lyric verse. We have also discovered in the process a new appreciation for Ezra Pound’s aims as a poet. By pulling the poem a part into its requisite sections, we also learned more about Pound’s poetic process, as well. We also believe that we live in a current culture of the arts which lends itself to this same disjoint between high culture and low culture.

### References

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Phonosymbolic Representations in A Clockwork Orange

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Abstract — Anthony Burgess invented an argot for his protagonist, Alex, in his famous novel A Clockwork Orange. This paper examines this invented language in “phonosymbolic” terms as a set of sound symbols with subconscious implicatures that go beyond the surface and reinforce the tone of the novel. The method is based on the research of procedure Cynthia Whissell who systematically assigned a numerical value of relative pleasantness, activation, cheeriness, and nastiness for 28 of the sounds that construct English words. A random selection of Nadsat words are analyzed based on Whissell's four predetermined phonemic criteria. Our results demonstrate weak tendencies toward phonosymbolism indicating negative values for pleasantness, activation, and cheeriness and a positive value for nastiness.

Keywords — Phonosymbolism, Linguistics, Anthony Burgess, A Clockwork Orange, Nadsat

1. Introduction

“Philosophers and Anthropologists have made it increasingly clear that language, rather than reflecting reality, can create its own reality” (Stone 1970). Anthony Burgess manipulates this linguistic tool in his novel, A Clockwork Orange, where he creates a fictitious language called Nadsat for his protagonist, Alex. The origins of Nadsat can be traced back mostly to Russian, intermixed with some completely invented words, and a few repurposed English words. As early as 1971 literary critics noted the sound symbolism in Nadsat with Robert Evans saying “the Slavic words connate communist dictatorship.” Literary critic, Goh (2000), notes that Nadsat “seems to be a variation on ...‘lexical onomatopoeia’ which rely on established ‘semantic properties’ but also foreground ‘phonetic properties’ to a much greater extent, in order to create a ‘heightened meaning’”. Through Nadsat, then, the “medium becomes the message in A Clockwork Orange” (Goh 2000). The meanings expressed by Alex are largely thought to be represented of him and his views of his future dystopia. Goh reinforces this point by citing another researcher, “M. Keith Baker argues that the teen language, “Nadsat”, spoken by the narrator Alex, represents various forms of entrapment and conditioning: it may reflect the subtle influence of “Russian propaganda” as well as having and aliening effect on its teen speaker, since it cannot be understood by mainstream society.”

2. Phonosymbology

Literary critics have argued whether Nadsat has had an effect in reinforcing the tone of its novel (Goh 2000) or is it just a confusing gimmick to promote readership (Evans 1971). Linguistic analysis suggests sounds carry meaning beyond the lexical value of a word; Nadsat words, therefore, have the potential to reinforce or detract from the author's intended tone. Any spoken word can be broken into phonemes: the smallest independently recognized sounds of a language. Research to establish the emotional content of phonemes began as early as 1933 with Stanley S. Newman and his paper “Further Experiments in Sound Symbolism.” He categorized phonemes in terms of big vs. small and dark vs. light. Others such as Jakobson (1981) and Tsur (1992) have reinforced this idea that the sounds we make when speaking are naturally expressive. Others like Chomsky (1996) and Skinner (1974) have contended that sounds are arbitrary symbols.

Cynthia Whissell of Laurentian University took this idea a step further concluding that phonemes in Newman’s categories were overly simplified. In her paper “Phonosymbolism and the Emotional Nature of Sounds” (1999), Whissell concluded that certain phonemes held qualities reflected along four criteria that she defined as Pleasantness, Activation, Cheeriness, and Nastiness. After an extensive analysis of song lyrics, advertisements, fiction, and nonfiction, Whissell quantified 28 of the 40+ English phonemes on a scale of .09 to .09, assigning a criteria value on one or more of the four categories. Her findings demonstrated that “there is a weak tendency for the phonemes /v/, /th/, /dh/, /iy/, /uh/, and /ay/ to be present more often in pleasant words, and similarly a weak tendency for the phonemes /b/, /d/, /r/, /s/, /t/, /w/, /ng/, and /ih/ to be present more often in unpleasant words. There is a weak tendency for the phonemes /l/, /h/, /j/, /v/, /ng/, /ch/, /uw/, and /o/ to occur more often in active words, and a weak tendency for the phonemes /b/, /d/, /k/, /l/, /n/, /z/, /ow/, /ao/, and /eh/ to occur more often in
passive words (1999) [The authors note that Whissell's symbols do not follow the currently preferred International Phonetic Alphabet (IPA) and use Whissell's symbols in honor of her original choice].

Based on the phonosymbolic values deduced by Whissell, we show that Nadsat’s words reflect negative values for pleasantness, activation, and cheerfulness, and a positive value for nasty, just as Burgess intends.

3. Methodology

The methodology for this experiment can be laid out in six steps. First, we randomly selected 20 words for the study from each of three categories: Russian borrowings, English re-purposings, and new inventions. Second, each of the selected words were transcribed into their phonemic components. Third, each phoneme was assigned a phonosymbolic value based on Whissell’s scales (−.09) to (.09) for pleasantness, activation, cheeriness, and nastiness. Next totals for each word was established by adding and subtracting the individual phonemic values assigned to each phoneme in each category. Finally, the average of each set of words in each category was then determined as was the over-all average for the Nadsat words selected for this study. An excerpt of Whissell’s chart is as followed: /t/ is −.04 Pleasantness, .08 Activation, 0 Cheeriness, and .09 Nastiness. If a phoneme was not quantified on Whissell’s chart it was represented by 0 in all categories.

For example, the word skrik is phonemically transcribed [s k r a y k]. The values for each phoneme and for the word as a whole are provided in the chart below.

<table>
<thead>
<tr>
<th>Phonoeme</th>
<th>Pleasantness</th>
<th>Activation</th>
<th>Cheeriness</th>
<th>Nastiness</th>
</tr>
</thead>
<tbody>
<tr>
<td>/s/</td>
<td>−.05</td>
<td>0</td>
<td>0</td>
<td>−.05</td>
</tr>
<tr>
<td>/k/</td>
<td>0</td>
<td>−.06</td>
<td>0</td>
<td>−.06</td>
</tr>
<tr>
<td>/t/</td>
<td>−.04</td>
<td>.08</td>
<td>0</td>
<td>.09</td>
</tr>
<tr>
<td>/ay/</td>
<td>.03</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>/k/</td>
<td>0</td>
<td>−.06</td>
<td>0</td>
<td>−.06</td>
</tr>
<tr>
<td>skrik</td>
<td>−.06</td>
<td>−.04</td>
<td>0</td>
<td>.02</td>
</tr>
</tbody>
</table>

From these findings we see that in terms of phonosymboly, skrik is highly unpleasant, inactive, neutral for cheeriness and slightly nasty.

4. Findings

Burgess’s main concern when writing A Clockwork Orange was the individual’s lived experience with in the novel’s given scenario (Goh). The individuals referred to in this statement are not Alex, but the reader as they experience the world right in tandem with Alex. The language of Nadsat then becomes the metaphor for the entire world presented. Once a language is created the possibility of a person under a specific mood can reinforce the mood, ongoing, by choosing from any number of words whether consciously or unconsciously. Cynthia Whissell was able to demonstrate that Chomsky and Skinner were incorrect in their assumptions of the arbitrary nature of phonemes. She stated that “phonemes do not have the power to induce full blown emotional responses of the lock-and-key type under any and all condition, but they do have some of this power some of the time” (1999). Therefore, Nadsat like any other language has the potential to either reinforce or detract from the established tone of a novel. The following table shows the final numerical results for the averages in each of the three categories, plus an overall average for the Nadsat language.

Table 2. Final results.

<table>
<thead>
<tr>
<th></th>
<th>Pleasantness</th>
<th>Activation</th>
<th>Cheeriness</th>
<th>Nastiness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia:</td>
<td>−.05</td>
<td>−.06</td>
<td>−.07</td>
<td>0</td>
</tr>
<tr>
<td>English:</td>
<td>−.09</td>
<td>−.03</td>
<td>−.08</td>
<td>.07</td>
</tr>
<tr>
<td>Invented:</td>
<td>−.03</td>
<td>−.05</td>
<td>−.03</td>
<td>−.01</td>
</tr>
<tr>
<td>Average:</td>
<td>−.056</td>
<td>−.043</td>
<td>−.056</td>
<td>.02</td>
</tr>
</tbody>
</table>

Pleasantness averaged −0.056 on a scale of 0.09 to −0.09. This is only 0.032 from the lowest potential value on Whissell’s chart. This overtly unpleasant feel is felt again and again in the novel. The youth entertain themselves by stealing cars, breaking and entering, and fighting in the park. The elderly are accosted on the street. This rather large tendency toward phonosymbolic unpleasantness reinforces Burgess’ apparent intention. Cheeriness also averaged −0.056. Alex kills two people, maims both enemies and friends, and is conditioned through the rehabilitation - to have a violent reaction whenever anything unpleasant arises. Burgess shows no cheer in anyone but Alex, and even this main character loses his cheery nature both during his rehabilitation and when reintroduced into society. With regard to activation, there are moments of activity in the

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novel, but the average phonemic value of Activation was
-.043. This falls right in line with the amount of
down time Alex spent in the milk bar, prison, and
watching movies for his rehabilitation. Nastiness
was the only positive phonemic value. Alex reveled
in his misdeeds as did other characters. Dim, for
example, began to sneer when he became a
policeman. The phonosymbolic value for Nastiness
average .02. This is not a large positive value. It is
just the other side of non-commital. However, any
positive number in the category of nasty does
reinforce the negative tone of Nadsat. Taken
together the average values for phonosymbolism in
Nadsat reinforce the dark dystopic tone of the
novel. Had Burgess known about the phonemic
weight words could hold he may have made his
world still darker by using fewer “non-nasty”
sounds like /k/ and more “nasty” sounds like /r/.

5. Limitations

The final phonemic numbers may reflect the tone
of the novel, but there are several points of
contention to be taken into account for any future
studies. A limitation that could be pointed out is
that the phonemes used to represent the words,
especially the vowels, can be pronounced
differently across many different English dialects.
This would have a direct effect on the phonemic
number representation and may instead reflect
how that region would react to the phonemes used
by the author. A second limitation to consider is
that this study was preformed from a linguistics
point of view. In the number creation an error
could have been over looked or introduced in the
creation of these statistics.

6. Future Study

This methodology could be used to analyze other
invented languages and their effect upon the
reader, for example Tolkien’s Dwarfish, Elvish, or
Star Trek’s Klingon to determine if the
phonosymbolic of these languages reflect the
literary tone the authors are trying to produce.
Further, a study could be completed on the
effectiveness of teaching phonosymbolic principles
to Creative Writing students. Expanding beyond
Literature, one could also explore the effect of
phonosymbolology in brand name creation and
advertising.

7. Closing

The study of phonemes is an invaluable tool for
anyone wishing to pursue a course in Marketing or

References

Chomsky, N. Syntactic Structures. The Hague:
Mouton, 1966.
Evans, Robert O. “Nadsat: The Argot and Its
Implications in Anthony Burgess’ A Clockwork
Orange.” Journal of Modern Literature 1.3
Goh, Robbie B.H. “Clockwork’ Language
Reconsidered: Iconicity and Narrative in
Anthony Burgess’s A Clockwork Orange.
263-280.
Jakobson, R. Six Lectures on Sound and Meaning.
Newman, Stanley S. “Further Experiments in
Sound Symbolism.” The American Journal of
Psychology 45.1 (1933): 53-75.
Skinner, B.F. About Behaviorism. New York:
Stone, Donald D. “Sense and Semantics in Jane
Austen.” Nineteenth-Century Fiction 25.1
Tsur, R. What Makes Sound Patterns Expressive?
Whissell, Cynthia “Phonosymbolism and the
Emotional Nature of Sounds: Evidence of the
Preferential Use Of Particular Phonemes in
Texts of Differing Emotional Tone.” Perceptual
German Dialects and Language Attitudes Toward Them

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Abstract — To demonstrate that dialect discrimination is an issue stretching beyond the United States, this paper deals with German dialects. An online survey was created to investigate students’ language attitude towards dialects in Germany. The data from three universities in different regions of the country is currently being collected. This survey is divided into three sections, starting with a general part. The second part consists of 18 questions about language attitude, based on Jeffrey Reaser’s questionnaire. The third part is an additional field, in which respondents can write about anything concerning German dialects. 41 students have answered the questionnaire so far. 18 students reported speaking Hochdeutsch only, 16 speak both Hochdeutsch and dialects, and 7 speak dialects only. The responses that were turned in to date show similarities to the responses Jeffrey Reaser had published. In both surveys, respondents strongly agreed that everyone should know and be able to use standard language. Furthermore, both, Germans and US-Americans disagreed with the assumption that people who speak dialects are not very smart. It can be said that attitudes towards dialects are a global issue.

Keywords — Germany, dialect, attitude, discrimination, tolerance

1. Introduction

Dialect is a linguistic universal. Although it is often subconscious, humans naturally set themselves into groups according to geographic location, race, socio-economic class, gender, age, etc. These groups actively include and exclude others based on internal criteria and tend to develop ways of speaking that differentiate themselves. Sadly, over time, these inclusions and exclusions become the basis for discrimination and bias.

Despite many worthy efforts to combat prejudice in the greater society, intolerance and social injustice remain. One of the most insidious forms of discrimination emerges from attitudes toward dialect. Research shows that individuals often judge others’ intelligence and honesty based on simply listening to short conversations or even simple sentences read aloud — even though they deny having any bias. Being subconscious, linguistic prejudices are highly resistant to change.

To put emphasis on the fact that dialect does not only exist in the US, this paper talks about the historical background of German dialects. Dialect is omnipresent in schools and universities and, hence, influences the everyday life of students, teachers, parents, and others in every community. As a consequence of the ubiquity of dialect, prejudices and stereotyped thinking occur between speakers of different dialects. In order to combat stereotyped thinking, this paper shall attempt to raise the reader’s awareness of dialects and one’s own subconscious prejudices against them. As this paper elaborates on language attitudes based on gathered data about dialects from students of various universities in Germany, the authors hope the readers will consider their own perspectives of dialect in their home countries.

2. Background

The Federal Statistical Office in Germany proclaimed that by the end of the year 2011 Germany had 81.8 million inhabitants. These 81.8 million people were spread across Germany’s 16 federal states. Throughout the article the word Hochdeutsch will be used, since it is the official German denotation of Standard German.

2.1 History of the German language

In the 15th and 16th century scholars, writers, and civic leaders gained greater influence in Germany. One important contributing event to that emerging influence was the invention of the printing press by Johannes Gutenberg in the mid 15th century. Moveable letters of metal facilitated to print texts faster and publish greater amounts of them. Nonetheless, by 1520 about 90 percent of the documents were still printed in Latin because Latin was seen as the language of
science, traffic and poetry. In addition to that family names had been translated into Latin or at least changed to appear Latin. Gradually, German was mixed with Latin. That is, Latin loan words and transscriptions were implemented into the German language. German was in need of new words, which is why the creation of compound nouns started at this time. Emphasis needs to be put on the fact that German in the 15th century was far from being one unique language. Many different dialects and vernaculars dominated the German language. Being aware of the language barrier supra-regional dialects developed. That is, synonymic words from two different dialects were published together. By 1680 the amount of books printed in German was the same as books published in Latin. Still, depending on the region the publications varied in their dialects of German.

2.2. The Political Division of Germany

The linguistic consequences of the division of Germany, from 1949 to 1990, are now said to be overrated. At that time people claimed that two different German languages were spoken; one form of German in the BRD (western Germany) and one form in the DDR (eastern Germany). König however, states that the German languages from the BRD and from the DDR shared 98% in terms of vocabulary and grammar. The main differences in vocabulary within the divided German language came from the two opposing political systems resulting in two different educational systems. In the BRD, the German language was enriched with many English loan words like Team and Plastik. Despite the political divide, many of these loan words found their way to eastern Germany, as well. Eastern Germany enriched its language with words from Russian. Consequently, new words like Abendstunde (evening classes) and Selbststudium (self-study) were generated. In general, it can be said that the English influence on the BRD was more powerful than the Russian influence on the DDR. Even today, some distinct differences remain, as it can be seen in the following table.

| Table 1. | BRD | English | DDR |
|----------------|----------------|----------------|
| Team | Team | Kollektiv |
| Astronaut | Astronaut | Kosmonaut |
| Brathähnchen | roasted chicken | Broiler |
| Plastik | plastic | Plaste |

2.3 German Dialects Today

According to an article published in Deutsche Welle, a German foreign broadcasting service, dialects are becoming extinct and in comparison to the rich dialectal diversity from the past, only a few are left today. In northern Germany, dialects, like Low German, are partially endangered many are not spoken by the young or even middle aged population. On the contrary, the south tries to keep dialects alive. The federal state of Baden-Wurttemberg has a slogan claiming that its inhabitants speak everything BUT Hochdeutsch. Cornelissen, a German linguist whose area of expertise are the Lower Rhine languages, claims that dialects have remained, but in a modified version. Their distinction is no longer a clear cut; rather, they mix with Hochdeutsch and are spread across larger areas. He calls this "phenomenon" Regiolekt, a dialect spoken throughout a wider region.

Two current surveys, one published in a periodical, the other conducted by YouGov Deutschland, asked Germans to rate five German dialects (Bavarian, North German, Swabian, Saxon and dialects from Berlin and Cologne) by how they sound. Even though the percentages differed by region the overall percentage looked almost identical. Both surveys stated that Germans find Saxon the least admirable dialect. The dialects that came in first and second place were Bavarian and North German.

The distinction between the six different dialects offered in the two surveys is not made from a scientific point of view. According to an article published in Deutsche Welle, a German foreign broadcasting service, dialects are becoming extinct and in comparison to the rich dialectal diversity from the past, only a few are left today. In northern Germany, dialects, like Low German, are partially endangered many are not spoken by the young or even middle aged population. On the contrary, the south tries to keep dialects alive. The federal state of Baden-Wurttemberg has a slogan claiming that its inhabitants speak everything BUT Hochdeutsch. According to an article published in Deutsche Welle, a German foreign broadcasting service, dialects are becoming extinct and in comparison to the rich dialectal diversity from the past, only a few are left today. In northern Germany, dialects, like Low German, are partially endangered many are not spoken by the young or even middle aged population. On the contrary, the south tries to keep dialects alive. The federal state of Baden-Wurttemberg has a slogan claiming that its inhabitants speak everything BUT Hochdeutsch. Cornelissen, a German linguist whose area of expertise are the Lower Rhine languages, claims that dialects have remained, but in a modified version. Their distinction is no longer a clear cut; rather, they mix with Hochdeutsch and are spread across larger areas. He calls this "phenomenon" Regiolekt, a dialect spoken throughout a wider region.

The distinction between the six different dialects offered in the two surveys is not made from a scientific point of view. According to the linguist C.A.M. Noble there are three major divisions of the German language: Low, Middle, and Upper German. All of the three divisions are further divided into Western and Eastern dialects, and Upper German is additionally subdivided into Northern dialects. Therefore, Bavarian, as it appears in the two surveys, is split up into North Bavarian, Middle and South Bavarian. All the three subdialects belong to Upper German. Saxon, named Upper Saxon by Noble, is part of Middle German. North German, as presented in the two surveys, complies with Noble’s category of Low German. This dialect alone has 13 subdialects. The overgeneralization of the general populous may contribute to stereotypes and misconceptions concerning dialects.

Experience shows, that even 23 years after the reunification, Germans from the former BRD, say that there is only one dialect besides the Hochdeutsch they speak: eastern German; whereas those from the former DDR, tend to say that there exists only one different dialect besides their own, the western German dialect.
It is more common to hear the term "Ostdeutsch" which indicates the eastern German dialect pejoratively. Even though from a linguistic point of view, Ostdeutsch does not exist. The federal states that belonged to the DDR, called New Länder, are linguistically divided into at least seven subdialects. As it can be seen in the map below, there are five different ways of telling the time in German (in this case 6:15). Two out of five ways are common throughout Germany. Usually, those people who solely know quarter past 6 (viertel nach 6) say that Eastern Germans say it differently. That is, they say “viertel 7”. The map suggests that is a false stereotype because “viertel 7” is used by people in the former “East Germany” and by many in “West Germany” as well.

Figure 1. Map of Germany’s inner border.

3. Methodology

In order to investigate students’ language attitude towards dialects in Germany today, an online survey was created and we are currently collecting data from three universities in different regions of the country. The questionnaire is divided into three sections, starting with a general part in which age, gender, place of birth and residence are asked. Another question is whether one speaks Hochdeutsch and/or dialects, and which dialects. In the second part 18 questions about language attitudes are posed based on the research of Jeffrey Reaser who did a similar study in North Carolina. In the third part of the survey people have the opportunity to respond freely whatever they want to say about dialects. The space to do so is unlimited. Every question of the survey is optional, there are no mandatory fields. To date, 41 completed surveys have been received.

4. Findings

Preliminary findings suggest that most of the 41 students who answered the questionnaire either live or have lived in the federal states of Bavaria, Rhineland-Palatinate or North Rhine-Westphalia. Data from the control group, students from around Hannover, which is said to be the Hochdeutsch region, are yet to be collected. So far, the most of the respondents have been female with only 10 male students answering the questionnaire. The respondents’ ages average 23.37 years. In terms of self-reported dialects, 18 students speak Hochdeutsch only, 16 speak both Hochdeutsch and one or more dialects, and 7 speak dialects only. Thirty-nine out of 41 students strongly agree that "One should know and be able to use Hochdeutsch". A strong majority (38) of respondents strongly disagreed with the statement, "People who speak a dialect are not very intellectual." Only 1 student, a speaker of only Hochdeutsch, strongly agreed that students should be punished for using non-Standard German, whereas 33 students strongly disagreed. Additionally, 29 students strongly disagreed with "There is no reason for speaking a dialect". Another outcome of the survey is that 21 students strongly agreed that "There are people who don’t speak a dialect" even though only 18 students answered that they speak only Hochdeutsch. Thirty-eight students strongly or partially agree that "Dialects don't follow a pattern". The additional comments, the third part of the questionnaire, divide naturally into positive, neutral, and negative remarks about dialects. Most of the answers were positive, for example that dialects are interesting, give people with the same dialect a sense of belonging, may be seen as romantic and beautiful, and are said to emphasize people’s individuality. A few students opined that dialects were unnecessary and cause confusion. Consistent with surveys mentioned above, Saxon was labeled as the worst dialect. Neutral comments observed that dialects are becoming extinct and that they are cultural artifacts.

5. Conclusion

Instead of drawing hasty conclusions, the authors are waiting for more results, especially for those of the control group. Final results will be documented and presented in April. Early indications suggest that stereotypes and prejudices exist among German students. Every respondent seems to have
an idea about what dialects are, but 38 out of 41 are of the opinion that dialects lack structure. This statement shows that the students haven't explicitly thought about dialects, or don't know about their structure and value. Either of these possibilities indicates that there is a need for education about dialects. Furthermore, the respondents appear to have mixed perceptions of the language they speak.

Although the length constraints of this venue disallow a full juxtaposition of Reaser's findings from the US with the findings about dialects in Germany, a short comparison can be made. The responses that were turned in to date show close similarities to the average responses Reaser published. In both surveys the respondents strongly agreed to the fact that everyone should know and be able to use their standard language. Furthermore, both, Germans and US-Americans disagreed with the assumption that people who speak dialects are not very smart. Therefore it can be said, that, even though the surveys dealt with two different languages attitudes towards dialects seem to be a global issue that desperately cries for more attention.

References

Deutsche Welle. http://www.dw.de/eine-deutschlandreise-f%C3%BCrs-ohr/a-4230751
Die Welt.
Lang, Peter (1983): Modern German Dialects.
YouGov Deutschland.
http://yougov.de/news/2012/10/02/umfrage-sachsisch-ist-der-unbeliebteste-dialekt/
Race, Romance, and Rebellion in Nineteenth Century American Literatures

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Abstract — My poster presentation is about my forthcoming book, Race, Romance, and Rebellion in Nineteenth Century American Literatures. The book argues that nineteenth-century United States print culture repeatedly flashed back to reports of the Haitian Revolution to revisit questions of insurgency—both political and sexual. Particularly in moments of domestic controversy over race, gender, and rights, the Haitian and American Revolutions proved equally significant in rhetoric about the progress of freedom in the Americas. Images of violent slave rebellion and stories of amorous cross-racial relationships appear both in cautionary tales that depict the Haitian Revolution as a gothic nightmare and in reform literature that idealizes and romanticizes race relations. Race, Romance, and Rebellion explores how authors such as Harriet Jacobs, Elizabeth Livermore, and Gertrudis Gómez de Avellaneda imagined the expansion of race and gender-based rights as a hemispheric affair, an echo of Haiti that united the US with Africa, Cuba and other parts of the Caribbean. Placing less-familiar women writers in conversation with their more famous contemporaries—Ralph Waldo Emerson, Margaret Fuller, and Lydia Maria Child—this book also mines an archive of nonfiction historical documents that trace the transnational progress of freedom through romance and rebellion.

Keywords — Race Relations, Caribbean, American Literary History, Abolition, Suffrage

1. Introduction

Race, Romance, and Rebellion illuminates the ubiquitous cultural obsession with cross-racial sex, violent rebellion, and territorial expansion in the era of reform (1836-69). Although David Blight’s Race and Reunion traces the influence of cultural images of racial union and disunion on political rhetoric during the Reconstruction period, Race, Romance and Rebellion extends the analysis back to the antebellum period. Like Gabrielle Foreman’s Activist Sentiments, Maria Sanchez’s Reforming the World and Robert Levine’s Dislocating Race and Nation, Race, Romance, and Rebellion considers how fiction imagines a more perfect hemispheric union between nations, races, and men and women. My attention to the romance genre in particular diverts the conversation from the Anglo-masculine narrative of nation that Dana Nelson has so influentially described and that Carolyn Sorisio and Peter Coviello have pursued; Race, Romance, and Rebellion proposes that imaginative alternatives to racial patriarchy always existed. Because the ideal of racial amalgamation also infiltrated antebellum ideas about expansion, annexation and the ongoing threat of rebellion in the Caribbean, this book builds upon Anna Brickhouse, Sibylle Fischer, Debra Rosenthal, and Ralph Bauer’s hemispheric constructions of American literary history.

2. Intimacy, Violence, and the Romance Genre

Race, Romance and Rebellion in Nineteenth-Century America asks why stories of cross-racial love and violent rebellion so often appear simultaneously in discussions of justice for white women and enslaved people in an era that was likewise preoccupied with territorial expansion. The lens of romance and rebellion unites three points: first, it makes a striking connection between popular nineteenth-century representations of cross-racial relationships and violent insurrections, which take place in the Americas but often outside the conventional borders of the United States. Second, it explores how diverse authors narrated their own racial and gender identity through literary representations of cross-racial encounter—intimate relationships or violent confrontations between people with different racial and gender identities—throughout the Atlantic World. Finally, it considers how the intellectual legacy of Romanticism translated into a political argument for radical equality in a post-slavery society through the romantic ideal of the expansion of the individual soul, the concomitant geographic expansion of national boundaries, and the revolutionary potential of the insurgent romantic hero.

4. The Archive

The antebellum cultural fascination with cross-racial romance and rebellion suffused fiction, political rhetoric, popular journalism, race science,
and biblical treatises. This book analyzes the simultaneous longing for racial union and fascination with rebellion in a variety of sources, ranging from the wildly imaginative writing of Elizabeth Livermore to Harriet Jacobs’s well-known non-fiction and the romance novels of Gertrudis Gómez de Avellaneda, Julia Collins, and Frances Harper. It also connects US Senate speeches by Henry Seward or Charles Sumner and rare archival pieces like Massachusetts Attorney General James T. Austin’s 1835 proslavery pamphlet or Paul Broca’s early race science texts to the literary milieu in the same era. Juxtaposing diverse voices that resounded in the era, I use approximately 250 sources, including archival manuscript items like Charles Chauncy Emerson’s 1835 “Lecture on Slavery,” personal letters from Wendell Phillips to Waldo Emerson, Elizabeth D. Livermore’s literary magazine, The Independent Highway and other magazines like Ballou’s Monthly, dramatic scripts including Lugarto the Mulatto, and newspaper reports from small New England papers as well as from Elizabeth Stanton and Susan Anthony’s Revolution or the A.M. E. church’s Christian Recorder. These items help reconstruct the political and social milieu of mid-nineteenth-century American writers, indicating the prevalence of themes of romance and rebellion that appeared in everyday print culture and personal letters as well as political discourse and literary sources.

5. Conclusions

The novels and narratives at the center of this study provide the most robust examples of the ideal of freedom that romance and rebellion imagines. This freedom is geographic, the right to travel or belong, regardless of racial classification, in places throughout the New World, and to embrace its various cultures; but it is also the freedom to love in a context where the radical equality of souls—the exchange between lovers—symbolizes a post-slavery future built upon principles of justice and mutual respect. Harriet Jacobs’s quest for freedom from racial and gender restrictions leads her to precarious romantic relationships and dangerous journeys through white space. Yet she also seeks a home outside of white space by any means necessary. Her narrative begins with a family history wherein her emancipated grandmother seeks refuge from Anglo-America in Spanish Florida and ends with her incomplete quest for freedom in the supposedly emancipated North. Similarly, Avellanada’s hero and heroine venture from the plantation to indigenous villages in the Cuban countryside, where they participate in the mythology of the conquered population, and also visit cities where they engage with the capitalist culture of Anglo-American émigrés. Livermore’s quadroon heroine makes a circum-Atlantic voyage from St. Croix to Denmark, then to England, and back across the Atlantic to Mobile, Havana, Kingston, Barbados, and home to St. Croix before she ascends to heaven with her Jewish lover. Collins’s characters move, generation by generation, up and down the Mississippi from New Orleans to New England, amalgamating the Creole South with the Anglo North. Although Harper and Child ultimately mourn the passing of these romantic and revolutionary ideals and shift into the realism that would pervade until the century’s end, their requiem for a moment of radical potential, with Haiti at its epicenter and cross-racial union as its goal, preserves the romantic, rebellious, amalgamated, and ever-expanding beauty of the ideal.

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References


---. *Zoe; or, the quadroon's triumph*. (1855). 2 vols. Cleveland: Truman and Spofford.


Monongah 1907: A Model Operation

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Abstract — One of Fairmont Coal Company's most modern operations was located in Monongah, West Virginia. In fact, Monongah's interconnecting mines, No. 6 and 8, were considered the jewels of the Fairmont field, safe and “up to date in every way.” The two mines spanned several hundred acres, and by best estimate the company possessed over one hundred acres for development. By 1907, these operations led the state in machine-mined coal, producing 433,285 long tons with the aid of fourteen cutting machines. Governor Aretas Brooks Fleming and his associates were so proud of the Monongah operations that visiting dignitaries often concluded tours of the Fairmont coal field at the Monongah plants. Moreover, the company was convinced that the Monongah operations were among the safest mines in West Virginia. Monongah Superintendent A. J. Ruckman, for example, responded to a young woman's query about the safety of No. 8, opining that “some mines might be dangerous, but this one was as safe as her parlor at home.” In spite of Ruckman’s optimism and the company’s pride, in the blink of an eye the Monongah operation was transformed from a showplace into the worst coal mine disaster in American History.

Keywords — Monongah, industrial accidents, coal mine explosions, industrialization, progressive era

1. Introduction

On a damp Friday morning, December 6, 1907, simultaneous explosions occurred in Fairmont Coal Company’s No. 6 and 8 mines; fire and dust cascaded from both. A large cloud of smoke spewed from No. 6 and one hundred feet of mountainside was blown out by the blast, leaving a giant crater where the No. 8 mine entrance had been. The force of the explosion broke windows in houses, buckled the pavement, and created tremors that were felt in the distant towns of Fairmont and Grafton. Monongah residents quickly converged on the mines and stood in a state of confusion, watching, praying and waiting for some word on the status of their family members. As the pit mouth billowed with what one observer described as “dirty white smoke,” the situation looked hopeless.

2. Reactions

Initially, the General Manager Lee Malone publicly placed the loss of life at well over 500 men and boys. The company, however, quickly took control of the scene, silencing Malone by establishing President Clarence W. Watson as the official company spokesman. Fairmont Coal Company managed the mine rescue, orchestrated relief efforts, and fearful of inflaming public opinion, the company attempted to manage the press. The grave nature of the disaster and the loss of life motivated a rethinking of the traditional approach to mine safety, inspiring one of Fairmont Coal’s founding fathers, Aretas Brooks Fleming to propose a new order in which his great coal enterprise would promote stability through the creation of the United States Bureau of Mines in 1910.

3. Conclusions

The real challenge was not the technical difficulty of maintaining cheap coal, but the political difficulty of steering the lobbying interests in manner that maintained stability and the illusions that industry was under. Continuing to provide coal and remain profitable involved three politically challenging steps. First, the country needed readily accessible coal and the high production model as represented at the Monongah operation appeared to offer the best approach to increased production. Continued stability and future growth required avoiding the devastating mistakes of the past while identifying solutions to the problems that remained. Second, the coal industry needed more science, in order to understand the dangerous forces unleashed as a result of the introduction of the new technology. Fleming had been involved in the industry for thirty years, and witnessed its evolution, but common sense alone was not enough in order to produce high quantities of bituminous coal in a safe environment. Finally, dealing with such complex problems required a thorough understanding of the coal business, common sense precautions, and a coordinated reform effort that would promote order, stability, and efficiency.

References
Manuscripts
Charleston, West Virginia
West Virginia State Archives
Aretas Brooks Fleming Collection
Henry Mason Matthews Collection
William A. MacCorkle Collection

Morgantown, West Virginia
West Virginia and Regional History Collection
Aretas Brooks Fleming Papers
Johnson Camden Papers

Pittsburgh, Pennsylvania
Wilson Library
Consolidation Coal Company Records
Fairmont Coal Company Minute books

Secondary Sources:
The No-Thing in the *Cloud of Unknowing*: Peace of Mind for the Blessed Few or for the Many?

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**Abstract** — *The Cloud of Unknowing* discusses the ultimate goal of contemplative prayer as being the ‘No-Thing.’ The No-Thing is an imageless, nonconceptual experience of God. The question for this study is whether or not this No-Thing is attainable by people living outside the monastic communities. *The Cloud* seems to assume it is not possible. In looking at the historical background of the *Cloud*, as well as the spirituality of St. Francis of Assisi, Mother Theresa and Thomas Merton, this study will argue that it is possible for lay people to attain the No-Thing.

**Keywords** — Contemplative Studies, Spirituality, Christian Mysticism

1. **Introduction**

The *Cloud of Unknowing* is an anonymous mystical text written in England sometime in the 14th century. In the *Cloud of Unknowing*, the author argues that the ultimate goal of contemplation is what he calls the “No-Thing.” After months or even years of effort at contemplation, the practitioner will arrive at the No-Thing. The No-Thing appears to be a deep level of mental silence, with no distracting thoughts, no images or sensations of any kind. In this No-Thing we at last experience directly the presence of God. (Wolters, 1961, Ch 68)

My question to consider here is the following: is this No-Thing attainable by only the fortunate few, or can it be achieved by anyone, especially those of us outside monasteries? Some historical background to the *Cloud* will help us find a few answers.

2. **Historical Background**

2.1 **Assumptions Behind the Cloud of Unknowing**

First, the *Cloud* belongs to the theological tradition called Apophatic or Negative Theology. The belief is that God so utterly beyond our limited understanding we cannot really know what God is. All we can do is say what God is not- God is not material, God is not bound by to me etc. In contrast, most Christians practice Kataphatic or Positive Theology, where it is believed that positive statements about God can be made, such as God is Love, God is Creator etc. (Egan, 1978)

Second, the *Cloud* is part of a tradition called Neoplatonism. Based on the philosophy of Plato (424-347 BCE), later philosophers, such as Plotinus (205-270 CE), further elaborated upon Plato’s original ideas. Neoplatonism taught that our eternal souls are trapped in our physical bodies that, while not evil, are of lesser importance than our souls. The goal is to free our souls from our bodies so that our souls can return to the One, the mysterious source of all things. Neoplatonism distinguishes between our lower reason and higher reason. Lower reason is tied to our bodily senses while higher reason is primarily our intellect. After neutralizing the lower reason through various practices of austerity, the higher reason is purified of concepts and images in preparation for returning to the One after bodily death.

Third, a widespread teaching in the Middle Ages was the Counsels of Perfection. The three Counsels of Perfection are vows of obedience, chastity and poverty. It was believed that there was a ranking of spiritual perfection to which people could aspire. At the bottom were lay people who had little hope of attaining much spiritual perfection. At the top were monks and nuns who could achieve higher levels of spiritual perfection by taking the three vows or Counsels of Perfection. The ultimate goal for monks and nuns was transforming union, a conscious awareness of God’s presence that stayed with them constantly.

The *Cloud* clearly shares many of these assumptions. The book is written for an apprentice monk rather than for the general public. While the *Cloud* does not teach specifically that our immortal souls are trapped in pesky physical bodies, its methodology reflects the influence of Neoplatonism. The very title, *Cloud of Unknowing*, refers to its ultimate goal of a nonconceptual, imageless experience of God in the No-Thing.

2.2 **Another Possible Interpretation of the No-Thing: Mother Theresa’s Spirituality**
Is this deeper experience of God through the No-Thing only available to monks and nuns? With some re-interpretation my answer is no.

Come Be My Light is an autobiographical account of the life of Mother Theresa of Calcutta (1910-1997) published after her death. In the book we learn some startling facts about Mother Theresa's spirituality. Early in her cloistered life she reports having visions, locutions and other powerful spiritual experiences. The gist of these experiences was a deep calling to establish her own order of nuns, Missionaries of Charity, devoted to providing death with dignity to the poorest of Calcutta. As the years went by and her order grew, a strange thing occurred. Mother Theresa no longer had any of the spiritual experiences of her earlier life. Her meditations and prayers encountered dead silence. This dragged on for almost forty years up until her death. While she continued her practices and did not lose faith, she felt deep anguish due to the lack of sensing God's presence in her life. However, she did report an interesting experience that seems to have been ongoing. When personally working with the sisters and ministering to the dying, Mother Theresa did feel God's presence. This gave her some consolation in the face of her otherwise barren spiritual practices. (Kolodiejchuk, 2007, 211)

Perhaps Mother Theresa has provided us a clue about experiencing the No-Thing outside the cloistered life. One possible explanation of the No-Thing is that it is not necessarily a conceptless, imageless experience of God. It could instead be described as a deep inner peace that becomes present in daily life. This inner peace is the result of clearing out emotional programming to which all humans are subjected in the process of growing up. We experience this emotional programming in our waking consciousness as the constant mental chatter at the edge of our mind. These inner voices are half-conscious but are markers of our unconscious emotional programs. A major goal of contemplative prayer is to clear out these emotional programs, what the mystics call the False Self. Once this process has been underway for a few months or years, the quiet we can encounter can be deafening. What can we do with this No-Thing if we are not living a cloistered life? Franciscan spirituality can give us a clue.  

2.3 Insights From Franciscan Spirituality

St. Francis of Assisi (1181-1226 CE) founded a monastic order in the Middle Ages. While the Order of the Friars Minor does practice a life of austerity like other monastic orders, there are some important differences. First, the Third Order of the Friars Minor is for secular people who cannot commit to the full monastic life, but still want to live by Francis' teachings. Second, Franciscan spirituality does not appear to be as heavily influenced by Neoplatonism as other medieval monastic orders. This is evident in two key values of Franciscan spirituality, peace and joy.

Around the year 1220 CE, Francis experienced a time of mental depression or disillusionment. During this time he composed a parable to explain his understanding of joy. A paraphrase of the parable is as follows: One of Francis' friars asked Francis 'What is your understanding of joy?' Francis replied, 'If the order of the Friars Minor were to continue to grow with great numbers joining, this would not bring me joy. If all of the leaders of the Catholic church were to join the order- Bishops, Cardinals, Pope- this would not bring me joy. If bothers travelled to distant countries and the whole world was converted to Christianity, this would not bring me joy. What would bring me joy? Imagine my arriving at the community after a long journey in winter. I have walking all night, I am covered in mud; icles on the hem of my cloak are lacerating and cutting my legs. I knock on the door of the community, a brother answers the door. I identify myself, but the brother refuses to let me in. I tell him I am exhausted and need to rest, he still refuses. I implore him, 'For the love of God, please allow me to enter.' The brother refuses and tells me to go away and foes back to his dorm, leaving me in the cold. To endure this patiently is my idea of joy.' (Short, 2008, Lecture 8)

Much can be found in this parable, but the main idea seems to be that true joy consists in being able to endure unjust suffering with patience. For example, perhaps we have been politically targeted at work, or have lost a job or are suffering with a terrible disease of some kind. Whatever the situation, Francis is saying that to endure such things with patience without being overwhelmed by feelings such resentment, anger or bitterness, this is true joy. Personally, I would call this peace of mind. But following Francis' suggestion, perhaps we can call this quiet joy or peaceful joy. The peaceful part of peaceful joy comes from the clearing out of our emotional programs, the No-Thing. But how do we find joy, especially in the face of unjust suffering?

An old adage says “the mind is like a mill wheel.” A mill wheel is always going round and round grinding wheat into flour. Likewise, the mind is constantly grinding on or thinking about something- worries, fears, concerns. Maybe what Francis is suggesting is that to keep our mind from being distracted with bad things, we should focus...
on the sources of real joy in our lives. But again, the question is how?

2.4 Thomas Merton on Spirituality

Thomas Merton may have some insight on this question of finding joy. Thomas Merton (1915-1968) was a Cistercian monk who wrote widely on contemplative prayer. He suggests that we are in very good spiritual place if we have achieved the following: if we can honestly appreciate the good things in our lives—family, friends, health—and we realize how fragile it all really is. (Merton, 2012) I think what Merton is saying is that we are grateful about the good things we have been given—they are not owned by us, deserved by us or even guaranteed to us, but given by God. Here I would define joy as the simple feeling “this moment is worth living and so will be the next.” So we are joyful about our blessings in life, something our mind can grind on instead of fears and anxieties. Yet this joy is tempered by humility as we realize that the good things we have could be altered or lost very easily. We understand that we do not have ultimate control over our fate. This is what Francis means by peaceful joy, and it is a goal within reach of anyone, not just monks or nuns.

3. Conclusions

In closing, I would suggest that this peaceful joy is what Mother Theresa may have reached in her own ministry. While her contemplative practices were barren for decades, she did seem to find a peaceful joy in connection with her day to day work. Maybe Mother Theresa, Saint Francis and Thomas Merton were on to something that the author if the Cloud did not fully grasp. To paraphrase an old hymn, “If its good enough for Saint Francis, its good enough for me.”

References


The World is a Beach: When the Waves of Generation X Hit the Shores of Society

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Abstract — As the 1980s came to a close, a social movement arose through music and swept the world. This paper uses the personal life and music of Kurt Cobain as a lens to evaluate the typical X-er.

Keywords — Music, History, Anthropology, Pop-Culture

1. Introduction

Generation X represented a new counterculture that became the mainstream and affected the world through its music, fashion, and angst. Arguably, the most important figure to lead Generation X was Kurt Cobain, the guitarist and lead singer of the band that dethroned Michael Jackson: Nirvana. Cobain was a typical “X-er”: withdrawn, angry, and embarrassed by his parents’ failed marriage. Cobain felt further alienated because he witnessed his mother’s boyfriend abuse her, peers called him gay because he hung out with a gay person in high school, and he lacked a consistent male figure. But Cobain and the others was that Cobain used music as an outlet. Whether playing or listening to it, Cobain released some of the built-up aggression from his traumatic childhood. Although he wrote instrumental orchestration first, lyrics are still very essential. The album Nevermind contains many allusions to events during his childhood and teens. This paper uses Kurt Cobain as a case study to understand Generation X.

2. Nevermind

Cobain’s personal life influenced the creation of Nevermind. For example, in the song “In Bloom,” Cobain speaks of a friendship with someone who liked the band but who blended in with a different social group. Cobain writes, “He’s the one who likes all our pretty songs/And he likes to sing along and he likes to shoot his gun/But he knows not what it means” (Nirvana “In Bloom”). Cobain stated that his friend listened to the songs, and knew the words, but he could not grasp the concepts within the music because he had not experienced Cobain’s life, a life that developed an attitude also reflected in the song “Lithium,” which discusses experiences such as loneliness and friendship, shown by Gen X-ers. Cobain tackles loneliness by addressing it directly: “I’m so happy ‘cause today/I’ve found my friends/They’re in my head” (Nirvana “Lithium”). Later in the song, Cobain sings “I’m so ugly, that’s okay/Cause so are you/We broke our mirrors” (Nirvana “Lithium”). Cobain exhibits a genuine dissatisfaction with appearance, but also uses that same dissatisfaction to reach out to someone else who can empathize with his struggles. 

Also on Nevermind, Cobain uses the song “Territorial Pissings” to launch an attack on the culture around which he grew up. He starts off the song by saying “when I was an alien/Cultures weren’t opinions” (Nirvana “Territorial Pissings”). By claiming to be an alien, Cobain separated himself from a far different culture, while going on to say people who are opinionated leaders set cultures. Cobain goes on to claim he has “never met a wise man/If so it’s a woman” (Nirvana “Territorial Pissings”), attacking the sexist ideas often associated with the group of people classified as “rednecks,” whom Cobain grew up around. Cobain says in Journals that he is “not gay, although I wish I were, just to piss off homophobes” (Cobain, 2002, p. 182). A recurring attitude that Cobain and other X-ers had was to reject any sort of discrimination that people, such as their parents displayed.

While Generation X focused on living counter to the mainstream, the song “Lounge Act” portrays a different side of Cobain’s culture. Cobain wrote this song about Tracy Marander, an ex-girlfriend who inspired some of the songs on Nirvana’s first album, Bleach, including “About a Girl,” which interrogates Marander’s urging for Cobain to get a job, and Marander’s desire for a traditional relationship with Cobain, who had no desire to settle down. Ironically, the same thing would happen to him in his next relationship with a drummer by the name of Tobi Vail. In “Lounge Act,” Cobain pens “I can’t let you smother me/I’d Like to, but it couldn’t work/Trading off, taking turns/Don’t regret a thing/And I’ve got this friend, you see/Who makes me feel and I/Wanted more than I could steal” (Nirvana “Lounge Act”). In those lines, Cobain discusses marriage, and hints that he
has moved on to someone else. The insight that Cobain provides allows the audience to believe that he views marriage as smothering, and that even though he would like it, he would not be happy. Cobain also says that he has no regrets, but as he moves on he finds himself wanting more than he can get from the person. The chorus of “Lounge Act” states, “I’ll go outta my way to prove I still/Smell her on you,” which may allude to the track “Smells Like Teen Spirit.” “Spirit” was the deodorant that Tobi Vail used. The second verse refers again to Marander. Cobain tells her that he will “keep fighting jealousy/’til its f---ing gone.” Though the relationship must end, he will still feel jealousy towards any man that gives her attention. Cobain reflects on many of these themes in Journals, published pages from his diary. Cobain talks about his drug use, conflicts within the band, depression, loneliness, and desperation. Before Cobain wrote Nevermind, he stated that he was “in absolute and total support of: homosexuality, drug use, in experimentation…antioppression, i.e. (religion, racism, sexism, censorship and patriotism) creativity thru music, art, journalism, love, friendship, family, animals and full scale violently organized, terrorist-fueled revolution” (Cobain, 2002, p. 130). The fame that Nirvana attained caused much of Cobain’s depression, a disorder with which many fans and people belonging to Generation X empathized and experienced themselves. On his fame, Cobain says, “It’s hard to decipher the difference between a sincere entertainer and an honest swindler” (Cobain, 2002, p. 179). In writing a review of Nevermind for Rolling Stone Magazine, Ira Robbins describes Nirvana as “scrappy garageland warriors setting their sights on the land of giants” (Robbins, 1991). The “land of giants” to which Robbins refers is mainstream rock, which was beginning to include the presence of other Seattle grunge bands such as Soundgarden and Mudhoney. By these bands snaking their way into the mainstream, they were able to establish a culture through their music that translated into fashion.

3. Conclusions

Music served an integral role in the revolution launched by Generation X. Noisy instruments drowned out the world and drew the music’s listeners who felt repressed, angry, and hurt by a society at large, while the successes of bands like Nirvana unified their audiences. Generation X arose from rejection: rejection from the past, rejection from the mainstream, and even rejection from their families. But the mass rejection of X-ers led them to create their own culture that accomplished what the punk movement of the 1970s could not. Grunge broke into the mainstream and dethroned the king of pop. Through music and fashion, Generation X built a new world order.

References

Measuring the Coefficient of Thermal Expansion using White Light Interferometry

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Abstract — A white light interferometer was created to directly measure the expansion of materials. This method exploits the non-coherent nature of the white light. This causes the interference fringes created by the multiple optical paths to be visible only when the net optical path difference is zero. Other optical methods such as a traditional interferometry with a laser source use fringe counting techniques, an indirect measure, to calculate the coefficients of expansion. To create interference patterns with a white light source the arms of the interferometer must be identical in length. A sample is placed in one arm and then heated or cooled, causing the arm with the sample to alter its length. The other arm is then moved to locate the interference pattern. The distance the second arm is moved is equal to the expansion length of the material. Coefficients of expansion of aluminum, copper, and steel have been determined using this method.

Keywords — Interferometry, thermal expansion

1. Introduction

Some interferometers use the method known as division of amplitude to create interference patterns (Fowles, 1975). This technique uses a single source that is split using a partially reflective surface, or a beam splitter. These separated beams travel along different optical paths and then are united to create interference patterns. While using a monochromatic coherent source, if the net optical path difference (which includes the actual path difference and the relative phase shift due to the reflections) is equivalent to an integer multiple of the light’s wavelength the light will interfere constructively and if equivalent to a half multiple of the wavelength the light will interfere destructively (Pedrotti and Pedrotti, 1993). If the path differences are altered, the interference pattern will shift to accommodate the changing path difference. For a white light source the optical paths of the split beams must be equal in order to generate an interference pattern (Jenkins and White, 1957). White light interferometry has been used to measure the thickness of material (Du, Yan, Nie, Zhang & Zheng, 2006; Hlubina, Ciprian, Luňáček & Lesňák, 2006; Pecheva, Montgomery, Montaner & Pramatarova, 2006;) and to study topology of surfaces (Grynszpan, Pastol, Lesko, Paris & Reapaet, 2004), but is not a method currently used to measure the thermal expansion coefficients. Precision alignment is the typical deterrent for using white light as an interferometer source.

The linear coefficient of thermal expansion is the fractional increase in the length per unit change in temperature (Schroeder, 2000). A mechanical method to measure the coefficient of expansion uses strain gauges which will experience a force as the material expands (Micro-Measurements, 2010). The traditional undergraduate laboratory method is to use a tube that is fixed at one end and has a strain gauge at the other end. As the rod expands the gauge value is then related to the expansion of the material. Optical methods are also employed to measure the coefficient. Scholl and Liby (2009) use a standard optical method to determine the coefficient of thermal expansion of copper. They used a Michelson interferometer with a 612 nm laser source and counted the number of fringes that move past the detector during the expansion. This number of fringes and the wavelength are used to determine the expansion length. The shifting of the interference pattern is a result of the optical path difference changing in the arm where the sample is placed.

2. Procedures

A white light interferometer was created using a GE 60 Watt bulb as the source, a 50/50 reflective pellicle as a beam-splitter, and two flat mirrors (see Figure 1). The pellicle was used to eliminate the need of a compensator which is normally used to aid in the creation of equal path differences due to the reflection through surfaces. The thinness of the pellicle does not affect the path difference like a thicker reflective plate does. One of the flat mirrors was connected to the sample to be analyzed while the other flat mirror was attached to a movable stage, a Pike Instruments (PI) M-112.1DG stage. This stage is controlled by a PI Mercury C-863 DC Motor Controller which is operated through the PI MikroMove software. The step size was set to be 0.0001 mm for this experiment.

The sample was heated using an Omega Duraflex Heating Strip which was controlled by an
Omega CN 74 Temperature Controller. Each sample was cored so that a thermal probe could monitor the temperature and provide feedback data to the controller. The thermal probe used was an Omega Precision Thermocouple 5TC-GG-K-24-36. Each sample was heated from room temperature to 24.0°C and maintained at that temperature. The samples were allowed to thermalize for 30 minutes before data was taken. After the heating data was taken the sample was allowed to cool back to room temperature and after reaching a stable temperature for 30 minutes another data set was taken.

The samples used are standard aluminum, copper, and stainless steel solid rods. Each sample was tested for purity using a simple density analysis. The white light fringe pattern is found for the sample at room temperature using visual observations. Five values of the position of the movable mirror are recorded: the first and last location the fringes are visible, the first and last location the complete pattern (which in this case is a four cusped hypercycloid) is created, and the location of maximum intensity. As the samples are heated or cooled the fringe pattern vanishes. The computer controlled stage is then moved until the pattern is once again visible. The same positions are once again recorded. The differences in the distances, ΔL, of the five locations are averaged to find the expansion length. The definition of the coefficient of expansion

\[ \alpha = \frac{\Delta L}{L_0 \Delta T} \]

where \( L_0 \) is the original length of the sample and the change in temperature, \( \Delta T \), is measured in Celsius. Each sample was run numerous times and the average values are listed in the results. The aluminum rod, the first rod tested, was sampled 28 times, the stainless steel rod 20 times, and the copper rod six times.

**3. Results**

The coefficient of thermal expansion for aluminum was found to be 23.80 x 10^{-6} ± 0.71°C⁻¹. Compared to the standard value, 24.0 x 10^{-6}°C⁻¹, this is a 0.83% difference. The coefficient of thermal expansion for the sample of stainless steel was 15.53 x 10^{-6} ± 0.51°C⁻¹. The standard value for stainless steel is in the region 11 x 10^{-6} to 17 x 10^{-6}°C⁻¹ depending on the composition of the sample. So the average for this sample falls into the expected region. The copper sample had a coefficient of thermal expansion of 16.89 x 10^{-6} ± 0.71°C⁻¹. This corresponds to a percent difference of 0.06% compared to the standard of 16.9 x 10^{-6} ± 0.51°C⁻¹. All standards are from Perry’s *Chemical Engineer’s Handbook 7th edition* (1997).

**Conclusions**

Using white light interferometry is a valid method to determine the coefficient of linear expansion of materials. It provides a direct measure of the expansion length to within the step size of the movable stage, 0.0001 mm. This method due to the small expansions that can be detected can be used for smaller samples as compared to traditional methods and temperature variation can be four to five degrees Celsius, which is lower than typical methods. An advantage over traditional interferometry is the elimination of vibrational concerns, which is a concern when attempting to count fringe shifts. The external vibrations may cause shifts in the fringe pattern which then are included in the fringe count due to the length expansion causing the count to be higher than expected because of the expansion. White light interferometry, though challenging to initially align, has many useful applications including determining the coefficient of thermal expansion.

**Acknowledgements**

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**References**


![Micro-stage with movable mirror](image)

**Figure 1.** The white light interferometer
Particle Distribution in a Curved Channel with Small Fluctuation Amplitude

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Abstract — This work considers the transport of Brownian particles in a curved channel, which is confined by a periodic potential. Asymptotic analysis method is mainly applied to analytically calculate the particle distribution in the limiting case of the small ratio between the fluctuation amplitude and the channel width. The leading order solution is a trivial solution of Boltzmann distribution. High order correction is obtained in this work, which helps researchers better understand the process of particle separation.

Keywords — Transport, Brownian particles, asymptotic analysis, curved channel

1. Introduction

The diffusive transport of Brownian particles in a confined region with or without external driving force is a fundamental problem in the process of continuous separation of different species in microfluidic devices, mathematical modeling of drug delivery, and the transport of particles in biological cells (Alberts et al. 2007; Bernate and Drazer 2011; Duke 1998; Herrmann et al. 2009; Pamme 2007; Saltzman 2001). Recent works focused on transport properties of Brownian particles confined by soft boundaries by using asymptotic analysis and Brownian dynamics simulation, which takes advantage of the small ratio between the channel width and the length of one period (Wang and Drazer, 2009; 2010). These analysis finally ended up with position depended diffusion coefficient, which is a function of channel width. However if the channel width is a constant all previous results will fail. This work will focus on this particular case, i.e., the transport in a channel with the same width.

2. Mathematical Model

The dimensionless long-time asymptotic probability density, \( P_\infty(x,z) = \lim_{t \to \infty} P(x,z,t) \), is governed by the equation,
\[
\nabla \cdot J_\infty = 0.
\]
The probability flux \( J_\infty(x,z) \) is given by
\[
J_\infty = \varepsilon \left( (Pe - \frac{\partial V}{\partial x}) P_\infty - \frac{\partial P_\infty}{\partial x} \right) \hat{i} + \varepsilon \left( \frac{\partial V}{\partial z} P_\infty - \frac{\partial P_\infty}{\partial z} \right) \hat{k}.
\]

Equivalently, the dimensionless governing equation for the long-time asymptotic probability is,
\[
\varepsilon^2 \frac{\partial}{\partial x} \left[ \left( P\varepsilon - \frac{\partial V}{\partial x} \right) P_\infty - \frac{\partial P_\infty}{\partial x} \right] + \frac{\partial}{\partial z} \left[ \frac{\partial V}{\partial z} P_\infty - \frac{\partial P_\infty}{\partial z} \right] = 0.
\]

Here the Peclet number is defined as \( Pe = FL/k_B T \) and measures the relative importance between convective and diffusive transport, where \( F \) is a uniform external force driving the particles in the \( x \)-direction, \( L \) is the length of one period, \( k_B \) is the Boltzmann constant, and \( T \) is the absolute temperature. And the Stokes-Einstein equation is used to write the diffusion coefficient \( D = k_B T/\eta \) where \( \eta \) is the viscous friction coefficient. We assume that the characteristic length scale in the cross-section is given by \( \epsilon L \), where \( \epsilon \) is the aspect ratio.

The far-field condition in \( z \) is a vanishingly small probability density and flux due to the confining potential,
\[
J_\infty^0(x, \pm \infty) = 0.
\]

Finally, the reduced probability is obtained by imposing periodic boundary conditions in \( x \),
\[
P_\infty(0,z) = P_\infty(1,z),
\]
and the normalization condition
\[
\int_0^1 dx \int_{-\infty}^\infty P_\infty dz = 1.
\]

2.1 Transport of Brownian Particles confined by a Parabolic Potential

For the sake of simplicity, a parabolic potential is considered here, which is specially constructed to confine particles in a curved channel with the same width in the cross-section (Fig. 1). The potential in the dimensionless form is,
\[
V(x,z) = (z + \lambda g(x))^2,
\]
where \( \lambda \) is the ratio between the fluctuation amplitude of the boundaries and the characteristic length in the transverse direction, and \( g(x) \) is a periodic function, i.e., \( g(x) = g(x+1) \). In the later specific calculation, \( g(x) = \sin 2\pi x \).
Figure 2. The schematic of a curved channel.

Previous work focuses on the special case of a narrow channel \( \varepsilon \ll 1 \) with \( \lambda - O(1) \) in which the channel is so narrow that particle distribution in the cross-section is considered to be at equilibrium. Therefore the original two or three dimensional problem can be approximated by a one dimensional problem by integrating over the cross-section, which is the well-known Fick-Jacobs approximation. This work will focus on another limiting case of the small amplitude of boundaries \( \lambda \ll 1 \). In terms of this small parameter, the solution of probability distribution is proposed in the following form,

\[ P_\omega(x, z) \sim \rho_0 + \lambda \rho_1 + \lambda^2 \rho_2 + \ldots \]

and the corresponding expansion for the probability flux is,

\[ J_\omega(x, z) \sim J_0 + \lambda J_1 + \lambda^2 J_2 + \ldots. \]

Substituting the perturbation solution into the governing equation, we obtain leading order system,

\[ \varepsilon^2 \frac{\partial}{\partial x} \left[ p \varepsilon \rho_0 - \frac{\partial \rho_0}{\partial x} \right] + \frac{\partial}{\partial z} \left[ -2zp_0 - \frac{\partial \rho_0}{\partial z} \right] = 0, \]

with the corresponding boundary conditions,

\[ j_0^\pm (x, +\infty) = 0, \]
\[ \rho_0(0, z) = \rho_0(1, z), \]
\[ \int_0^1 dx \int_{-\infty}^{\infty} \rho_0 dz = 1. \]

This leads to the leading order solution of probability density,

\[ \rho_0(x, z) = \frac{1}{\sqrt{\pi}} e^{-z^2}. \]

This is exactly the solution of Boltzmann distribution, which says that the leading order solution cannot feel the influence of slightly perturbed boundaries. In order to find out the influence from the perturbed boundaries, the higher order solution is desired. Here the governing system at order of \( \lambda \) is,

\[ \varepsilon^2 \frac{\partial}{\partial x} \left[ p \varepsilon \rho_1 - 2 \frac{dg}{dx} \varepsilon \rho_0 - \frac{\partial \rho_1}{\partial x} \right] + \frac{\partial}{\partial z} \left[ -2z \rho_1 - 2g(x) \rho_0 - \frac{\partial \rho_1}{\partial z} \right] = 0, \]

with the corresponding boundary conditions,

\[ j_1^\pm (x, +\infty) = 0, \]
\[ \rho_1(0, z) = \rho_1(1, z), \]
\[ \int_0^1 dx \int_{-\infty}^{\infty} \rho_1 dz = 0. \]

Then the probability density at order of \( \lambda \) is,

\[ \rho_1(x, z) = \frac{-2(2\varepsilon^2 \pi^2 + 1)^2 \sin 2\pi x + 2\pi \varepsilon^2 p_\varepsilon(2\varepsilon^2 \pi^2 + 1) \cos 2\pi x}{\pi^2 \varepsilon^4 p_\varepsilon^2 + (2\varepsilon^2 \pi^2 + 1)^2} z \rho_0. \]

3. Conclusions

Asymptotic analysis is applied to study the particle distribution in a soft channel with the same width confined by a periodic potential. The leading order solution is the trivial solution of Boltzmann distribution. And the higher order solution is obtained systematic asymptotic analysis. This work will enrich the research community of particle transportation and continuous particle separation.

References


Arthur Vining Davis Foundations High Impact Fellows

The $200,000, three-year grant from the Arthur Vining Davis Foundations created High Impact Fellows, a cadre of Wofford students who partner with a high school faculty member and a Wofford faculty member to develop ready-to-use classroom materials that reflect current research in various disciplines.

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Getting Inside: A Close Look at the Graphic or Visual Communication Design Industry

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Abstract — The industry of graphic design or visual communications evolves almost as fast as the software and hardware that support its creation. Changes occur so quickly that growth in this area needs to expand and accommodate accordingly. Keeping up with the latest trends, digital media, procedures, and even terminology is a daunting task. In order to increase my industry experience and knowledge base of the graphic design/visual communications field across all media, I proposed a plan with the goal of gaining insights that would serve to inform my teaching, students, and design practice. Situating myself in Seattle, I mapped out areas of focus and set goals: Interview with industry professionals; Tour agencies and corporations; Research available job postings and their descriptions—determining the specific skill sets that would be required for my students as well as various procedures in the application process; Connect with the design community of Seattle and surrounding areas; Create my own design presence and get design commissions. Results of the interviews, tours, and the examination of job postings/procedures revealed areas for revision in our design curriculum and in the preparation of students for graduation. Connections produced several commissions. My new website showcases my work. This experience expanded my knowledge, exposed me to different design aesthetics, gave me additional credibility, and allowed the opportunity to look inside the design industry.

Keywords — Design, graphic, web, visual, communication

1. Introduction

The ability to keep current in the graphic design or visual communications field can challenge even seasoned professionals. Interestingly enough, the profession also confuses us with the title, or what we call our work. We cannot decide. Are we graphic design, visual design, visual communications, communication design, or what? Graphic Arts used to be our title but a historical look reveals that term referring more to the production of printed design and the trade of printers on presses. Evolutions in the industry occurred most rapidly with the introduction of desktop publishing. This took the design and production of graphic design work from a two to three person endeavor to a one-stop shop sitting at a desk with a huge CPU and black and white monitor. Desktop publishers could now design, set type, insert images, and add color indications, basically taking the jobs of a designer, typesetter, and paste-up person and rolling them all into one. Further advances in technology served to increase capabilities and while these expanded a designer’s control over a project, it also added more responsibility and an expectation of a larger skill set than in previous periods.

For the design educator, this resulted in an accelerated learning curve. Many educators were caught off guard and had to scramble to deliver timely material to students. Through the years this has been the case. As educators teach design, the technology is ever moving forward. We learn a new version of software, finally get it in the classroom for use and within six months, a newer version is released and the process begins again. Design practice and trends as well as job positions and their descriptions change in order to meet the need. So how does the designer/educator keep ahead of the curve? In order to meet this challenge, I felt compelled to invest in a plan to meet it. I proposed a plan to explore several opportunities including mentoring with the private sector, engaging in study, researching available job positions and their descriptions. All with the goal of gaining insights that would serve to inform my teaching, my students, and my own professional development.

2. Industry Interviews

After ‘cold calling’ several lead agencies, I set up appointments that included interviews with either
owners, creative and/or art directors, designers, or recruiters within each advertising or design agency. I asked them versions of the following:

**The Business:**
What direction do you think the advertising/design industry will take in the future? What will it look like in 5 years, 10 years?

What will be the next big thing in advertising/design/communications? What about technology? What’s next?

Where do you think branding is headed? Are there so many brands that the consumer will give up and just go to the tried and true brand they always used?

What will the consumer facing retail market look like? Will we all be online shopping? Will there be any more physical retail stores?

What will B2B be like? (B2B = Business to Business)

What do you think about the big surge of interest in info graphics? Is there a market for this kind of work?

**Education:**
Is there a market for graphic designers anymore? —More specifically, design for print designers?

If you were to draw a pie chart and divide it up into percentages of a designer’s education or say, their portfolio, what would the categories be and how much in each?

**Web/interface:**
Should students become more versed in computer science, coding and the like?
Interactive UX UI
Motion Advertising Info Graphics
Mobile design Way finding

**Portfolio:**
What does your ‘winning’ portfolio of work look like? How many pieces? What kind of variety?

What direction do you think the advertising/design industry is going to take in regards to future careers?

What does an ideal design education program look like to you? What should it have?

**Getting a job:**
Best advice for finding/applying for jobs?

What should they feature on their résumé?
More about their technical skills or more about their work or education? How does one get noticed when many jobs wouldn’t allow one to post a PDF of their résumé. What if it has to be uploaded as a word doc or cut and pasted into a cell?

We strive to provide our students with a well-rounded design sense and skill set that help them prepare for entry into the industry. Excellent portfolios that show a wide variety of work, as well as good ideas continue to be key to getting jobs. These interviews supported our philosophy and also revealed several areas that our students need to focus on when making work for portfolio inclusion: web-based projects, marketing and branding, and also projects that showcase good ideas. A short list of must haves: personal websites and personal identity systems, good ideas, sophisticated design, a good variety of collateral pieces, a process piece, and they need to apply a brand experience and extensions of a brand to several media including video, print, storyboarding, advertising, products, point of purchase displays, and package design.

We emphasize much of this already, but this certainly reinforced and expanded my interpretation of expectations.

3. Tours of Agencies and Corporate Headquarters

Through new contacts and existing connections I was able to get inside some major corporations and agencies. Pictured below are a few of the highlights.
Photos 1-2. Tour of Microsoft with Jeremy Knudsen, former student of mine during my graduate school teaching at University of Idaho.

Photo 3. Me with the Founders

Photos 4-6. Starbucks Corporate Headquarters. A guided tour by the Director of Global, IT, John Shepard.

Photo 7. Tether Agency Founder, Stanley Hainesworth and Nancy Urner, Operations Director.
Photo 8. Inside Tether.

Photos 9-10. Wexley School for Girls agency

Photo 11. Amazon campus in South Lake Union, Seattle.

Photo 12. Inside one of the Amazon buildings.
4. Job Posting Research

Our students need to know the best practices for entry into the industry. They need to be informed and armed with the best possible tools for acquiring positions. Since I am of the belief that one always learns best by doing, part of this experience meant immersion into the process of looking for positions. I searched using the obvious Craig’s List and classifieds, but also through one of my contacts, I had a list of staffing and/or temp agencies. I signed up with three: Filter, Creative Group, and Creative Circle. Filter and the Creative Group were basically online only services while Creative Circle actually had me come in and interview with them so they could ‘place’ me more easily. This was fascinating to me. It was all very formal and thorough. Contracts and tax forms signed and procedures explained, I came out of the interview with the expectation that they would first send me notifications of jobs, I respond to their emails, and they then present me to the clients. These agencies make their profits from the employers, not the applicants, so I did not have to pay fees. So from then on, I received 1-3 job positions daily.

These postings, while generally temporary positions, contain capsulated skill sets. I need these along with the full time postings I was finding, to inform and possibly correct current curriculum ‘holes’ in content, or to provide new ideas for course development and direction.

5. Connections to the Design and Arts Community

Early on, I connected with the local Seattle chapter of AIGA, the professional association of design, (Graphic Design’s national organization) and found several events I could use as networking opportunities. The SlideLuck PotShow is an event that showcases visual artists (mostly photographers) in a slideshow with a discount on entry if attendees bring a potluck item. It occurred...
at VODA photo studio. I decided to volunteer thinking I would meet more people that way. My contact person ended up being from Corbis, a stock photo company. I met other people as well, including my filmmaker friend who has made a documentary about the Fremont Arts Council and the Troll.

The Wayzgoose Smackdown, a large format printing event, pitted several agencies against each other. The School of Visual Concepts hosted the event. Poster/prints were so large they printed them using a steamroller. It was great to see all the agency work plus vendors were there to sell paper, books, inks, type sets, and other supplies.

In order to solicit more freelance work, I too, needed to create an identity system for myself. I wanted to use my existing logo as it is established and has identified my work for years. I started this process early on in the assignment. Requiring my immediate attention, I began by reducing my 8 page academic CV to a 2 page designer résumé. My design experience needed to be more forward facing and I would design with other promotional items in mind such as a website and business cards. Fontspeak is the title I use because my name is a common one. (Images included at end of article.)

I then turned to website development. The website is critical to job applications as many employers will not accept PDFs of work any longer and insist on the URL address in order to view one’s work. Knowing students were not always adept at website functionality, I searched for website template sites where they could chose a layout and upload their images to showcase their work. These sites are made for portfolios most specifically. Some of the many options include WIX, Wordpress, Cargo, Squarespace and issuu. I found a couple of them too limiting as I have several categories for my work. I chose issuu because it afforded me the option to upload already designed double page spreads that then turned into magazine type layouts. The interface simulates the turning of pages.

6. Personal identity and website development

In order to solicit more freelance work, I too, needed to create an identity system for myself. I
Conclusion

This extensive 'look inside' already serves to inform my teaching, my students, and my own professional development. My experiences resulted in an increased awareness of the latest skills required for students entering industry, information about project inclusion for portfolios, documentation of agency locales as examples, and expanded knowledge of the industry and its future. I gained new perspectives about design and viewed works in progress. I advanced my opportunities for networking for teaching and professional growth. These connections produce commissioned work such as my design for the documentary film title, *Hall of Giants, the story of Fremont Arts Council and the Troll.*

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Figure 5. Résumé. Textured paper background, cropped images, and LAnderson logo occur on all promotional pieces.
Figure 6. Two-sided Business Cards. This view shows both sides. The cards would fold down the middle vertically and be glued to create a thicker stock. Then they would be trimmed out to form ten different images on the back of cards.

Figure 7. Website portfolio.
Book Design: Charles William Link, A Past Disseminated by Design

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Abstract — Designers can take what appears to be an overwhelmingly complex and sticky web of information and transform it into a legible, understandable, and even more surprising, aesthetically pleasing form of communication. The dissemination of ancestry transformed into a book format presents designers with one of the most challenging problems. Lisa Anderson and Jarod Phillips designed and produced a 117+ page edition of 150 hardcover books featuring the ancestry of Charles William Link. Commissioned by Mr. Link, this self-published run with a full color cover, intrigued us as the text includes historical references and research well beyond his family tree. We visualized a book full of information collected by the author with features such as spreads containing world history as it coincided with the main text. Historic images, memorabilia, and timelines would be utilized in such a way to attract the audience. Jarod Phillips, helped to organize the content, layout, and typeset the copy, create artwork, timelines, catalogue, digitize and edit vintage photos/images, and assist in the preparation of the manuscript for printing, including pagination. A rare opportunity, it provides the student and myself with an excellent "text-rich" portfolio component and potentially a 'showcase piece' for future commissions.

Keywords — Ancestry, book design, bindery, case-bound

1. The Design Process

Designing a multipage document is challenging for any designer therefore, one needs to keep the following key aspects in mind: Planning is essential, Knowing the desired end product, Budgeting resources and awareness of constraints, Establishing a timeline of collection, input, production, Pleasing the client, Creating a design to engage the audience, Producing a finished product in a timely manner. These comprise main considerations of the design process. This paper and presentation will systematically demonstrate the process of a large design project from beginning to end, using visuals and narrative to communicate. This example can serve as a guide for students, designers, and clients in order to facilitate a better understanding of process, thereby provide a kind of model for future design practice.

2. Book Design

2.1: The Project

“I need a book designed that features my family heritage,” stated Charles William Link (Bill) in October of 2011. Lisa Anderson thought this could potentially be a good student project if she could find one that had time and the people skills to appreciate such a project and its client. So they agreed to meet.

As Link proceeded to tell her about his project and what it would involve, she began to shift her interest. This project was big. He described an edition of 500, with approximately 150-pages, case-bound book, (hardback) with a full color cover photo, like a “coffee table” book. He wanted color on the inside pages too, “if it wasn’t too expensive.” He went on to add it would have 200 ‘or so’ photos and twenty pages of background information, plus biographies of family members. All in addition to the family tree multi-generational breakout descriptions and charts she expected to see. The scope of the project widened. The financial commitment he was willing to make would be substantial. The book would be a huge responsibility.

As a student advocate, Lisa Anderson knew a graphic design student would be overwhelmed with the amount of work and detail involved. So she decided to take this one on herself, knowing she would apply for a Research Assistant as so possible. What an excellent opportunity for a student to experience firsthand a large, text rich, photo-filled project of this kind. Also, if Link’s funding ran out, the student would not be affected. In addition, she would be able to oversee the production of a large multi-page document and take it to press. It provided an excellent opportunity not often available in her capacity as a professor. Just as technological advancements are made in hardware and software for the graphic design industry, the printing industry makes advances in production methods. Anderson could also share this knowledge in the classroom.

On his next visit, he brought in photos and binders of his text. Because of their age, photos were not digital. So, scanning, indexing and documentation would be involved. Link and Anderson discussed a contract and a payment...
schedule. The contract would provide an estimate or a set amount, a deposit up front, a production timeline, and payment schedule. According to the contract, printing costs would be entirely Link’s responsibility.

3. Method

3.1 Preparation

Anderson applied for the Research Assistant and for a course reallocation award for spring 2012. The student must have the time to devote to a semester-long project with a flexible enough schedule for client meetings and tight deadline crunches. Other requirements included: reliability, software skills, design talent, conceptual aptitude, willingness to collaborate, and a desire to learn. Anderson predicted that Phillips would bring even more to the project. Once word came of our awards, we began our process. The project started with scanning and documentation of the photos. Link still needed to edit text. So the start up was rather slow. A design project of this size requires all the elements before designing.

Local printer bid estimates came in very high as they use traditional presses and sent out books for binding, so Anderson researched online book printers like Lulu. This research revealed many options and quantities could range from one book to hundreds. The process for online printing of books is this: Choose the format and number of pages, create the layouts according to their specifications, save them as PDFs, upload them to the book website, and choose quantity. A single proof would be approximately $30. If something was wrong, it would have to be fixed and then another proof would be needed. For an edition of this size, Anderson knew if we ordered as needed, slight variations within each book would occur. Finished books would cost $25-35 each. We had to find alternatives. The solution came not surprisingly from the state of Utah, home of Ancestry.com, and the most famous of the genealogy research sites. Salt Lake City boasts two print shops specializing in printing ancestry books for families: Family Heritage Publishers and Family History Publishers. Anderson authored new bids under their guidelines and we were pleased to find a reasonable price for a now more reduced number of books. Link had decided he could not use or sell his original edition idea of 500 books. We had the publishers bid for editions of 100, 200, and 300. The bids for full color inside and out were prohibitive (which we knew would be much higher). So Link kept his original hardcover, case-bound, full bleed photo cover idea and went to one color on the inside.

3.2 Design

Relating a design throughout multiple pages including the cover proves to be a challenge for the designer. Inside layouts or spreads (usually two pages) would need to be interesting yet keep the same feel as other parts of the book. We knew we would have three sections of text: 1) Link’s account of his ancestry quest including background history of Germany, German naming and handwriting customs, and background of the family in general terms. 2) The Families and their individual timelines. 3) Biographies of individual members collected by the author. Photographs and other imagery would also be elements for inclusion. In addition we knew Link wanted to incorporate the Link Family Crest. Phillips and Anderson considered several ideas for layout of the book. We used interactive examples such as, Journey of Hope by Kerby and Patricia Miller as inspiration and incorporated the spirit of them into the design. Format was discussed; recommendations such as a landscape orientation were made to the client. We created a grid system that would be altered to accommodate the varied sections and their contents.

Figure 1. “German and Family History” section layout.

Figure 2. “The Generations” section layout.
The cover would showcase a photo of the German town, Aldingen, where the majority of the Link family originated. This is also the town where Link first found and met members of his family. We pressed the client for a name for the book. Phillips felt Linking Generations was the best title and Anderson agreed. Eventually we convinced our client that it far outshone “the History of the Link families” or other such renditions. We enjoyed the play on the word Link, as it was also the author’s last name. Yet, since it did not specifically say Link, it was far more inclusive of the other families featured in the book than other options we considered. Phillips and Anderson appreciated being a part of the creative process in naming the book. After so much scanning, Phillips happily started designing the title including choosing the perfect typeface, Deutsch Gothic. He ‘linked’ the last letter of Link and the first letter of Generations (because they are the same letter, a visible connection could be created) to reveal a brilliant visual representation of the meaning of the title.

Figure 3. The “Biographies” of family members section layout.

Featuring the Link Family Crest became a challenge. Electronic versions of the crest were pixelated, lacking in quality and the embroidered version contained incorrect colors. Neither would work well for print. So taking a cue from patterned endpapers and repetitive designs in wallpaper, Phillips created a silhouette of the crest, placing multiples on a gray background, and then positioned the resulting pattern on a double page spread. It would become the background for the pages that divide the main sections of the book. Anderson ended up hand rendering the Link Family Crest as an illustration for the cover and title pages as well.

Figure 6. Typographical element (letter L) adaptation for Chapter Headers.

3.3 Production

The process continued where we inserted actual text into our matrix grid layouts. The number of pages this would require became more evident and we adjusted our bids to the printers to accommodate the changes. We divided out production where Anderson designed and typeset the historical and informational section and the biographies. “The Generations” section required particular attention as the photos’ insertion locations became critical. With his knowledge of the photos, Phillips created these sections. Together we designed the section break pages.

Figure 4. Early versions.

Figure 5. Final version.

Figure 7. The Link Family Crest and section break pattern.
3. Results

Up to this point our deadline for prepress completion had been pushed forward several times due to predetermined schedules of the client and our own school-related commitments. We worked on several portions of the work during the month of May when Phillips and Anderson could work together without scheduling conflicts. A firm, established deadline of June 4, 2012 occurred when Anderson decided to seek funding for travel to Salt Lake City in order to oversee the printing of the book. She felt the experience would inform her teaching and provide an even better product for our client.

Once the point person at Family Heritage Publishers, (winner of the bid) had the files, he provided Anderson with a press proof and color proofs for the cover. Being onsite provided her the opportunity to make some adjustments to the files, resave them, and have them reimported at the printer. Anderson received a tour of their operation and watched the proof come off their very sophisticated copier. Yes, to make Linking Generations an affordable short run book, it was run on a new industry standard copy-style printer. The company had provided us samples earlier in the process so we knew the printing and paper quality. The cover ran on a different machine. Once the ‘guts’ were printed the book would be bound in-house and shipped within the next week. She felt confident the book would be successfully printed because they seemed genuinely invested in its future. Impressed with the quality, the owner shared that many of their jobs did not have this high caliber of design. The books arrived in Spartanburg in perfect condition. Finally his dream of a published family heritage book was realized.

Link reports positive reviews from family members and others who have purchased the book. The reviews reflect the care and meticulous attention to detail required for the design and production of a book.

4. Conclusions

A project of this size will never go ‘as planned’ especially with the number of variables we encountered. Learning and experience gained in the process will serve both of us in future projects and in client relations. Skills obtained in the interpretation of client needs, design, and production, plus time and budget management in the oversight of a project from beginning to end will extend our professional experience. We were challenged, met those challenges, and benefited from the completion of tasks along the way. Our client received a well-designed and thoughtful representation of his ancestry.

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