TEXAS A&M UNIVERSITY
CORPUS CHRISTI

TRiO

RONALD E. McNAIR
POST-BACCALAUREATE
ACHIEVEMENT PROGRAM

BIOGRAPHY OF
DR. RONALD E. McNAIR

HE OVERCAME OBSTACLES.

Dr. Ronald Erwin McNair, Physicist & Astronaut, dared to dream. As an African-American growing up in a poor community in the South, he encountered discrimination early in his youth. Yet this did not stop him from pursuing his dream of becoming a scientist.

HE ACHIEVED ACADEMIC EXCELLENCE.

In 1971, he graduated magna cum laude from North Carolina AT&T State University with a B.S. degree in physics. Ronald McNair then enrolled in the Massachusetts Institute of Technology. In 1976, at the age of 26, he earned his Ph.D. degree in laser physics.

HE BECAME A LEADER IN HIS FIELD.

Dr. McNair soon became a recognized expert in laser physics while working as a staff physicist with Hughes Research Laboratory. He was selected by NASA for the space shuttle program in 1978 and was a mission specialist aboard the 1984 flight of the shuttle Challenger.

HE WAS RESPECTED AND COMMENDED.

For his achievements, Ronald McNair received three honorary doctorate degrees and many fellowships and commendations. These distinctions include: Presidential Scholar, 1967-71; Ford Foundation Fellow, 1971-74; National Fellowship Fund Fellow, 1974-75, Omega Psi Phi Scholar of the Year, 1975; Distinguished National Scientist, National Society of Black Professional Engineers, 1979; and the Friend of Freedom Award, 1981.

HE EXCELLED IN MANY ASPECTS OF LIFE.

Ronald McNair also held a fifth degree black belt in karate and was an accomplished jazz saxophonist. He was married and was the dedicated father of a daughter and a son.

After his death in the Challenger explosion in January 1986, members of Congress provided funding for the Ronald E. McNair Post-Baccalaureate Achievement Program to encourage college students with similar backgrounds to Dr. McNair to enroll in graduate studies. Thus, the program targets students of color and low income, first-generation college students. This program is dedicated to the high standards of achievement inspired by Dr. McNair's life.

Biography courtesy of the University of Nevada, Las Vegas

TABLE OF CONTENTS

2015 McNAIR RESEARCH ARTICLES

PROVOST AND VICE PRESIDENT FOR ACADEMIC AFFAIRS

DR. KELLY QUINTANILLA

The McNair Scholars Program at Texas A&M University-Corpus Christi continues to play a key role in helping the university to achieve its objective of ensuring that disadvantaged students persist in their education and achieve the professional careers they desire.

The McNair Journal illustrates the program's commitment to improving students' academic ability through professional guidance and direct participation in scholarly research. The articles in the following pages of this journal are a reflection of the McNair Scholars Program's dedication to helping underrepresented students attain the academic and professional abilities vital to their post-baccalaureate endeavors.

The substantial accomplishments of these McNair Scholars demonstrate the continuing success of the McNair Scholars Program in challenging and motivating students to overcome obstacles and achieve their academic and professional goals. It is an honor for TAMUCC to host the program and the dedicated faculty and staff that help make it successful.

Kelly M Quintanilla

Dr. Kelly Quintanilla
Provost and Vice President for Academic Affairs

ASSISTANT VICE PRESIDENT FOR STUDENT SUCCESS

DR. GERARDO MORENO

Texas A&M University-Corpus Christi is devoted to developing the academic and professional abilities of underrepresented students through specialized approaches to education that focus on cultivating academic excellence. TAMUCC's McNair Scholars Program shares this common goal and is an integral factor in helping to transform our students into the professionals of tomorrow.

The McNair Journal is the product of the hard work and tireless dedication of the McNair students, staff, and contributing faculty members. This journal clearly displays the successes of the McNair Program in equipping its students with the necessary skills to succeed in their chosen fields.

I would like to commend the McNair Scholars for their significant achievements and extend my gratitude to all contributing faculty and the entire university community for its continued support of our students' scholarly activities.

Sincerely,

Dr. Gerardo Moreno
Assistant Vice President for Student Success

MCNAIR SCHOLARS PROGRAM STAFF

DR. PATRICIA SPANIOL-MATHEWS
PROGRAM DIRECTOR

MS. MARGARITA COOPER
ADMINISTRATIVE ASSISTANT

MS. ANABEL HERNANDEZ
PROGRAM MANAGER

JOURNAL EDITORS

MR. ETHAN RICE
SENIOR EDITOR

MS. MARGARITA COOPER

MS. ANABEL HERNANDEZ

DR. PATRICIA
SPANIOL-MATHEWS

2015 McNAIR RESEARCH ARTICLES

PHENOTYPIC VARIATION IN INTERTIDAL LIMPETS (*CELLANA SANDWICENSIS*) ALONG A DEPTH CLINE IN PAPAHANAUMOKUAKEA MARINE NATIONAL MONUMENT

by MATTHEW CRUZ

MENTORS

Dr. Derek Hogan

Assistant Professor
Department of Physical and
Environmental Sciences
College of Science and Engineering

Dr. Chris Bird

Assistant Professor
Department of Physical and
Environmental Sciences
College of Science and Engineering

Ms. Polly Hajovsky

Research Technician
Genomics Core Laboratory
College of Science and Engineering

ABSTRACT

Extreme environmental gradients can drive the vertical zonation and speciation of organisms inhabiting intertidal shorelines. The upper, mid, and lower sections rocky-intertidal shores experience different temperatures, desiccation, hydrodynamic forces, and predation pressure. Limpets are an ideal taxon to study adaptations to environmental conditions because the properties of their conical shells are well understood with respect to thermal, desiccation, hydrodynamic, and predation stress. In this study, we test for relationships between phenotypic variation in shell morphology of Cellana sandwicensis limpets and shore height on the islands of Mokumanamana (MMM) and Nihoa (NI) in the uninhabited Papahanaumokuakea Marine National Monument. Cellana sandwicensis is endemic to the Hawaiian archipelago and has many adaptations to thrive on wave-swept, rocky-intertidal shores. It was expected that the limpets would exhibit morphologies that are more resistant to thermal and desiccation stress at the upper limit of their vertical range, more resistant to predation pressure at the lower limit of their range, and more resistant to hydrodynamic force in the middle of their range. Relative indices of height (height/length), pointiness (angle of shell spire), aperture roundness (width/length) and desiccation susceptibility (circumference/volume) were determined for limpets collected from the upper limit, lower limit, and middle of their vertical range on NI (n=132) and MMM (n=128). There were phenotypic differences between

limpets at the upper, mid, and lower ends of their vertical range for all morphological indices investigated on both MMM and NI. At both islands and for all shore heights, as shell length increased, shells became relatively taller and pointier, with increasingly round shell apertures, and decreasing ratios of aperture circumference to shell volume. The relationships between the morphological indices and shore height followed expectations on MMM, but not on NI, where the mid-shore adult (>20 mm) limpets had the tallest, pointiest shells with the roundest apertures and lowest ratio of aperture circumference to shell volume. Further genomic investigations will be conducted to determine how much of the variation in morphology is due to phenotypic plasticity relative to genotype.

INTRODUCTION

The realized morphological variability in a species is driven by both genetic identity and environmental factors. It is well evidenced that over time, phenotypic changes can be related to genotypic changes that lead to speciation, such as finches in the Galapagos Islands, snakes in Australia, and marine invertebrates in intertidal shorelines around the world (Reid 1989). In many cases, phenotypic variations have been correlated to ecological (environmental and/or biological) parameters (Harley et al. 2009). Phenotypic plasticity, the variability within characters of organisms that is not genotypic in nature, is common and can underlie at least a portion of phenotypic variation.

Intertidal zones are good systems to research phenotypic variation along an ecological gradient. Intertidal zones occur at the interface of the aquatic and terrestrial spheres where tidal and wave action variably inundate and expose organisms. In the Hawaiian archipelago, there is evidence of phenotypic variation in shell morphology among the vertically stratified intertidal *Cellana* spp. (*C. exarata, C. talcosa,* and *C. sandwicensis*) (Bird 2011). *Cellana sandwicensis* inhabit the mid-shore area of the Hawaiian rocky intertidal zone and are an excellent model species because individuals are subjected to different levels of environmental and biological stressors throughout their vertical range on the mid shore. For example, organisms lower on the shore are more susceptible to predation by fishes and crabs, while organisms higher on the shore are more susceptible to thermal heating and desiccation. Hence,

the mid shore can be divided into three different sections according to environmental variation: high (subjected to extreme temperature gradients and desiccation), mid (subjected to the greatest hydrodynamic forces due to wave action) and low (subjected to the greatest predation pressure) (Bird et al. 2013).

Morphological shell variation in *C. sandwicensis* could be related to the different abiotic pressures in the mid shore. Taller and pointier shells can be more easily grasped and crushed by predators but are more tolerant of thermal stress. Shells with circular apertures experience greater hydrodynamic drag forces than those with ovate apertures. Smaller ratios of aperture circumference to shell volume are associated with greater desiccation susceptibility.

This study focuses on phenotypic variation in shell morphology of *C. sandwicensis* collected from different shore heights on two Hawaiian Islands: Mokumanamana (MMM) and Nihoa (NI). We test whether shell morphology varies across shore heights as expected given ecological variation and the morphological constraints of limpet shells.

METHODS

A total of 260 *C. sandwicensis* were collected from MMM (n = 132) and NI (n = 128) during the summer of 2013. Limpets were classified by size based on lengthwise measurements of their shells ranging from 0-1, 1-2, 2-3, 3-4, 4-5, and 5-6 cm. Eight samples of each size class on each island were collected from each of three sections within the mid shore of the rocky intertidal zone: high-mid shore (HM), mid-mid shore (MM) and low-mid shore (LM). The length, width, height (lengthwise), and height (widthwise) of each shell were measured using analogue dial calipers. Measurements were then used to calculate the height index (height lengthwise/length), aperture roundness index (width/length), desiccation index (circumference/volume) and pointiness index (2°tan*width/height lengthwise). An analysis of covariance was performed (shell length was used as the covariate) to test for differences between each section (HM, MM, and LM) on each island with respect to the aperture roundness index, height index, pointiness index and circumference to volume ratio. Additionally, we tested for differences between trends of

FIGURE 1.
Scatter plots of Height Index (height lengthwise/length) and Pointiness Index
(2°tan*width/height lengthwise) versus length (mm) with best-fit least-squares regression lines plotted
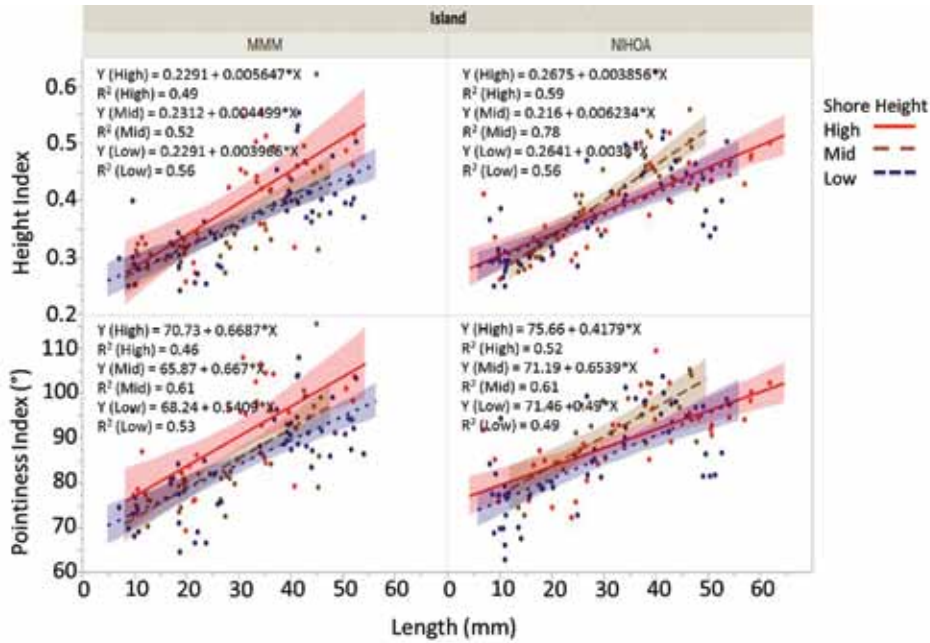
FIGURE 2.
Scatter plots of aperture roundness (shell aperture width/length) versus length (mm)
with best-fit least-squares regression lines plotted
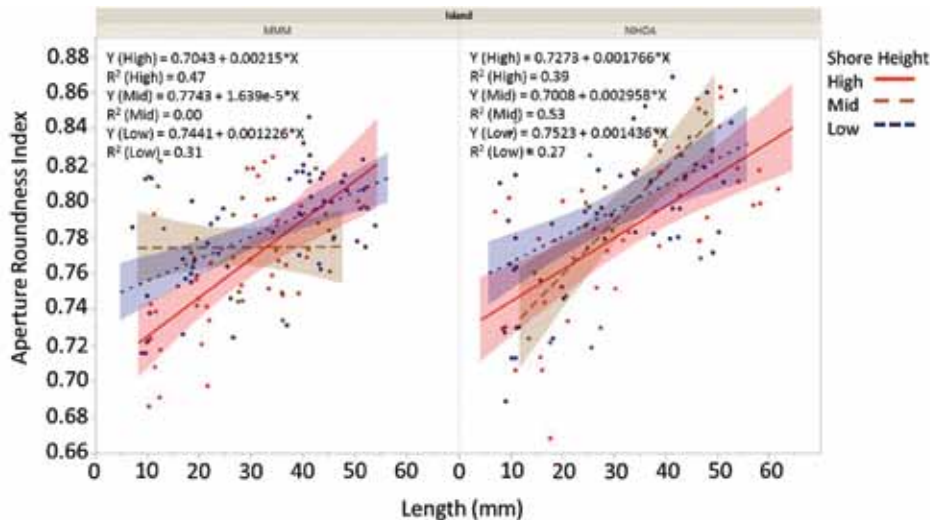
indices found on MMM and NI. Each test was performed to determine if slopes were significantly different from zero or each other and if the elevations of the regression lines (y intercepts, not shoreline elevations) were significantly different from each other.

RESULTS
Pointiness & height indices

The height index and index of pointiness were highly correlated, so we only discuss the index of pointiness
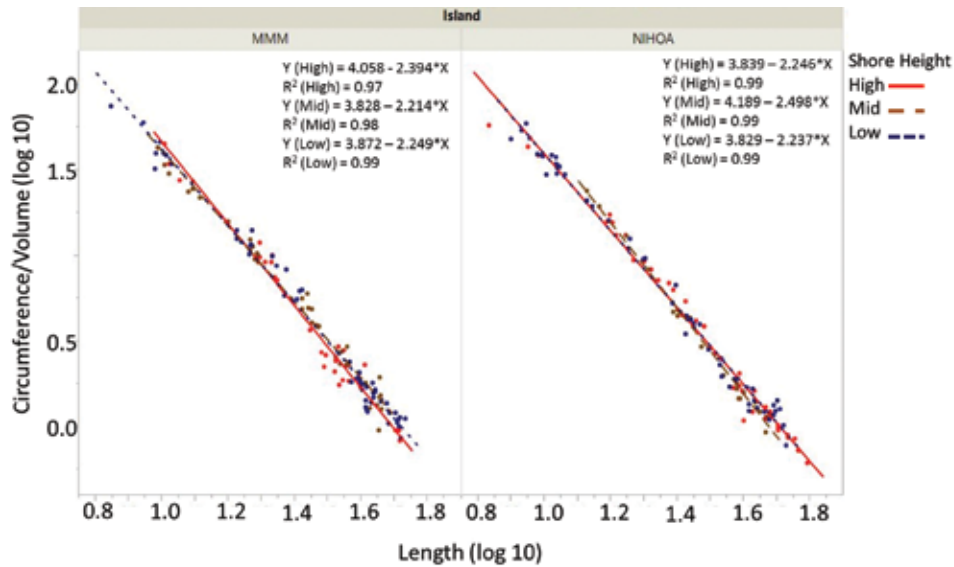
FIGURE 3.
Scatter plots of Desiccation Susceptibility (log circumference/ log volume) versus length (mm)
with best-fit least-squares regression lines plotted

here. The pointiness of the shells increased as length increased for all zones and both islands (P<0.0001, Figure 1). On MMM, as expected, limpets from the low-mid shore were the least pointy and those from the high-mid shore were the most pointy (p<0.0001). The slopes of shell pointiness versus shell length were significantly different between the shore heights (P < .0001), with the low-mid shore having the smallest slope and the high-mid shore having the largest slop on MMM. On NI, contrary to expectation, the mid-mid shore limpets were the pointiest and had the greatest slope for shell pointiness versus length. Interestingly, the slope and elevation of high-mid shore limpets on MMM and mid-mid shore limpets on NI were not significantly different.

Aperture roundness index

The shell apertures became increasingly round with increasing shell length for all limpet samples (p<0.0001, Figure 2) with the exception of the mid-shore sample from MMM (p=0.014), where the slope was not significantly different than zero (p>0.05). The mid-mid shore limpets from MMM behaved as expected, with the adults being the most oblong. On NI, however, the adult mid-mid shore limpets were the most round. In general, the patterns of variation of roundness with

length were similar for the low and high zones of both islands: the shells got more oblong (aperture roundness closer to 1) as length increased (Figure 2).

Desiccation susceptibility index (shell aperture circumference/volume)

The desiccation susceptibility index values decreased as shell length increased (Figure 3), and there was a very strong relationship between these parameters ($R^2>=0.97$). The larger the shell, the less susceptible a limpet is to desiccation. Thus, having greater volume would help mitigate desiccation since it would be able to hold more water. Additionally, less circumference presents less area where water can evaporate. As with shell pointiness and aperture roundness, the high-mid shore limpets on MMM exhibited a similar pattern to the mid-mid shore limpets on NI (higher desiccation susceptibility index in small limpets and lower desiccation susceptibility index in large limpets), and this pattern was slightly different than that of the other samples. This result was unexpected for the juveniles, but the differences were not statistically significant.

DISCUSSION

C. sandwicensis limpets exhibit morphological traits that confer an advantage for the wave zone on Hawaii's rocky intertidal shores, such as being shorter than limpets that reside higher on the shore because they have more predation risk and less thermal and desiccation stress (Tyler 2014; Bird 2011). Not surprisingly, these traits vary among *C. sandwicensis* residing at different vertical shore levels.

The shell pointiness index varies with depth in a similar fashion to that of the height index, as height plays a factor in both of these indexes (Chiba 2005). Crabs can grasp and crush pointy shells more easily than flatter, round shells because of the increasing slope of the shell (Tyler 2014). So we propose that this is why *C. sandwicensis* are flatter with greater depth and why the smaller limpets, with thinner shells, are flatter than the larger limpets (Denny 2000). It was unexpected, however, that the mid-mid shore limpets on Nihoa were taller and pointier than those at other shore heights. We propose that this may be due to different conditions on the two islands, or there may have been a mistake in classifying the shore heights of these limpets.

Regarding the aperture roundness index, the data support our expectations that adult *C. sandwicensis* on MMM are more oblong than limpets residing higher or lower on the shore. Due to constant bombardment by wave action that occurs in the mid-shore region, being oblong can reduce the drag force experienced by limpets (Ortega 1985). These changes can reduce drag and have no apparent adverse effects on the shell itself (Denny 2000). Additionally, smaller, younger limpets tend to exhibit less adhesive tenacity (CEB observation) and they tend to be more oblong than larger limpets with more adhesive tenacity. Therefore, oblong shells on smaller limpets may reduce the risk of dislodgement and subsequent mortality at the jaws of the abundant carnivorous reef fishes below the water line.

With regards to desiccation, *C. sandwicensis* assume a shape that is progressively less susceptible to desiccation where the ratio of shell aperture circumference (evaporative water loss) to volume (capacity of fluids) decreases as the limpets grow larger. It is surprising that there is little variation in this relationship, even among shore heights. The lack of variation suggests that this morphology is tightly constrained, regardless of shore height. Given that most *C. sandwicensis* exist above mean high water level, they may all be at risk of desiccating when the waves die down, an uncommon occurrence in spring and fall.

CONCLUSION

Overall, the realized morphology of *C. sandwicensis* follows expectations and does vary with shore height. Based on the data that we collected and analyzed along with morphological observation our hypothesis that the Hawaiian *Cellana sandwicensis* adaptively speciated within the Hawaiian Archipelago is supported (Bird, 2011). It is still unclear whether these changes in shell morphology are an exclusive result of environmental and tidal forces (Kay 1987), such as tidal fluctuations, or due to predation (Chiba 2005) because there is evidence that supports both hypotheses at this present time. We are also unsure whether the variation in morphology observed here is due to phenotypic plasticity or genotypic variation. These individuals have been genotyped, however, and efforts are underway to identify a relationship between genotype and phenotype.

REFERENCES

Bird, Christopher E. (2013) Between tide and wave marks: a unifying model of physical zonation on littoral shores. *PeerJ,* 154: 16.

Bird, Christopher E. (2007) Contrasting phylogeography in three endemic Hawaiian limpets (*Cellana* spp.) with similar life histories. *Molecular Ecology,* 16: 3173–3186.

Bird, Christopher E. (2011) Diversification of sympatric broadcast-spawning limpets (Cellana spp.) within the Hawaiian archipelago. *Molecular Ecology,* 20: 2128–2141.

Bird, Christopher E. (2011) Morphological and Behavioral Evidence for Adaptive Diversification of Sympatric Hawaiian Limpets (*Cellana* spp.). *Integrative & Comparative Biology,* vol. 51: 466-473.

Chiba, Satoshi. (2005) Shell shape and habitat use in the North-west Pacific land snail *Mandarina polita* from Hahajima, Ogasawara: current adaptation or ghost of

species past? *Biological Journal of the Linnean Society*, 91, 149-159.

Díaz, Fernando (2013) Behavioral thermoregulation and critical thermal limits of giant keyhole limpet Megathura crenulata (Sowerby 1825) (Mollusca; Vetigastropoda). *Journal of Thermal Biology,* Vol. 54, 133-138.

Grahame, John W. (2006) Adaptation to a steep environmental gradient and an associated barrier to gene exchange in *littorina saxatilis. Evolution,* 60: 268–278.

Kay, Alison E., and Palumbi, Stephen R. (1987) Endemism and Evolution in Hawaiian Marine Invertebrate: Dept. of Zoology, University of Hawaii, at Manoa Honolulu, Hawaii 96822, USA, Vol 2, Issue 7, 183-186.

McLay CL, McQueen DJ. (1995) Intertidal zonation of Cyclograpsus lavauxi H. Milne Edwards, 1853 (Brachyura: Grapsidae) along the coast of the South Island of New Zealand. *Crustacean Research,* 24:49–64.

Menge B.A, Olson, A.M. (1990) Role of scale and environmental factors in regulation of community structure. *Trends in Ecology & Evolution,* 5: 52–57.

Menge B.A., Sutherland, J.P. (1987) Community regulation: variation in disturbance, competition, and predation in relation to environmental stress and recruitment. *American Zoologist,* 130: 730–757.

Ortega, Sonia. (1985) Competitive interactions among tropical intertidal limpets. Journal of *Experimental Marine Biology and Ecology*, Vol. 90, (1) 11-25.

Rocha L.A., Bowen B.W. (2008) Speciation in coral-reef fishes. *Journal of Fish Biology* 72: 1101–1121.

Rubinoff D. (2008) Phylogeography and ecology of an endemic radiation of Hawaiian aquatic case-bearing moths (Hyposmocoma : Cosmopterigidae). *Philosophical Transactions of the Royal Society of London Biological Sciences*, 363, 3459–3465.

Savolainen V., Anstett M.C., Lexer C., Hutton, Ian, Clarkson, James J., Norup, Maria V, Powell, Martyn P., Springate, David, Salamin, Nicolas, and Baker, William J. (2006) Sympatric speciation in palms on an oceanic island. *Nature*, 441, 210–213.

Schluter D, (2009) Evidence for ecological speciation and its alternative. *Science*, 323, 737–741.

Silva, A.C.F. (2008) Predation by small mobile aquatic predators regulates populations of the intertidal limpet *Patella vulgata* (L.). *Journal of Experimental Marine Biology and Ecology,* 367: 259-265.

Stamatakis, A. (2006) RAxML-VI-HPC: maximum likelihood based phylogenetic analyses with thousands of taxa and mixed models. *Bioinformatics*, 22, 2688–2690.

Somero, G.N. (2002) Thermal physiology and vertical zonation of intertidal animals: Optima, limits, and costs of living. *Integrative and Comparative Biology*, 42, 780–789.

Tyler, Carrie L. (2014) The effects of limpet morphology on predation by adult cancrid crabs: *Journal of Experimental Marine Biology and Ecology*, Vol 451, 9-15.

ACKNOWLEDGEMENTS

STREPTOCOCCUS PNEUMONIAE'S ADHESION TO LUNG CELLS UNDER NOREPINEPHRINE REGULATION OF SPXB

by MARISA D. GONZALES

INTRODUCTION

Streptococcus pneumoniae, also known as pneumococcus, is the primary cause of bacterial pneumonia in children under the age of five. Pneumococcus resides asymptomatically in the nasopharyngeal cavity of some individuals. When it becomes pathogenic, it can invade the lungs and even translocate into the blood causing bacteremia, septicemia, and in the worst case, meningitis. Bacterial infections have been found to increase the production of hormones in the body as a defense mechanism against the infection (Freestone et al., 2008). Studies in the field of microbial endocrinology suggest that stress hormones increase the bacterial growth rate as well as the virulence and attachment to host tissue (Freestone et al., 2008; Hegde et al., 2009; Lyte et al., 1997; Vlisidou et al.,

2004). Under stress, pneumococcus has an increase in growth (via a mechanism involving norepinephrine-delivery of transferrin-iron), pathogenicity, and biofilm formation (Sandrini et al., 2010). Systemic release of norepinephrine (NE), a tyrosine-derived catecholamine that functions as a hormone in blood, is a component of the acute stress host response to infection. Bacteria such as *E. coli* and *Pseudomonas aeruginosa* had a positive reaction to NE, with an increase of adhesion to epithelial cells (Bansal et al.*,* 2007; Hegde et al., 2009). In the study done by Gonzales et al. (2013), NE has an adverse effect on pneumococcus. This study suggests that NE decreases pneumococcus's adhesion to the lung cells, but it increases bacterial growth. The spxB (pyruvate oxidase) gene has been considered due to the results gathered by Gonzales et al. (2013) that suggest that NE targets a pneumococcal iron regulatory system which influences cell adhesion by acting as a siderophore. The NE would bind to iron to release it from host transferrin and lactoferrin, both carrier proteins for iron, making it available for microorganisms to utilize (Burton et al., 2002; Freestone et al., 2000; Sandrini et al., 2010).

SpxB (pyruvate oxidase) is found to be used more in *S. pneumoniae's* production and survival of H2O2. Pneumococcus is known to inhibit other upper respiratory bacteria such as *Haemophilus influenzae, Moraxella catarrhalis,* and *Neisseria meningitides* via the

MENTOR
Dr. Xavier Gonzales

Professional Assistant Professor
Department of Life Sciences
College of Science and Engineering

production of hydrogen peroxide (H2O2) (Pericone et al., 2000). Both Gram-positive and Gram-negative bacteria use catalase to eliminate H2O2 (Storz et al., 1999; Zuber et al., 2009), yet pneumococcus lacks this enzyme and is able to survive the exposure (Pericone et al., 2003). Despite its ability to survive, it is not entirely protected from H2O2's adverse effect. Endogenous or exogenous H2O2, paired with an increase in spxB activity, increases the mutation rate, alters membrane composition, can cause morphological changes, and its stationary growth has a decrease in survival rate (Pericone et al., 2002; Regev-Yochay et al., 2007). Endogenous H2O2 production is mediated by spxB, which converts pyruvate to acetyl phosphate, CO2, and H2O2 under aerobic conditions (Spellerberg et al., 1996). The mechanism through which the spxB helps pneumococcus survive in H2O2 is currently unknown. A reduction or deletion of spxB has shown to lead to a decrease in survival in the presence of 20 mM H2O2 (Pericone et al., 2003). We propose that NE inhibits pneumococcal adhesion through regulation of the iron associated surface protein spxB that participates in adhesion.

METHODS AND MATERIALS

Culture and Treatment of Streptococcus pneumoniae

S. pneumoniae strains (T4 and T4 *spxB*) were grown on Tryptic Soy Agar supplemented with 3% (v/v) sheep's blood or in Todd Hewett broth with 0.3% yeast extract (w/v) (Thy-B). (±)- Norepinephrine (NE) was added to liquid media at a physiologically relevant concentration of 50mM. The *S. pnuemoniae* cultures were inoculated from frozen stock and incubated at 37°C with 5% CO$_2$.

Growth Curve

S. pneumoniae T4 and T4Δ*spxB* were grown in THY-B to the OD of 0.3 and diluted down to OD of <0.1 into separated tubes for Control and NE. Absorbance was taken at the OD of 0.1, 0.2, 0.3, 0.4. Dilutions were made at each point and then plated on blood agar plates. Colonies were counted after 24 hours.

Adhesion Assay

The researchers prepared a 24-well plate with 500,000 A549 Lung Epithelial cells in each well and enough cell culture media for a total of 500 μl. The plate

was incubated overnight at 37°C. The next day, 10ng of TNF-α was added to each well and left for two hours. The wells were then washed and rinsed with 1x Phosphate Buffered Saline (PBS). The researchers prepared the *Streptococcus pneumoniae* strain T4 and *spxB* mutant to an O.D of 0.4 in THB (with conditions of with norepinephrine and without norepinephrine) and then spun down and re-suspended it in cell culture media. The bacteria was added to each well with the ratio of 10:1. The bacteria and cells incubated for 30 minutes and were then washed twice with 1x PBS. The researchers added in 0.25% Trypsin EDTA for 2-3 minutes and neutralized with 500 uL of cell culture media. The cells were collected and spun down at 800 rpm for 8 minutes. The supernatant was discarded and the cells were re-suspended in 1x PBS. Dilutions were performed with cold PBS solution and the samples were plated. The plates incubated at 37°C with 5% CO2 overnight (no more than 18 hours). The CFU's were counted and the data was recorded.

RESULTS AND DISCUSSION

The data collected from the growth assays shows that the norepinephrine (NE) affects *S. pneumoniae* TIGR4 (T4) strain. T4 is shown to have a lower growth rate compared to the control and under the condition of Iron (II) sulfate (FE^{2+}). Figure 2 shows that under NE, the T4 strain has less Colony Forming Units (CFU) than the control. The growth curve was done to make sure that the results we got in the adhesion assay weren't affected by the change in growth.

For the adhesion assays, it is easy to see in Figure 1 that the T4 strain has had a decrease in adherence under the addition of NE. The *S. pneumoniae* TIGR4 *spxB* (T4 *spxB*) strain showed a minimal decrease compared to the T4 strain. We expected to see no difference between the T4 *spxB* with and without NE, but we did see a small change. The data still tells that *spxB* does have a role in pneumococcus adherence, as the CFU count for *spxB* with NE was higher than the T4 with NE. The slight decrease in T4 *spxB* with NE could be an indicator that *spxB* may not be the only gene to be affected by the NE; that another gene is working in tandem with the *spxB* to adhere the bacteria to the lung epithelial cells. Further research is needed to see if there are indeed other genes

FIGURE 1.
Adherence percentage of the TIGR-4 (T4) and the TIGR-4 ΔspxB (T4ΔspxB) with and without norepinephrine (NE)
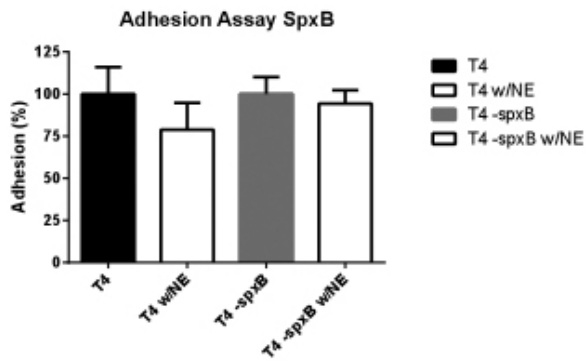
The T4 had a larger decrease in adhesion compared to the T4ΔspxB. Seeing that decrease in adherence in the T4ΔspxB, however small, says that there may be another gene being affected by NE.

FIGURE 2.
Absorbance (y-axis) vs CFU (x-axis)
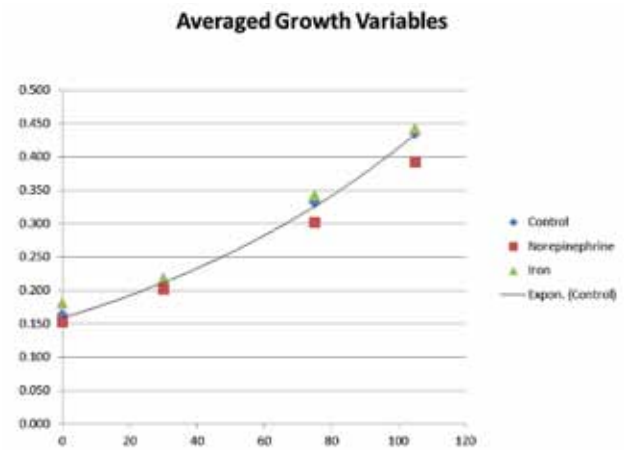
T4 under the condition of norepinephrine has a lower growth rate than T4 control and under Iron.

that are geared towards adhesion and are affected by NE.

T4's decrease wasn't as we expected. We had expected to see an even larger decrease than the one we got. The T4 strain is capsulated and this could have affected the adherence right from the start. To get around this, we plan to do some adhesion assays using a TIGR4r (T4r) strain where it is not capsulated and therefore able to be properly affected by the NE. We would expect to see even more of an impact in bacterial adhesion.

This data does support our hypothesis that NE does have an effect on *spxB* and in result, pneumococcus' adherence to A549 lung epithelial cell. The next steps would be to use TIGR4r and a TIGR4r *spxB* strain to further verify our results. Further research will include doing 2D gels to search for other proteins that have a hand in adhesion and gaining *S. pneumoniae* mutant strains for them. Other work would be adding Iron (II) sulfate (Fe^{2+}) and Iron (III) sulfate (Fe^{3+}), as well as a mix of NE and the FE's in the adhesion and growth assays to address *S. pneumoniae's* iron regulatory system.

REFERENCES

Burton, C. L., Chhabra, S. R., Swift, S., Baldwin, T. J., Withers, H., Hill, S. J. & Williams, P. (2002). The growth response of Escherichia coli to neurotransmitters and related catecholamine drugs requires a functional enterobactin biosynthesis and uptake system. Infect Immun 70, 5913–5923.

Cakan, G., Turkoz, M., Turan, T., Ahmed, K. & Nagatake, T. (2003). Scarboxymethylcysteine inhibits the attachment of Streptococcus pneumoniae to human pharyngeal epithelial cells. Microb Pathog 34, 261–265.

Freestone, P. P., Sandrini, S. M., Haigh, R. D. & Lyte, M. (2008). Microbial endocrinology: how stress influences susceptibility to infection. Trends Microbiol 16, 55–64.

Freestone, P. P., Lyte, M., Neal, C. P., Maggs, A. F., Haigh, R. D. &Williams, P. H. (2000). The mammalian neuroendocrine hormone norepinephrine supplies iron for bacterial growth in the presence of transferrin or lactoferrin. J Bacteriol 182, 6091–6098.

Gonzales X F., Falconi FQ., Rojas GC., and Vidal YL. 2010. Streptococcus pneumoniae treatment with catecholamines affects growth based on strain isolation site with a lack of effect on biofilm formation. International Journal of Infectious Diseases. e398.

Gonzales X F., Castillo-Rojas G., Castillo-Rodal A L., Toumanen E., Lopez-Vidal Y. 2013. Catecholimine norepinephrine diminishes lung epithelial cell adhesion of Streptococcus pneumoniae by binding iron. Microbiology. 159(11):2333-2341.

Hegde, M., Wood, T. K. & Jayaraman, A. (2009). The neuroendocrine hormone norepinephrine increases Pseudomonas aeruginosa PA14 virulence through the las quorum-sensing pathway. Appl Microbiol Biotechnol 84, 763–776.

Lyte, M., Erickson, A. K., Arulanandam, B. P., Frank, C. D., Crawford, M. A. & Francis, D. H. (1997). Norepinephrine-induced expression of the K99 pilus adhesin of enterotoxigenic Escherichia coli. Biochem Biophys Res Commun 232, 682–686.

Pericone, C.D. et al. (2000) Inhibitory and bactericidal effects of hydrogen peroxide production by Streptococcus pneumoniae on other inhabitants of the upper respiratory tract. Infect. Immun. 68, 3990–3997.

Pericone, C.D. et al. (2002) Short-sequence tandem and nontandem DNA repeats and endogenous hydrogen peroxide production contribute to genetic instability of Streptococcus pneumoniae. J. Bacteriol. 184. 4392–4399

Pericone, C.D. et al. (2003) Factors contributing to hydrogen peroxide resistance in Streptococcus pneumoniae include pyruvate oxidase (spxB) and avoidance of the toxic effects of the Fenton reaction. J. Bacteriol. 185, 6815–6825.

Regev-Yochay, G. et al. (2007) spxB is a suicide gene of Streptococcus pneumoniae and confers a selective advantage in an in vivo competitive colonization model. J. Bacteriol. 189, 6532–6539.

Sandrini, S. M., Shergill, R., Woodward, J., Muralikuttan, R., Haigh, R. D., Lyte, M. & Freestone, P. P. (2010). Elucidation of the mechanism by which catecholamine stress hormones liberate iron from the innate immune defense proteins transferrin and lactoferrin. J Bacteriol 192, 587–594.

Spellerberg, B. et al. (1996) Pyruvate oxidase, as a determinant of virulence in Streptococcus pneumoniae. Mol. Microbiol. 19, 803–813.

Storz, G. and Imlay, J.A. (1999) Oxidative stress. Curr. Opin. Microbiol. 2, 188–194.

Vlisidou, I., Lyte, M., van Diemen, P. M., Hawes, P., Monaghan, P., Wallis, T. S. & Stevens, M. P. (2004). The neuroendocrine stress hormone norepinephrine augments Escherichia coli O157 : H7- induced enteritis and adherence in a bovine ligated ileal loop model of infection. Infect Immun 72, 5446–5451.

Zuber, P. (2009) Management of oxidative stress in Bacillus. Annu. Rev. Microbiol. 63, 575–597.

CHOOSING TO ENJOY: THE ADVANTAGES OF MALLEABLE BELIEFS ABOUT ENJOYMENT

by LAUREN MEGAN HERNANDEZ

ABSTRACT

People who hold more malleable beliefs about various attributes such as intelligence (Dweck & Leggett, 1988), relationships (Knee, 1998), emotion (Tamir, John, Srivastava, & Gross, 2007), and even dieting (Burnette, 2010) benefit from an increased sense of self-control over such attributes. We reasoned that beliefs about enjoyment may range from fixed (something is either enjoyable or it is not) to malleable (anything can be enjoyed if you try hard enough). We further posited that people who hold malleable beliefs about enjoyment should feel more in control of their ability to enjoy life and relationships and therefore should experience greater happiness, self-esteem, and relationship satisfaction. Participants (n = 259) completed a measure of malleability of enjoyment (created for this study) along with measures of self-control, self-esteem, general happiness, and relationship satisfaction. Consistent with predictions, greater malleability of enjoyment was associated with reported self-control, self-esteem, happiness, and relationship satisfaction.

Dr. Steven Seidel

Professor of Psychology
Department of Psychology
and Sociology
College of Liberal Arts

People are able to enjoy many activities throughout their life. However, not everyone enjoys the same activities, and not everyone has the same ideas about enjoyment. What one person might find enjoyable is sometimes the opposite of what another may enjoy. This research project explores the nature of people's implicit beliefs about enjoyment, as implicit beliefs are thought to be the main influencers of personality and adaptive functioning (Dweck, 2008). In general, people who hold more malleable beliefs about various attributes such as intelligence (Dweck & Leggett, 1988), emotion (Tamir, John, Srivastava, & Gross, 2007), and even dieting (Burnette, 2010) have been found to benefit from an increased sense of self-control over such attributes. Consistent with these findings, we reasoned that beliefs about enjoyment range from fixed (something is either enjoyable or it is not) to malleable (anything can be enjoyed if you try to enjoy it). We further posited that people who hold malleable beliefs about enjoyment should feel more in control of their ability to enjoy life and relationships. We predicted that control over enjoyment would be associated with higher levels of happiness, self-esteem, self-control, and relationship satisfaction.

Dweck, Chiu, and Hong (1995) described a model of how implicit beliefs concerning human attributes influence reactions to stimuli. Taking its foundation in the works of Kelley's (1955) personality theory and Heider's (1958) theory of social perception, both emphasizing the importance of lay theories in the formation of personality and social information processing, it was reasoned that people who hold entity theories (fixed, trait-like beliefs) tend to understand outcomes in terms of such fixed traits. In contrast, people adopting incremental theories (malleable, developable beliefs) tend to understand outcomes in terms of psychological mediators. As a result, people holding incremental theories may react to adversity in a more adaptable and effortful way that would be more likely to overcome failure.

Recent research has explored the role of implicit beliefs in a wide range of domains. For example, Job, Dweck, and Walton (2010) explored whether people's implicit theories about self-control (willpower) moderate ego depletion effects. As expected, they found that only people who thought or were led to think of willpower as a limited resource showed ego depletion and the more people held this limited resource theory, the poorer their self-regulation was. In contrast, participants who believed willpower was an incremental commodity showed better self-control and self-regulation. In a study of weight management, Burnette and Finkel (2012) examined whether an incremental beliefs intervention could help dieters manage their body weight while being tempted by stimuli that could cause severe dieting setbacks. As expected, participants assigned to the incremental beliefs condition experienced less dieting setbacks.

Tamir et al. (2007) investigated the link between implicit beliefs and emotion. The authors reasoned that people differ in their implicit theories of emotion, with some viewing it as fixed and others as malleable. They tested the emotional and social adjustment of college students during their first term and first year and found that students who adopted fixed beliefs about emotions showed less favorable emotional experiences and had decreased social support than those who viewed emotion as malleable after their first semester. After a full year of college, entity theorists showed lower well-

being, greater depressive symptoms and lower social adjustment than incremental theorists.

Dweck and Leggett (1988) studied how implicit theories drive people toward particular goals and how these goals establish different patterns in people's lives. Specifically, the authors examined how adaptive and maladaptive behaviors follow from these goals. Dweck and Leggett investigated implicit theories of intelligence in children and found that some children believed intelligence was malleable while others believed intelligence was more fixed and uncontrollable. Children in their study performed a challenging task in which they failed to perform up to a standard. The authors found that when faced with failure, those with fixed beliefs of intelligence tended to give up and choose future tasks that were less challenging while those children holding malleable beliefs overcame failure by choosing more challenging future tasks and putting more effort into future attempts. Thus, children who believe intelligence is augmentable pursue learning goals more often, which is consistently associated with adaptive motivational patterns (Dweck & Leggett, 1988).

Research by Knee (1998) evaluated the effects of implicit beliefs on relationships. He studied individuals' fixed and malleable theories about destiny and growth and the impact of these beliefs on romantic relationships. His study found that the relation between initial and relationship longevity was stronger for those who believed in romantic destiny and also found that belief in growth independently holds that successful relationships are developed over time and was associated long-term approaches to dating. Those who held strong destiny beliefs were more likely to view negative events as a sign for relationship termination, whereas those with strong growth beliefs viewed negative events as something to work through and grow from. The destiny theory of relationships seems to come from the belief that the outcomes of a relationship are out of one's control and, because of this, those who hold these beliefs are quicker to end a relationship.

In another study, Knee, Patrick and Lonsbary (2003) researched implicit beliefs people have about relationships and how they compare to implicit beliefs about other domains. The authors proposed that implicit beliefs of relationships influence goals,

attributions, and behavior in romantic relationships. Implicit theories of relationships were characterized by a belief in romantic destiny and belief in relationship growth. Destiny beliefs are defined as beliefs that potential relationship partners are either compatible or they are not. Growth beliefs are defined as beliefs that relationship challenges can be overcome. Those with strong growth beliefs about relationships tend to believe that conquering obstacles and growing closer helps to develop successful relationships.

In line with the research cited here on implicit beliefs, we proposed that implicit beliefs of enjoyment are related to overall happiness, self-esteem, self-control, and relationship satisfaction. We reasoned that people hold different beliefs regarding enjoyment. Some people may view enjoyment as a fixed entity while others may hold enjoyment beliefs that are more malleable. People holding fixed beliefs about enjoyment would believe that something is either enjoyable or it is not. Such beliefs should lead people to perceive that they have less control over their enjoyment of activities. In contrast, people holding more malleable beliefs would believe that they have much more control over enjoyment, perhaps believing that just about anything could be enjoyed.

Consistent with previous research (Dweck & Leggett, 1988; Tamir et al., 2007; Burnette, 2010; Knee et al., 2003), malleable beliefs about enjoyment should be associated with numerous benefits for those who adopt them. Because malleable beliefs about enjoyment would allow greater control over emotional responses, they should be associated with greater happiness in general. Diener, Kanazawa, Suh, and Oishi (2015) suggest that people in general exhibit a positive mood offset, the natural tendency of people to be in a positive mood rather than a neutral mood when at rest. Thus, it appears that if given a choice, people desire to maintain a positive state. Believing that one can enjoy just about anything (malleable belief) would likely make maintaining a positive mood offset much easier.

People holding malleable beliefs about enjoyment should have the ability to find enjoyment in almost anything since they view enjoyment as originating internally. As a consequence of this tendency, it is likely that such individuals would choose to practice

positive self-regard. We therefore suggest that malleability of enjoyment beliefs should be associated with positive feelings about oneself. We predicted that those possessing greater malleability in their beliefs of enjoyment would also demonstrate higher self-esteem.

For the present project, we argued the malleable beliefs about enjoyment would be associated with higher levels of happiness, self-esteem, self-control, and relationship satisfaction. We tested such predictions by developing a survey that contained a measure of malleable enjoyment along with measures of happiness, self-esteem, self-control, and relationship satisfaction.

METHODS

Participants

The sample for the present study consisted of 259 undergraduate students at Texas A&M University-Corpus Christi (66 males and 193 females) who completed an online survey. There was no monetary compensation offered and participants completed the survey anonymously to rule out bias.

Measures and Procedure

An online survey was generated using Qualtrics© software. In addition to some demographic information, the survey consisted of measures of happiness, self-esteem, self-control, and relationship satisfaction, as well as a malleable enjoyment scale that was created for the study.

Happiness. The Subjective Happiness Scale (Lyubomirsky & Lepper, 1999) is a four-item measurement of global subjective happiness. Two items refer to how happy people consider themselves to be using absolute ratings and ratings relative to peers. The other two items provide brief descriptions of happy and unhappy individuals and ask respondents the extent to which each characterization describes them. All items are measured on a scale of 1–7, and higher scores reflect higher levels of subjective happiness.

Self-Esteem. Participants' level of self-esteem was measured using the Rosenberg Self-Esteem Scale (Rosenberg, 1965; 1979). Participants rated 10 items on a dichotomous scale by how much they agreed or disagreed with each. Higher scores indicate greater self-esteem.

Self-Control. Self-control was measured using the Brief Self-Control Scale (Tangney, Baumeister, & Boone, 2004) consisting of 13 items. The Brief Self-Control Scale focuses on direct self-control processes. This measure has shown good reliability and validity among college students (de Ridder et al., 2012; Tangney, Baumeister, & Boone, 2004) and relates to a variety of behaviors. Higher scores indicate greater self-control.

Relationship Satisfaction. To measure relationship satisfaction, we used the Relationship Assessment Scale (Hendrick, Dicke, Hendrick, 1998). The RAS consists of seven items rated on a 5-point Likert scale. This instrument has good psychometric properties (Hendrick et al., 1998; White, Hendrick, Hendrick, 2004) and is effective in discerning couples who stay together from couples who will break up (Hendrick, 1988).

Malleable Enjoyment. A 16-item measure of malleable beliefs about enjoyment was created for the purposes this study. This scale was created based on Knee's (1998) Implicit Theories of Relationships Scale. We generated items for the scale that represented malleable and fixed implicit beliefs about enjoyment. Fixed items were reverse scored to form a measure of enjoyment malleability where high scores indicated greater malleability.

RESULTS

We conducted reliability analyses on the multiple item scales used in the present study. Scores on the general happiness (alpha = .842), Rosenberg self-esteem scale (alpha = .885), self-control scale (alpha = .754), relationship satisfaction scale (alpha = .843), and enjoyment malleability scale (alpha = .783) were all found to be reliable. The means and standard deviations for each measure along with the correlations between these measures are presented in Table 1. No sex differences were found for happiness, self-esteem, self-control, or malleability of enjoyment. However, female participants (M = 3.63) were found to report greater relationship satisfaction than male participants (M = 3.28), $t(236)$ = 2.35, p = .02. As predicted, enjoyment malleability was found to be associated with higher happiness (r(n= 259) = .500, p < .001), self-esteem (r(n= 259) = .378, p < .001), self-control (r(n= 258) = .228, p < .001), and relationship satisfaction (r(n= 138) = .238, p = .005). Higher self-control scores were associated with greater happiness (r(n= 258) = .262, p < .001) and increased self-esteem (r(n= 258) = .388, p < .001). Happiness was also found to be highly associated with greater self-esteem (r(n= 259) = .560, p < .001) and relationship satisfaction (r(n= 242) = .265, p < .001). Finally, self-esteem was found to be positively related with relationship satisfaction (r(n= 242) = .185, p < .004).

DISCUSSION

We reasoned that people's implicit beliefs, fixed or malleable, would have an effect on the level of enjoyment they experience throughout their lives. We predicted that malleable beliefs about enjoyment would be associated with a greater sense of self-control. The results of the present study were supportive of this hypothesis. As such, the present study suggests that malleable beliefs may be a trait of people with more self-control, consistent with research by Job et al. (2010).

In addition to self-control, we reasoned that malleable beliefs of enjoyment would be associated with greater happiness. In support of this hypothesis, the results of our study showed an association between malleable enjoyment beliefs and individual happiness of the participant. These results are consistent with those of Tamir et al., (2007), in which college students with more malleable beliefs about emotion experienced greater social adjustment and well-being by the end of their first year of college.

Consistent with our prediction for greater happiness, we predicted that malleable enjoyment beliefs would be associated with greater relationship satisfaction. In support of this hypothesis, the results of our study showed that greater malleability of enjoyment beliefs was associated with greater relationship satisfaction scores reported by our participants. This finding is consistent with studies by Knee and colleagues (1988; 2003) who found that the malleability of relationship beliefs was a common factor in the formation and longevity of relationships.

Finally, we predicted that malleability of enjoyment would be associated with greater self-esteem. The results of the present study supported this hypothesis. Participants' self-esteem scores were associated with greater malleability of enjoyment. These results are

consistent with other research that has found increased self-esteem among those who adopt incremental (malleable) beliefs (Robins & Pals, 2002).

Some study limitations of this research are worth mentioning. This research relies on online survey data. This may have discouraged potential participants to contribute to the data because of lack of resources. Another limitation of our research was that the data were collected solely from college students at Texas A&M University-Corpus Christi. Future research designs may benefit from including a participant sample with a wider range of ages in the study.

The goal of the present study was to explore correlates of enjoyment beliefs. As such, no causal conclusions are possible from the current results. Future research should begin to focus on attempts to manipulate malleability of enjoyment to test its effect on a wide range of psychological constructs such as happiness and self-esteem. Such research would likely lead to new strategies for dealing with depression and problems associated with low self-esteem or unhappiness.

The present research suggests that the mindset one has for an activity influences the level of enjoyment one derives from it. Further, the results of the present study suggest that adopting malleable beliefs about enjoyment may bring a wealth of benefits, including greater happiness, relationships satisfaction, feelings of self-control, and greater self-esteem. While many argue that happiness is a choice, we suggest that happiness may in fact be the result of making a choice to enjoy an activity. Future studies should explore such a possibility.

REFERENCES

Burnette, J. L. (2010). Implicit theories of body weight: Entity beliefs can weigh you down. *Personality And Social Psychology Bulletin*, *36*(3), 410-422. doi:10.1177/0146167209359768

Burnette, J. L., & Finkel, E. J. (2012). Buffering against weight gain following dieting setbacks: An implicit theory intervention. *Journal of Experimental Social Psychology*, *48*(3), 721-725. doi:10.1016/j.jesp.2011.12.020

de Ridder, D. T., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: A meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review*, *16*(1), 76-99. doi:10.1177/1088868311418749

Diener, E., Kanazawa, S., Suh, E., & Oishi, S. (2015). Why people are in a generally good mood. *Personality and Social Psychology Review*, *19*(3), 235-256. doi:10.1177/1088868314544467

Dweck, C. S. (2008). Can personality be changed? The role of beliefs in personality and change. *Current Directions in Psychological Science*, *17*(6), 391-394. doi:10.1111/j.1467-8721.2008.00612.x

Dweck, C. S., Chiu, C. Y., & Hong, Y. Y. (1995). Implicit theories and their role in judgments and reactions: A word from two perspectives. *Psychological Inquiry*, *6*(4), 267-285. doi:10.1207/s15327965pli0604_1

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, *95*(2), 256-273. doi:10.1037/0033-295X.95.2.256

Heider, F. (1958). *The psychology of interpersonal relations*. New York: Wiley.

Hendrick, S. S., Dicke, A., & Hendrick, C. (1998). The relationship assessment scale. *Journal of Social and Personal Relationships,* 15, 137 – 142.

Job, V., Dweck, C. S., & Walton, G. M. (2010). Ego depletion—Is it all in your head? Implicit theories about willpower affect self-regulation. *Psychological Science*. *21*(11), 1686-1693. doi:10.1177/0956797610384745.

Kelly, G.A. (1995). *The psychology of personal constructs*. New York: Norton.

Knee, C. R. (1998). Implicit theories of relationships: Assessment and prediction of romantic relationship initiation, coping, and longevity. *Journal of Personality and Social Psychology*, *74*(2), 360-370. doi:10.1037/0022-3514.74.2.360

Knee, C. R., Patrick, H., & Lonsbary, C. (2003). Implicit theories of relationships: Orientations toward evaluation and cultivation. *Personality and Social Psychology Review*, *7*(1), 41-55. doi:10.1207/S15327957PSPR0701_3

Lyubomirsky, S., & Lepper, H. S. (1999). A measure of subjective happiness: Preliminary reliability and construct validation. *Social Indicators Research*, *46*(2), 137-155. doi:10.1023/A:1006824100041

Malouf, E. T., Schaefer, K. E., Witt, E. A., Moore, K. E., Stuewig, J., & Tangney, J. P. (2014). The Brief Self-Control Scale Predicts Jail Inmates' Recidivism, Substance Dependence, and Post-Release Adjustment. *Personality & Social Psychology Bulletin*, *40*(3), 334-347. doi:10.1177/0146167213511666

Robins, R. W., & Pals, J. L. (2002). Implicit self-theories in the academic domain: Implications for goal orientation, attributions, affect, and self-esteem change. *Self and Identity*, *1*(4), 313-336. doi:10.1080/15298860290106805

Rosenberg, M. (1979). Conceiving the self. New York. NY. Basic Books.

Rosenberg, M. (1965). Society and the adolescent self-image. *American journal of orthopsychiatry*, *36*(3), 560-562.

Steiger, A. E., Allemand, M., Robins, R. W., & Fend, H. A. (2014). Low and Decreasing Self-Esteem During Adolescence Predict Adult Depression Two Decades Later. *Journal Of Personality & Social Psychology*, *106*(2), 325-338. doi:10.1037/a0035133

Tamir, M., John, O. P., Srivastava, S., & Gross, J. J. (2007). Implicit theories of emotion: Affective and social outcomes across a major life transition. *Journal of Personality and Social Psychology*, *92*(4), 731- 744. doi:10.1037/0022-3514.92.4.731

White, J. K., Hendrick, S. S., & Hendrick, C. (2004). Big Five personality variables and relationship constructs. *Personality and Individual Differences*, 37, 1519 – 1530. doi:10.1016/j.paid.2004.02.019

TABLE 1.
Correlations Among and Descriptive Statistics for Key Study Variables

	M (SD)	SC	H	SE	RS
Malleability	3.39 (.49)	.228***	.500***	.378***	.128*
Self-Control (SC)	3.24 (.64)		.262***	.388***	.037
Happiness (H)	3.62 (.81)			.560***	.265***
Self-Esteem (SE)	3.72 (.72)				.185**
R Satisfaction (RS)	3.55 (1.04)				

NOTE: *N*'s range from 241 to 259 due to occasional missing data. R Satisfaction = Relationship Satisfaction.
*p < .05, **p < .01, ***p < .001.

MALLEABLE BELIEFS ABOUT ENJOYMENT PREDICT EXERCISE ATTITUDES AND HEALTH OUTCOMES

by MARITZA HERNANDEZ

ABSTRACT

The goal of the current study was to expand the growing body of research on implicit beliefs (beliefs that specific attributes are either fixed or malleable) by examining the association between beliefs about enjoyment and physical health. Two hundred fifty-nine undergraduate students completed an online survey that assessed the malleability of their beliefs about enjoyment (e.g., beliefs about whether certain tasks are simply enjoyable or not vs. beliefs that anything can be made to be enjoyable), their exercise behavior (e.g., frequency and duration), and health outcomes (e.g., perceived fitness, frequency of symptoms). Correlational analyses revealed that participants with more malleable beliefs about enjoyment reported greater perceived fitness and perceived health. Furthermore, they were more likely to persist when exercise is difficult and more willing to try

MENTOR
Dr. Amy Houlihan
Professor of Psychology
Department of Psychology
and Sociology
College of Liberal Arts

new forms of exercise; however, they did not report greater frequency or duration of their current exercise habits.

Studies have been conducted on implicit theories/beliefs and how they affect everyday life decisions of individuals. Implicit theories are defined as personal structures about particular phenomenon that exist in the minds of individuals. Studies have shown that implicit theories within a given domain, such as intelligence, most strongly predict behavior within that domain, such as giving up on a challenging exam (Knee, Patrick, & Lonsbary, 2003).

A belief that personal attributes (e.g., intelligence, athletic ability) are unchanging is called an entity or fixed theory, and a belief that traits can be improved or developed is called an incremental or malleable theory (Burnette, 2010; Dweck & Leggett, 1988). Individuals who hold malleable beliefs (e.g., a belief that with hard work one is able to achieve or do anything, such as lose weight) view attributes as controllable, but those who hold entity beliefs (e.g., a belief that one is unable to change, such as not being able to lose weight) view attributes as fixed and impossible to control. Incremental beliefs lead people to make flexible, contextual interpretations of events (Tamir, John, Srivastava, &, Gross, 2007). When approached by a challenging event, these beliefs promote assertive

attempts at self-regulation, which increases the chances of successful performance. Challenging events for individuals who hold entity beliefs cause motivation to self-regulate to decrease, leading to failure of self-regulation. For instance, people who hold an entity theory of intelligence seem to be more sensitive to the early signs of potential failure (Knee et al., 2003).

Prior research on implicit beliefs has focused on the domains of intelligence, personality, ability, morality, and emotion (Heslin, 2005). Personality has an intense impact on how individuals view themselves, those around them, and how they approach certain situations. According to Yeager and colleagues (2014), adolescents' implicit theories of personality create a framework for their understandings of setbacks. Adolescents who hold an entity theory of personality believe that people who are "bullies" or "victims," "winners" or "losers," can't change. Victimization may be perceived as done by and to people who are unable to change. People who believe this may feel satisfaction from harming the wrongdoer. Dissimilarly, people who hold incremental theories believe that people are able to change; therefore, victimization may be thought of as done by and to people who are able to change overtime. This notion may reduce aggressive vengeance by allowing students to see their future as more hopeful and by creating a greater desire to understand or influence wrongdoers (Yeager et al., 2014).

Tamir and colleagues (2007) examined students who were transitioning from high school to college to see how their implicit theories of emotion affected their social functioning and their overall adaptation during a major life transition. It was found that individuals with entity theories of emotion experienced less positive and more negative emotions and also received less social support, while those who held incremental theories of emotion received more social support. As the semester advanced, the same individuals with entity theories of emotion received less social support from their college friends, experienced lower well-being, greater depression, increased loneliness, and poorer social adjustments (Tamir, John, Srivastava, & Gross, 2007).

The associations between implicit beliefs about relationships and relationship outcomes have also been examined (Knee, Nanayakkara, Vietor, Neighbors, &

Patrick, 2001). A belief in destiny (an entity belief), signifies the idea that potential relationships partners are either destined for each other or they are not and emphasizes initial impressions. Those who believe in growth or change (an incremental belief, such as a belief that relationships can mature despite of going through obstacles) experience fewer one-night stands, spend more time dating the same person, and make more attempts to maintain relationships when problems happen (Knee et al., 2001).

Out of all of the research that has been conducted on implicit beliefs (e.g., intelligence, romantic relationships, emotion, and dieting) a pattern has emerged in which malleable beliefs are associated with more positive outcomes (e.g., feeling that one has personal value, cherishing social groups) than entity beliefs are (King, 2012). Recent work has explored a new domain: beliefs about enjoyment. Seidel hypothesized that people who hold malleable beliefs about enjoyment should feel more in control of their ability to enjoy life and relationships. It was also predicted that such control over enjoyment would lead to greater relationship satisfaction. These predictions were tested in a recent survey study, and the findings supported the hypotheses; enjoyment control scores were found to be positively related to relationship satisfaction, growth beliefs, and malleable enjoyment beliefs (Escobar, Seidel, Sherwood, & Wilson, 2015).

Exploring Implicit Theories in the Health Domain

The belief that health is malleable leads to the belief that one's personal ability to change their own health promotes successful self-regulation (Tamir et al., 2007). A study was designed to see if participants who went through an incremental intervention would come to believe that their body weight is changeable which would result in losing weight (Burnette, 2010). Three different interventions were presented: an incremental intervention to help individuals reach their weight-loss goals, a comprehensive information-based weight-loss intervention, and a knowledge intervention. The results showed that participants in the incremental intervention had more malleable beliefs about their body weight than the participants in the other two conditions. Similarly, Burnette and Finkel (2012) demonstrated that incremental beliefs buffered participants against setback related weight gain, which led to more weight loss.

Past research by Yeager, Johnson, Spitzer, Trzesniewski, Powers, and Dweck (2014) examined freshmen in high school who were considered as having a fixed personality. These individuals showed more negative reactions to social adversity as well as more stress, poor health, and low grades. Adolescents with more of an entity theory of personality reported more stress, anxiety, and negative self-feelings. They also reported poorer physical health by the end of the school year along with lower grades. Over the course of the year it was shown that entity theory believers showed negative short-term reactions to social adversity, greater stress, worse health, and lower grades (Yeager et al., 2014).

The Current Study

In the current study, malleable vs. fixed theories of enjoyment were examined in the context of physical health. We hypothesized that individuals with malleable beliefs about enjoyment would report better perceived health and fitness compared to individuals with fixed beliefs about enjoyment. We also hypothesized that people with malleable beliefs about enjoyment would exercise more and have more positive attitudes towards exercise (e.g., be more willing to try a new challenging exercise).

METHOD

Participants

The 259 individuals who participated in this study were enrolled in Texas A&M University-Corpus Christi. They were registered in Experimental Psychology, General Psychology, or Human Sexuality courses. These participants chose to take a part in this study voluntarily and received extra credit in one of the three courses they were enrolled in. Seventy-five percent of the participants were female.

Procedure

The participants in this study were recruited by an announcement made by the professors from each of the three classes that the students were enrolled in. The survey was online and only available to students through Blackboard. A link was provided that took them directly to the website with the survey. Before starting the survey, the participants were required to read and sign an informed consent form.

Measures

Enjoyment beliefs. Participants responded to 16 statements regarding their beliefs about the malleability (vs. fixed) nature of enjoyment. Each item was rated on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*) and coded such that higher scores represented greater malleability. Questions included "Mondays are always bad days" (reversed), "I believe everyday can be enjoyable," and "Whether I enjoy something or not is up to me."

Perceived health and fitness. Participants reported their perceived health with the following questions: "How often do you feel sick? (cold, flu, etc.)," and "How often do you feel tired during the day?" on a scale from 1 (*never*) to 5 (*very often*). "How fit do you think you are?" was reported on a scale from 1 (*not at all*) to 5 (*very fit*). In addition, participants were asked, "In general, you would say your health is _____" which was answered on a scale from 1 (*poor*) to 4 (*excellent*).

Exercise behavior. The participants' exercise behaviors were measured with the following questions: "In the last 3 months, how often have you exercised?" on a scale of 1 (*never*) to 5 (*everyday*), and "When you exercise, how long do your workouts typically last?" on a scale of 1 (*less than 20 minutes*) to 5 (*more than an hour*).

Exercise attitudes. To assess exercise attitudes, the participants were asked: "How willing are you to try new types of exercise/sports?" on a scale of 1 (*not at all willing*) to 5 (*very willing*), and "When exercise becomes difficult_____" on a scale from 1 (*I quit right away*) to 3 (*I stick it out until the end*).

RESULTS

Descriptive Statistics

The participants in this study reported being fairly healthy ($M = 2.22$, $SD = .70$). They also described themselves as being physically fit ($M = 2.9$, $SD = 1.03$) and somewhat willing to try new types of exercise/sports ($M = 3.8$, $SD = 1.1$). When exercise becomes challenging, the participants stated that they are very likely to stick it out until the end of the exercise rather than quitting ($M = 2.4$, $SD = .61$). See Table 1 for descriptive statistics and correlations for all study variables.

Correlational Analyses

First it was hypothesized that people who held malleable beliefs about enjoyment would report better perceived health and fitness. The results were consistent with the hypothesis, as those who had more malleable beliefs about enjoyment reported getting sick less often ($r = -.16$, $p < .01$) and feeling less tired during the day ($r = -.20$, $p = .001$). Malleable beliefs about enjoyment were also associated with participants' perceptions of how healthy they are ($r = -.12$, $p = .05$) and how fit they are ($r = .12$, $p = .05$).

Secondly, it was hypothesized that individuals with higher malleable beliefs of enjoyment would exercise more than those with lower malleable beliefs about enjoyment. The results did not support the hypothesis, because malleable beliefs about enjoyment were not significantly correlated with exercise frequency ($r = .07$, $p = .23$) or duration ($r = .04$, $p = .53$).

Our final hypothesis stated that individuals with malleable beliefs about enjoyment would have more positive attitudes toward exercise. Consistent with this hypothesis, the results showed that participants who held malleable beliefs about enjoyment were more willing to try new types of exercise/sports ($r = .23$, $p < .001$), and when exercise becomes difficult they are more likely to stick it out until the end than quit right away ($r = .18$, $p < .01$).

DISCUSSION

The present study predicted that participants who held malleable beliefs about enjoyment would be healthier, more physically fit, exercise more, and have a better attitude toward exercise than individuals who do not hold malleable beliefs about enjoyment. The results were consistent with two of the three hypotheses. Participants who held malleable beliefs about enjoyment (1) perceived themselves to be more healthy and fit and (2) held more positive attitudes when it came to exercising than their counterparts. However, participants with malleable beliefs about enjoyment did not report exercising more often or for longer periods of time than those with more fixed beliefs about enjoyment.

This study is an additional illustration of how malleable beliefs are associated with positive outcomes. For example, when individuals face a challenging experience, malleable beliefs encourage assertive attempts at self-regulation, which increases the chances of a positive outcome (Knee et al., 2003). In addition, people who hold malleable beliefs have more pleasant relationships with significant others and are also more likely to have greater achievements in schoolwork, friendships, and extracurricular activities (King, 2012). Research by Tamir et al. (2007) demonstrated that college students with malleable beliefs benefited from more social support from peers and faculty. As the semester progressed, the students with entity beliefs received less social support from their peers, experienced lower prosperity, endured greater feelings of depression, increased loneliness, and struggled with adjusting socially. The present study has expanded upon prior research on malleable beliefs by examining a new implicit theory of enjoyment and its associations with exercise and health outcomes.

Limitations

A few limitations of the current study are worth noting. Because the surveys were online, we had no control over what kind of settings the participants were in. For example, some may have been in a loud public setting with little to no concentration on the accuracy of their answers, while others may have been in a quieter setting with their full attention focused on the survey.

Although we knew the gender of the participants, not enough questions were asked regarding the other demographic characteristics of the participants (such as their age and ethnicity). The participants were all college students, but it is unknown what year of college they were in. Furthermore, female students were disproportionately represented in the sample, which could have caused the results to be biased.

Furthermore, the results are solely based on self-reported data, which is significant for the health and fitness questions. It is unknown how healthy the participants actually were; we only know how they perceived themselves to be. We do not know if their perceptions are accurate reflections of their actual health.

Future Directions and Intervention Implications

Given the results of the current study, it could stand to reason that if people could adopt more malleable beliefs,

they may experience better health outcomes. Prior research has found that individuals who completed implicit interventions were more likely to live healthier lives and be more successful in different aspects of their lives than those who did not. For example, Yeager et al. (2014) examined ninth graders who were categorized as having a fixed personality. These participants showed more negative reactions to social adversity as well as more stress, poor health, and low grades by the end of the school year. After going through a short-term intervention that taught them the belief that people could change, this group showed less negative reactions to the experience of social adversity, lower stress, and less physical illness.

Yeager, Trzesniewski, and Dweck (2012) also examined an implicit belief intervention among high school students, but in this study the domain of aggression was researched. Three students were randomly assigned to one of three different conditions (incremental theory group, coping skills group, and the no-treatment group). According to Yeager and colleagues, the results of the coping skills group did not differ from the no-treatment control group, while the incremental theory condition successfully opposed the belief that the type of person someone is in high school cannot be changed (Yeager et al., 2012). It was also found that aggression retaliation was reduced after learning an incremental theory.

Miu and Yeagar (2014) examined students transitioning to high school and the increase in the prevalence of depressive symptoms among these students. In this study, 600 adolescents went through a one-time intervention that taught them an incremental theory of personality. The intervention helped decrease the prevalence of clinical levels of depressive symptoms by the end of the school year. These students were less likely to use negative emotion, talk about the past, and talk about inconsistencies. On the other hand, adolescents with more of an entity theory of personality (these students did not go through an intervention) showed increases in depressive symptoms.

In conclusion, the results of the present study support earlier research on implicit beliefs as predictors of important life outcomes. This study has demonstrated that malleable beliefs about enjoyment predict people's attitudes toward exercise and perceptions of their health and fitness.

REFERENCES

Burnette, J. L. (2010). Implicit theories of body weight: Entity beliefs can weigh you down. *Personality and Social Psychology Bulletin*, 36(3), 410-422.

Burnette, J. L., & Finkel, E. J. (2012). Buffering against weight gain following dieting setbacks: An implicit theory intervention. *Journal of Experimental Social Psychology*, 48, 721-725. doi:10.1016/j.jesp.2011.12.020

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, 95(2), 256-273. doi:10.1037/0033-295X.95.2.256

Escobar, A. R., Seidel, S. D., Sherwood, A. N., & Wilson, K. A. (2015). Choosing to enjoy: Enjoyment mindsets as a predictor of relationship satisfaction. Poster presented at Southwestern Psychological Association Convention, Witchita, KS April 10-12, 2015.

Heslin, P. A., Latham, G. P., & Walle, D. V. (2005). The effect of implicit person theory on performance appraisals. *Journal of Applied Psychology, 90(5)*, 842-856. doi:10.1037/0021-9010.90.5.827

King, R. B. (2012). How you think about your intelligence influences how adjusted you are: Implicit theories and adjustment outcomes. *Personality and Individual Differences*, 53, 705-709. doi:10.1016/j.paid.2012.05.031

Knee, C. R., Patrick, H., & Lonsbary, C. (2003). Implicit theories of relationships: Orientations toward evaluation and cultivation. *Personality and Social Psychology Review,* 7(1), 41-55.

Miu, A. S., Yeager, D. S. (2014). Preventing symptoms of depression by teaching adolescents that people can change: Effects of a brief incremental theory of personality intervention at 9-month follow-up. *Clinical Psychology Science*, 3(5), 726-743. doi: 10.1177/2167702614548317

Tamir, M., Srivastava, S., John, O. P., & Gross, J. J. (2007). Implicit theories of emotion: affective and

social outcomes across a major life transition. *Journal of Personality and Social Psychology*, 92(4), 731 -744.

Yeager, D. S., Trzesniewski, K. H., & Dweck, C. S. (2012). An implicit theories of personality intervention reduces adolescent aggression in response to victimization and exclusion. *Child Development, 84*(3), 970-988.

Yeager, D. S., Johnson, R., Spitzer, B. J., Trzesniewski, K. H., Powers, J., & Dweck, C. S. (2014). The far-reaching effects of believing people can change: Implicit theories of personality shape stress, health, and achievement during adolescence. *Journal of Personality and Social Psychology*, *106*(6), 867-884.

TABLE 1.
Correlations and Descriptive Statistics

	1	2	3	4	5	6	7	8	9
1. Malleability of enjoyment beliefs	1	-.16**	-.2***	.12*	.07	.04	.12*	.23***	.18**
2. Frequency of sickness		1	.31***	-.38***	-.07	-.14*	-.16**	-.05	-.20**
3. Frequency of tiredness			1	-.26***	-.11	.03	-.16**	-.01	-.02
4. Perceived health				1	.26***	.20**	.41***	.16**	.24***
5. Exercise frequency					1	.43***	.56***	.31***	.30***
6. Exercise duration						1	.33***	.37***	.32***
7. Perceived fitness							1	.44***	.37***
8. Willingness to try new exercise								1	.42***
9. Exercise persistence									1
M	3.39	2.31	3.43	2.22	2.99	3.51	2.94	3.76	2.40
SD	.49	.98	1.02	.70	1.07	1.17	1.03	1.08	.61
Range	1.69 – 5.00	1.00 - 5.00	1.00 - 5.00	1.00 - 4.00	1.00 - 5.00	1.00 - 5.00	1.00 - 5.00	1.00 - 5.00	1.00 - 3.00

CONTENT ANALYSIS OF THE SCHNEIDER FAMILY BOOK AWARDS CHILDREN'S DIVISION FROM 2004 TO 2015

by LYNETTE LAMBERT

INTRODUCTION

Teachers of the twenty-first century will have students with diverse abilities, interests, and learning styles. This diversity will necessitate a wide array of resources in literature that will connect and introduce students to different cultures, lifestyles, and abilities. Literature transforms human experiences and reflects them back to us, and in that reflection we can see our own lives and experiences as part of the larger human experience. Reading then becomes a means of self-affirmation, and readers often seek their mirrors in books (retrieved from http://www.rif.org/us/literacy-resources/multicultural/mirrors-windows-and-sliding-glass-doors.htm). Books which feature a character or characters that are living positively with a disability may dispel commonly held misconceptions and stereotypes that students may have

about individuals with special needs. The challenge for many teachers is finding well-written books that portray individuals with special needs as individuals living a full life. Books that have won the Schneider Family Book Awards are a reliable resource that teachers could choose to use in the classroom to open awareness of different abilities found in the twenty-first century classroom.

BACKGROUND

The Schneider Family Book Award was founded by Dr. Katherine Schneider when she jokingly told her father on his sick bed that she needed to find a cause that they both could agree on, otherwise she was likely to give away her inheritance. Katherine Schneider, who is blind, grew up and went to grade school in the 1950s, a time when the only mention of blindness in the media was limited to Helen Keller, Louis Braille, and seven blind men who went to see the elephant (2004 SFBA Manual). She credits her love of reading to the librarian at the Michigan Library for the Blind and her mother for reading books to her that were unavailable in Braille. These books opened a world of knowledge for Dr. Schneider and put her on the path to her Ph.D. from Purdue University and a thirty-year career as a clinical psychologist. Dr. Schneider used the Coretta Scott King Award as a model when establishing the

MENTOR
Dr. Corinne Valadez
Associate Professor
Department of Curriculum
and Instruction
College of Education

TABLE 1.
Books for the Children's Category

Award Year	Title	Author	Illustrator
2015	*A Boy and a Jaguar*	Alan Rabinowitz	Catia Chien
2014	*A Splash of Red: The Life and Art of Horace Pippin*	Jen Bryant	Melissa Sweet
2013	*Back to Front and Upside Down!*	Claire Alexander	Claire Alexander
2011	*The Pirate of Kindergarten*	George Ella Lyon	Lynne Avril
2010	*Django: World's Greatest Jazz Guitarist*	Bonnie Christensen	Bonnie Christensen
2009	*Piano Starts Here: The Young Art Tatum*	Robert Andrew Parker	Robert Andrew Parker
2008	*Kami and the Yaks*	Andrea Stenn Stryer	Bert Dodson
2007	*The Deaf Musicians*	Pete Seeger & Paul Dubois Jacobs	R. Gregory Christie
2006	*Dad, Jackie, and Me*	Myron Uhlberg	Colin Bootman
2005	*My Pal, Victor/Mi Amigo, Victor*	Diane Gonzales Bertrand	Robert L. Sweetland
2004	*Looking Out for Sarah*	Glenna Lang	Glenna Lang

criteria for Schneider Family Book Award. According to Dr. Schneider, "Disability is a minority group that people don't think of as a minority group. We qualify" (retrieved from http://www.ilovelibraries.org/article/schneider-family-book-award-legacy-inspiration). Dr. Schneider was adamant that the books chosen for the Schneider Family Book Award depict a character or characters whose disability experience was part of the character's full life, not the focus of their life.

The Schneider Family Book Award recognizes three books a year. The award categories include the following: Children's Books, ages 0 to 8; Middle Grades, ages 9 to 13; and High School, ages 14 to 18. The person with the disability may be the protagonist or a secondary character but cannot be a passive bystander. Content must portray the emotional, mental, or physical disability as part of a full life, not as something to be pitied. Characters with disabilities must be represented realistically and should not be exaggerated or stereotyped, and the information on a disability must be accurate.

METHOD

The purpose of this study was to analyze the Children's category of the Schneider Family Book Awards from 2004 to 2015. There were a total of 11 books that won the Schneider Family Book Award since its inception (Table 1). Content analysis was used to analyze the books, since this particular study sought to analyze how

individuals with special needs were portrayed within the text. Content analysis is a set of procedures for collecting and organizing information in a standardized format that allows analysts to make inferences about the characteristics and meaning of written and other recorded material (Krippendorff, 1980). Content analysis was used to analyze the books for the specific disability experience represented in each book. In addition, content analysis was used to identify how the disability was portrayed in each of the books selected for this award. Finally, the data collected from the research were checked for commonalities and differences among the books in the Children's category.

RESULTS

Common running themes in the Schneider Family Book Award-winning books in the Children's Book category are: acceptance, determination, overcoming obstacles, pursuing passions, self-esteem, and living positively with a disability. Nine of the books show the characters positively pursuing passions in careers and leisure activities. They were as follows: *Looking out for Sarah*; *My Pal, Victor,/Mi Amigo, Victor; Dad, Jackie, and Me*; *The Deaf Musicians*; *Kami and the Yaks*; *Piano Starts Here: The Young Art Tatum*; *Django: World's Greatest Jazz Guitarist*; *A Splash of Red: The Life and Art of Horace Pippin*; and *A Boy and A Jaguar*.

Other themes were also found throughout the award-winning books. For instance, the importance of

TABLE 2.
Disabilities Portrayed

Disability	Title	Year
Speech Impairment	*A Boy and a Jaguar*	2015
Orthopedic Impairment	*A Splash of Red*	2014
	Django	2010
	My Pal, Victor/Mi Amigo, Victor	2005
Dyslexia	*Back to Front and Upside Down!*	2013
Visual Impairment	*The Pirate Kindergarten*	2011
	The Piano Starts Here	2009
	Looking Out For Sarah	2004
Hearing Impairment	*Kami and the Yaks*	2008
	The Deaf Musicians	2007
	Dad, Jackie, and Me	2006

TABLE 3.
Character Portrayed with Disability: Main, Secondary or Both

Character Portrayed with Disability	Title	Year
Main Character With a Disability	*A Boy and a Jaguar*	2015
	A Splash of Red	2014
	Back to Front and Upside Down!	2013
	The Pirate of Kindergarten	2011
	Django	2010
	Piano Starts Here	2009
	Kami and the Yaks	2008
Secondary Character With a Disability	*Dad, Jackie, and Me,*	2006
	My Pal, Victor/Mi Amigo, Victor	2005
	Looking Out for Sarah	2004
Main and Secondary Characters With a Disability	*The Deaf Musicians*	2007

friendship between people or animals can be found in *My Pal, Victor/Mi Amigo, Victor*; *Piano Starts Here: The Young Art Tatum*; *Looking out for Sarah*; *Deaf Musicians*; and *A Boy and a Jaguar*.

Finding passion at an early age and pursuing that passion into adulthood was found in the following books: *A Boy and a Jaguar*, *A Splash of Red: The Life and Art of Horace Pippin*, *Django: World's Greatest Jazz Guitarist,* and *Piano Starts Here: The Young Art Tatum*.

Importance of family and family values were found in these award winning books *A Boy and a Jaguar*, *A Splash of Red: The Life and Art of Horace Pippin*, *Django: World's Greatest Jazz Guitarist, Piano Starts Here: The Young Art Tatum, Kami and the Yaks*, and *Dad, Jackie, and Me*.

The ability to ask for help and receive positive feedback and to achieve success in the classroom is found in the books *Back to Front and Upside Down!* and *The Pirate of Kindergarten.*

Disabilities Portrayed

Analysis of the text found that of the 11 Schneider Family Book Award winners analyzed in the Children's category, there were five different disability experiences portrayed: orthopedic, visual, hearing, and speech impairment, and dyslexia (Table 2). It was interesting to note that, for three years in a row, the characters of the Schneider Family Book Award winners had a hearing impairment.

It should also be noted that in the books *A Splash of Red: The Life and Art of Horace Pippin*, and *Django: World's Greatest Jazz Guitarist,* both of the characters' physical impairments were the result of an injury to one of their hands. Both characters in these books had to adapt to

TABLE 4.
Explicit and Implicit Representation of the Disability within the Story

Representation of the Disability Experience	Title	Year
Explicit	*A Boy and His Jaguar*	2015
	A Splash of Red: The Life and Art of Horace Pippin*	2014
	Back to Front and Upside Down!	2013
	The Pirate of Kindergarten	2011
	Django: World's Greatest Jazz Guitarist *	2010
	Piano Starts Here: The Young Art Tatum	2009
	Kami and the Yaks	2008
	The Deaf Musicians	2007
	Dad, Jackie, and Me	2006
	Looking Out for Sarah	2004
Implicit	*My Pal, Victor/Mi Amigo, Victor*	2005

*--The disability experience happens after an injury

TABLE 5.
Genres

Genres	Titles	Year
Biography	*A Boy and a Jaguar*	2015
	The Piano Starts Here	2009
	Django	2010
	Splash of Red	2014
Historical Fiction	*Dad, Jackie, and Me*	2006
Fantasy	*Back to Front and Upside Down*	2013
	Looking Out for Sarah	2004
Contemporary Realistic Fiction	*The Pirate Kindergarten*	2011
	Kami and the Yaks	2008
	The Deaf Musicians	2007
	My Pal, Victor/Mi Amigo, Victor	2005

their disability in order to pursue their passion. These two books also brought messages to readers that a disability is not always something that a person is born with and that anyone has the potential of acquiring a disability that could affect their life at any age. Django and Horace's stories show readers that while a disability is an actuality, it does not have to be debilitating or prevent a person from pursuing or continuing passions. Each book portrayed the characters adaptation to their disability as a sign of strength in order to improve their quality of life.

Out of eleven books found in the Children's category of the Schneider Family Book Awards, seven had a main character with the disability experience (Table 3). Three books had a secondary character with a disability experience and one book featured both the main character and secondary character with disability experiences. *The Deaf Musicians* shows Lee, the main character, who is deaf, make friends with Max, who is the secondary character and deaf as well. They join up with several other characters that are deaf to make a band that plays in the subway. *The Deaf Musicians* is the only book that shows multiple characters with disabilities, thus making readers aware that living with a disability is not just an individual event and that others with the same disability can get together to interact and enjoy their lives.

While eight of the books introduce the character's disability explicitly within the first few pages, one, *My Pal, Victor/Mi Amigo, Victor* was implicitly represented so the reader was unaware of the character's physical impairment until the last page (Table 4).

Genres

There were four different genres represented in the eleven award winning books: four biographies, one historical fiction, two fantasy, and four contemporary realistic fiction (Table 5). Contemporary realistic fiction genre won the award two years in a row in 2007 with *The Deaf Musicians* and *Kami and the Yaks* in 2008. Biographies won in back to back years as well with *Piano Starts Here* in 2009 and *Django* in 2010.

DISCUSSION

The books that received the Schneider Family Book Award feature characters that help students to understand and look beyond a person's disability because they soon see that they have more similarities than differences. It is possible that reading books like these could make students more compassionate, empathetic, and less judgmental. Books should connect students with disabilities so that they can see characters on a personal level, making the book relevant, realistic, and applicable to their life. They will be able to discuss their challenges more easily and help their peers to see that their disability is not the focus of their life and that there is so much more to them as a person. Students become more invested and engaged when they read about characters with different abilities dealing with familiar, relatable situations that they have experienced firsthand. Books like these will take the reading process to a higher level, and inspire students to read more for enjoyment. The student will want to use books to compare and contrast how close the characters' experiences are to their own. Books will help students relate to internal and external conflicts that the characters are dealing with, and this will enhance their reading experience as well. Discussions between students will reach higher levels when students can connect personally with characters.

Teachers can facilitate higher critical thinking skills by asking open-ended questions and having students give feedback from their experiences either orally or in written form. Relative literature expands minds and opens new doors for students while enabling them to confidently share their life experiences and listen to others tell of their life experiences. Books that have won the Schneider Family Book Awards are a reliable resource that teachers could choose to use in the classroom to open awareness to different abilities found in the twenty-first century classroom. Reading books like these will increase students' empathy, compassion, and understanding for their classmates with different abilities or for people with different abilities in general.

REFERENCE/BIBLIOGRAPHY

Alexander, C. (2012). *Back to front and upside down!* Grand Rapids: Eerdmans Books for Young Readers.

America Library Association. (n.d.). *Schneider family book award manual*. Retrieved from http://www.ala.org/aboutala/sites/ala.org.aboutala/files/content/schneiderawardmanual-2-2.pdf.

American Library Association. (n.d.). The Schneider family book award: A legacy of inspiration. Retrieved from http://www.ilovelibraries.org/article/schneider-family-book-award-legacy-inspiration.

Bertrand, D.G. (2004). *My pal Victor/mi amigo, Victor*. McHenry: Raven Tree Press.

Bryant, J. (2013). A splash of red: The life and art of Horace Pippen. New York: Alfred A. Knopf/Random House Children's Books.

Christensen, B. (2009). *Django: World's greatest jazz guitarist*. New York: Neal Porter Book/Roaring Brook Press.

Krippendorff, K (1980). *Content analysis; An introduction to its methodology*. Beverly Hills, CA: Sage.

Lang, G. (2003). *Looking out for Sarah*. Watertown: Charlesbridge Publishing.

Lyon, G. E. (2010). *The pirate of kindergarten*. New York: Atheneum Books for Young Readers/Simon & Schuster Children's Publishing.

Parker, R. A. (2008). *Piano starts here: The young Art Tatum*. New York: Schwartz & Wade Books.

Rabinowitz, A. (2014). *A boy and a jaguar*. New York: Houghton Mifflin Harcourt Publishing Company.

Seeger, P. & Jacobs P. D. (2006). *The deaf musicians*. New York: G.P. Putnam's Sons Books for Young Readers.

Sims Bishop, R. (n.d.). *Multicultural literacy: Mirrors, windows, and sliding doors*. Retrieved from http://www.rif.org/us/literacy-resources/multicultural/mirrors-windows-and-sliding-glass-doors.htm

Stryer, A. S. (2007). *Kami and the Yaks*. Palo Alto: Bay Otter Press.

Uhlberg, M. (2005). *Dad, Jackie, and me*. Atlanta: Peachtree Press.

THE RELATIONSHIP BETWEEN CONVERGENCE, DIVERGENCE, RECOGNITION, AND TRACKING SKILLS AND BATTING PERFORMANCE OF PROFESSIONAL BASEBALL PLAYERS

by TYEISHA LAWSON

ABSTRACT

The purpose of this study was to investigate the relationship between convergence, divergence, recognition, and tracking skills and batting performance of professional baseball players. Three hundred fifty-two (352) minor league baseball players were evaluated for visual skills and batting performance during the 2013 minor league baseball season. Visual skills were measured using Vizual Edge Performance Trainer® (VEPT), a software program which measures eye alignment, depth perception, convergence, divergence, visual recognition, and visual tracking. Individual subtest scores were recorded and combined to give an overall EDGE score. Visual skill testing was conducted by professional baseball scouts as part of pre-draft player evaluations. Visual skills composite EDGE score was determined by the subtest scores of convergence station score (CON), divergence station score (DIV), visual recognition response time (VR), and visual tracking response time (VT). Batting performance was determined by 2013 season statistics, which included batting average (BA), bases on ball percentage (BB%), strikeout percentage (SO%), on base percentage (OBP), slugging percentage (SLG), and on base plus slugging (OPS). Players were divided into quartiles based on each of the four VEPT variables. Descriptive statistics and Pearson's correlations were calculated for all variables. In addition, t-tests for independent samples were used to analyze significant differences between upper and lower quartiles. Data analysis determined statistically significant relationships for VR and BA (r = -.114, p = .035) and DIV and SO% (r = -.096, p = .058). In addition, practical significance was determined due to the significant disparity between upper and lower quartiles on CON and OPS (.702 to .719), VR and SLG (.388 to .364), VR and SO% (.236 to .251), VR and OPS (.726 to .694) and finally VT and SO% (.268 to .223). The results suggest that there is a significant relationship between convergence, divergence, recognition, tracking skills and batting performance. Coaches and training staffs should consider a variation of visual stimuli training or VEPT to help gauge and train the visual skills of professional baseball players.

Keywords: *Reaction, Response, Testing, Athlete, Visual, VEPT*

MENTOR

Dr. Frank Spaniol

Professor
Department of Kinesiology
College of Education

INTRODUCTION

Visual skills are of vital importance to sport, where the eyes convey an estimated 80% of information processed by athletes (Mier et al., 2005). Anthropometric and physiological characteristics of baseball have been studied; however recent studies are looking past the biomechanics of baseball skills and examining the importance of vision (Kohmura et al., 2008). Visual involvement varies according to environmental demand, so an athlete's visual characteristics depend on the sport in which they specialize (Ghasemi et al., 2011). Therefore, the ability to track and process a moving object is dependent on the object's characteristics such as size, color, and speed (Millslagle et al., 2013). By training visual skills, athletes may enhance their reaction time, depth perception, recognition, and object tracking skills (Young & Farrow, 2013).

The visual and proprioceptive systems provide an athlete - or, more precisely, the central nervous system - with important information about what is happening in his or her external and internal environments (Meir, 2005). The reaction of the brain to assess and recognize what's going on can determine the success or failure to any athlete (Mier, 2005). Ghasemi, Momeni, Jafarzadepur, Rezaee, & Tahier (2011) examined visual skills of expert soccer referees and determined that visual perception is more dependent on speed of recognition and reaction to a stimulus than vision in the peripheral visual field (Ghasemi et al., 2011). Recent research has suggested the importance of visual skills in sport and how training visual skills can enhance performance.

By definition, visual convergence and divergence are the ability of the eye to focus on an object as it nears or as the distance increases (Seiller & Ciemiewicz 2013). As an object nears, the eyes unite their gaze together to focus as the object's closes. Conversely, as an object travels further away from the eyes, the eyes depart their gaze away from each other to focus as the distance increases (Seiller & Ciemiewicz 2013). Another component to the visual skill set would be visual recognition which is identified by David G. Lowe (1984) as a correspondence between elements of the image being viewed and a prior representation of a similar object. Similarly, Seiller & Ciemiewicz (2013) describe recognition as the ability to call upon past visual experiences and react with the proper motor movement. For example, this can occur during an at bat where a hitter views varying amounts of pitches and reacts accordingly the next time the same pitch is thrown. Consequently, the batter's recognition of a certain pitch may possibly result in a favorable outcome. The final aspect of visual skill that will be examined is visual tracking. Seiller and Ciemiewicz (2013) explain tracking as processing a simple target and responding with the correct action. A batter may track the ball to contact with the bat just as a fielder tracks the ball into the glove. Tracking, along with the other visual variables being investigated, can potentially allow an athlete to succeed in high-paced, fast-moving ball games in accordance with the environment (Mier et al., 2005).

Adding visual training specific to a particular sport has been suggested to potentially increase that skill in that sport (Ouedejans et al., 2012). In 2012, a study on visual control training of female basketball players, the women increased their three point shooting percentages by 8% (Ouedejans, 2012). By the same token, a study in 2011 used special goggles that studied the effects of sports vision exercises on the visual skills of students (Du Toit et al. 2011). The study suggested that with the correct visual training, certain visual skills can be improved. However, in training youth field hockey players with visual training, some visual training aids proved to show little to no increase in visual abilities (Schwab & Memmert, 2012). Visual and motor reaction time showed an improvement, but what they call a "Transfer Task", showed no improvement. Berg (2006) recommends that if visual training is to be included in a sports conditioning program, the training be perceptual in nature and include rapid identification of visual cues.

Baseball is perceived as a game of numbers that aim to predict performance. Whether it is for the next game or next year's draft, professional baseball scouts are consistently looking for relationships between a player's skill set and performance output. Along with physical attributes such as strength, power, height, and weight, an increasingly amount of attention is being paid to a player's visual proficiency as a means of helping a team's chance of success (Kohmura et al., 2008). Therefore, a rise in visual research among athletes has come about in recent years.

The purpose of this study is to investigate the relationship between visual skills and batting

performance of professional baseball players. Visual skills will be defined as convergence, divergence, recognition, and timing visual skills will be defined by the sub-scores of Vizual Edge Performance Trainer®. Batting performance will be determined by end of season batting statistics. A null hypothesis stated that there will be no significant relationship between the visual skills and batting performance of professional baseball players.

METHODS

Subjects

For this study, archived visual skills data of 352 minor league baseball players were collected prior to the 2013 minor league season. The data came from athlete testing that occurred before the 2013 minor league season and was conducted by professional baseball scouts while assessing talent for pre-draft player evaluations. Each subject willingly participated in Vizual Edge Performance Trainer® testing. Batting performance was determined from statistics of the 2013 season.

Procedures

The software used to determine visual skills was Vizual Edge Performance Trainer®. Upon completion of testing, each player received a composite EDGE score from the Vizual Edge Performance Trainer®. The composite EDGE score was compromised of several subtest variables which included a convergence station score (CON), divergence station score (DIV), visual recognition response time (VR), and visual tracking response time (VT). Batting performance variables were obtained from the 2013 minor league season which included batting average (BA), base on ball percentage (BB%), strikeout percentage (SO%), on base percentage (OBP), slugging percentage (SLG), and on base plus slugging percentage (OPS).

Before engaging in Vizual Edge Performance Trainer® testing, subjects were verbally and visually instructed on protocol for computer testing (Powell & Spaniol 2013). Subjects were allowed test trials of Vizual Edge Performance Trainer® software where the scores were not being recorded to allow for an acclimation to the program. Once familiarity had been established, subjects were instructed to commence testing. Vizual Edge Performance Trainer® measured each subject

for visual skills that included eye alignment, depth perception, visual convergence and divergence, visual recognition and visual tracking (Spaniol et al., 2013). Three trials were performed by the subjects and the best attempt was recorded. Upon completion, each subject was issued a comprehensive VEPT score which was comprised of a calculation of each of the individual sub-test scores. After the final scores were issued, subjects were asked to submit results for examination (Powell & Spaniol 2013).

After evaluation of both visual variables and performance variables, data was entered into a data sheet using Microsoft Excel Spreadsheet software. Data was ranked according to individual visual variables and then sorted into quartiles using means and standard deviations. Upper and lower quartiles of batting performance variables according to the rankings of visual variables were then compared for disparities and further statistical analysis. Data from the quartiles was then entered into IBM SPSS 22.0 statistical software for processing. Using the data from the quartiles analyzed with Independent Samples T-Test, along with Pearson's correlation coefficient (r), was then executed to determine statistical significance. The alpha level was set at $p = 0.05$.

Experimental Approach to the Problem

A correlation study design was used to investigate the relationship between convergence, divergence, recognition, tracking skills and batting performance of professional baseball players. All participants remained anonymous and no identifying information was shared with anyone outside of the research team.

Statistical Analyses

Means, standard deviations, and correlation coefficients were calculate for CON, DIV, VR, VT, BA, BB%, SO%, OBP, SLG, and OPS. Visual variables were also ranked and sorted into quartiles using Microsoft Excel software. Visual variables were then transferred over to IBM SPSS 22.0 where t tests for independent samples were used to determine if statistically significant differences existed between the upper and lower quartiles. Significance was accepted at $p \leq 0.05$.

RESULTS

The three hundred and fifty two professional baseball players' results are as follows: a mean BA of .254 ± .041, a mean BB% of .108 ± .045, a mean SO% of .250 ± .163, a mean OBP of .333 ± .047, a mean SLG of .374 ± .081, and a mean OPS of .707 ± .116. Vizual Edge Performance Trainer® results are as follows: a mean CON of 34.87 ± 17.26, a mean DIV of 20.41 ± 10.77, a mean VR of 1.03 ± .44 seconds, and a mean VT time of .59 ± .12 seconds (Table 1). Statistical significance was found between VR and BA (r = -.114) and also DIV and SO% (r = -.096) (Table 3, Figure 1, Figure 2). On the other hand, no significant relationship was found for VR and OPS (r = -.083), VR and SLG (r = -.084), VR and SO% (r = .029), VT and SO% (r = -.034), and finally CON and OPS (r = -.052) (Table 3). In addition, practical significance was determined due to the significant disparity between upper and lower quartiles on CON and OPS (.702 to .719), VR and SLG (.388 to .364), VR and SO% (.236 to .251), VR and OPS (.726 to .694) and finally VT and SO% (.268 to .223).

DISCUSSION

The major finding in this study was that there was a significant relationship between VR and BA. Significance was accepted at the p = 0.05 level where VR and BA resulted in a significance level of p = .035, which indicates that a low recognition time is inversely related to a high batting average (Figure 1, Table 3). In addition, a significance was also found between DIV and SO% where p = .058, signifying a positive relationship between divergence and strikeout percentage (Figure 2, Table 3). Based on these results, the null hypothesis was rejected.

In addition, when comparing upper quartiles and lower quartiles of batting performance statistics, a practical significance was identified. Greatest differences were discovered for CON and OPS (.702 to .719), VR and SLG (.388 to .364), VR and SO% (.236 to .251), VR and OPS (.726 to .694) and finally VT and SO% (.268 to .223)(Table 2). The disparity between the upper and lower quartiles provides additional support in suggesting that visual variables are positively correlated with batting performance.

Through these findings, there is evidence to indicate that a player with a high Vizual Edge Performance Trainer® score on either recognition or divergence testing, along with a high overall VEPT score, is suggestive of superior batting performances (15, 16). Investigation of the visual variables and batting performance indicates a strong Vizual Edge Performance Trainer® score is accompanied by a positive batting performance. Upon further examination, the player with the most at bats (606) and most hits (184) was also ranked in the top quartile for BA (.304), VR (.70 sec), VT (.49 sec), along with a 75th percentile ranking for CON (38/77) and DIV (23/77) respectively. Furthermore, the player with the highest DIV (54/77) also outperformed his peers with an overall EDGE score of 91.32, which was best of the three hundred fifty two participants. The same player also scored the fastest VR time (.45 sec) as well as earning a top quartile BA (.316), all while managing to rank in the 25th percentile in SO% (.260). Despite the disparity in those individual results of the top divergence score and strikeout percentage, the results are in support of the statement that superior visual skills may produce high batting performance statistics.

These findings are supported by previous studies where a significant correlation between visual skills and batting performance had been found (Szymanski et al., 2011). In these studies participants were also tested by Vizual Edge Performance Trainer® alongside batting variables (i.e. skills and performance) to investigate any relationships between the two skills. In all four studies, a significant correlation was found between visual skills and batting variables of the subjects (Szymanski et al., 2011). In one particular study, Szymanski et. al. (2011) determined, the effect of vision training on batting performance and pitch recognition was examined and no significant increase was found in batting performance, however pitch recognition saw a significant increase. Just as in the current study, evidence to support that visual variables impact batting performance was found in the previous studies.

CONCLUSION

In conclusion, this present study does support previous studies and their findings of high correlations with visual skills and batting performance (Spaniol et al., 2013). Additional research should be conducted in order to further investigate the exact relationship convergence, divergence, recognition, and tracking skills have with batting performance and propose how to specifically train those traits individually. In addition, there was no supporting evidence found in past literature to help define the significance between divergence and strikeout percentage. However future examinations should explore deeper into this interesting discovery. The data suggests that the differences between upper and lower quartiles imply that there is a significant difference among players who score in the upper quartile of Vizual Edge Performance Trainer® versus those who score in the lower quartile of independent visual variables. Although this study does not indicate a causal relationship, it is possible, however that further research can be done to represent a causal relationship between a player whom possesses strong visual skills tested by Vizual Edge Performance Trainer®, could potentially be a strong candidate for superior batting skills.

REFERENCES

Abernathy, B., Wann, J., & Parks, S. (1998). Training perceptual-motor skills for sport. In B.Elliott (Ed.), *Training in Sport: Applying Sport Science* (pp. 1-68). New York: Wiley & Sons.

Barnes, P. D., & Davids, K. W. (1984). The effect of physiological stress upon the functional visual field during sports performance. *Relay: Occasional Papers in Human Movement*, 2, 30-32.

Berg, K. E. (2006). Comprehensive training for sport: Implications for the strength and conditioning professional. *NSCA Strength and Conditioning Journal*, 28(5), 10-18.

Du Toit, P. J., Kruger, P. E., Mahomed, A. F., Kleynhans, M., Jay-Du Preez, T., Govender, C., & Mercier, J. (2011). The effect of sports vision exercises on the visual skills of university students. *African Journal for Physical, Health Education, Recreation, and Dance*, 17(3), 429-440.

Ghasemi, A., Momeni, M., Jafarzadehpur, E., Rezaee, M., & Taheri, H. (2011). Visual skills involved in decision making by expert referees. *Perceptual and Motor Skills*, 112(1), 161-171.

Gilliam, S. T., Szymanski, D. J., Braswell, M. T., Britt, A. T., Cicciarella, C. F., Herring, A. L., Holloway, B. T., Lowe, H. E., Potts, J.D., Szymanski, J.M., Till, M.E., & Spaniol, F.J. (2010). Effect of vision training on batting performance and pitch recognition of division I baseball players. *NSCA Journal of Strength and Conditioning Research*, 24.

Kohmura, Y., Aoki, K., Yoshigi, H., Sakuraba, K., & Yanagiya, T. (2008). Development of a baseball-specific battery of tests and a testing protocol for college baseball players. *NSCA Journal of Strength and Conditioning Research*, 22(4), 1051-1058.

Lowe, D. G. (1984). *Perceptual Organization and Visual Recognition*. Stanford, CA: Stanford University.

Meir, R. (2005). Conditioning the visual system: A practical perspective on visual conditioning in rugby football. *NSCA Strength and Conditioning Journal*, 27(4), 86-92.

Millslagle, D. G., Smith, M. S., & Hines, B. B. (2013). Visual gaze behavior of near-expert and expert fast pitch softball umpires calling a pitch. *NSCA Journal of Strength and Conditioning Research*, 27(5), 1188-1195.

Oudejans, R. R. D. (2012). Effects of visual control training on the shooting performance of elite female basketball players. *International Journal of Sports Science & Coaching*, 7(3), 469-480.

Powell, J., & Spaniol, F. (2013). The relationship between visual skills and reactive agility of NCAA division I male basketball players. Master's thesis, Texas A&M University-Corpus Christi, Corpus Christi, 2013.

Schwab, S., & Memmert, D. (2012). The impact of a sports vision training program in youth field hockey players. *Journal of Sports Science & Medicine*, 11, 624-631.

Seiller, B. L., & Ciemiewicz, S. M. (2013). Sports Officials Should Train their Eyes for Improved Performance. *Vizual Official*. Retrieved April 7, 2014, from http://vizualofficial.com/images/VZ_VEPT_Article.pdf

Spaniol, F. (2013). The relationship between visual skills and batting performance of professional baseball players. *Journal of Strength and Conditioning Research*, 28, S101.

Spaniol, F., Bonnette, R., Coker, L., Melrose, D., Paluseo, J., & Szymanski, D. (2008). Effect of visual skills training on the batting performance of NCAA Division I baseball players. *Journal of Strength and Conditioning Research,* 112.

Szymanski, J. M., Lowe, H. E., Szymanski, D. J., Cicciarella, C. F., Lowe, D. W., Gilliam, S. T., & Spaniol, F. J. (2011). Effect of vision training on batting performance and pitch recognition of division i softball players. *NSCA Journal of Strength and Conditioning Research*, 25.

Young, W., & Farrow, D. (2013). The importance of a sport-specific stimulus for training agility. *NSCA Strength and Conditioning Journal*, 35(2), 39-43.

ACKNOWLEDGMENTS

FIGURE 1.
Relationship between recognition and batting average. Significant at $p \leq .05$
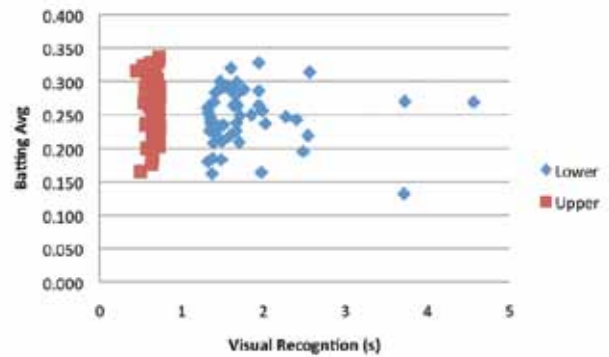
(r = -.114)

FIGURE 1.
Relationship between divergence and strikeout percentage. Significant at $p \leq .05$

(r = -.096)

TABLE 1.
Group mean values of convergence, divergence, recognition, tracking, batting average,
base on balls percentage, strikeout percentage, on base percentage, slugging percentage,
and on base plus slugging percentage of all baseball players tested (n = 352)
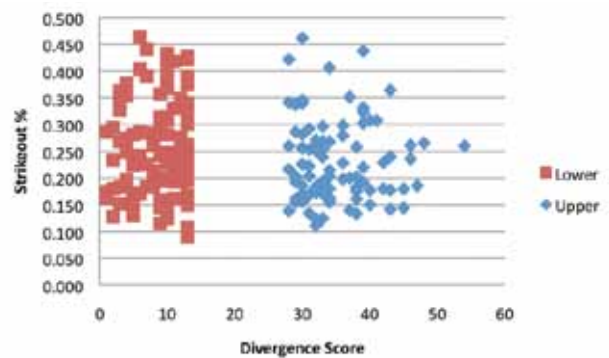
Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
VEPT	352	48.22	43.06	91.28	79.1261	6.54950	42.896
CONSS	352	70.00	1.00	71.00	34.8665	17.26109	297.945
DIVSS	352	53.00	1.00	54.00	20.4119	10.76997	115.992
VRRT	352	4.11	.45	4.56	1.0290	.43814	.192
VTRT	352	.66	.42	1.08	.5904	.12281	.015
BATAVG	352	.253	.110	.363	.25374	.040915	.002
BBPERCT	352	.273	.028	.301	.10751	.045293	.002
SOPERCT	352	2.426	.005	2.430	.25006	.163231	.027
OBP	352	.319	.173	.492	.33302	.046734	.002
SLG	352	.512	.119	.631	.37440	.080586	.006
OPS	352	.739	.297	1.036	.70728	.116241	.014
Valid N (listwise)	352						

TABLE 2.
Group upper and lower quartiles for batting average, base on ball percentage, strikeout percentage,
on base percentage, slugging percentage, and on base plus slugging percentage
as dictated by convergence, divergence, recognition, and tracking rankings (n = 352)

	AVG	BB%	SO%	OBP	SLG	OPS
CON	Upper .257	Upper .098	Upper .230	Upper .329	Upper .373	Upper .703
	Lower .257	Lower .106	Lower .237	Lower .337	Lower .383	Lower .719
DIV	Upper .255	Upper .106	Upper .231	Upper .333	Upper .380	Upper .712
	Lower .253	Lower .113	Lower .280	Lower .336	Lower .377	Lower .713
VR	Upper .263	Upper .102	Upper .237	Upper .338	Upper .389	Upper .727
	Lower .247	Lower .110	Lower .252	Lower .330	Lower .365	Lower .695
VT	Upper .256	Upper .104	Upper .269	Upper .334	Upper .372	Upper .705
	Lower .251	Lower .112	Lower .224	Lower .333	Lower .379	Lower .712

TABLE 3.
Group results for independent t tests (p) and Pearson's correlation coefficient (r) for all pairings possible between convergence, divergence, recognition, tracking, batting average, base on balls percentage, strikeout percentage, on base percentage, slugging percentage, and on base plus slugging percentage (n = 352)

	BA	BB%	SO%	OBP	SLG	OPS
CON	p=.960 r=-.008	p=.174 r=-.048	p=.533 r=-.041	p=.255 r=-.044	p=.381 r=-.052	p=.301 r=-.052
DIV	p=.780 r=.042	p=.288 r=-.021	p=.058 r=-.096	p=.656 r =.012	p =.833 r = .033	p =.976 r = .028
VR	p= .035 r=-.114	p=.347 r=.044	p= .343 r= .029	p= .334 r=-.063	p= .114 r=-.084	p =.139 r=-.083
VT	p= .478 r=-.077	p= .316 r=.019	p =.120 r=-.034	p= .924 r=-.057	p =.643 r=-.025	p =.751 r=-.039

DO PARENTS PICK MORE THAN A NAME? FIRST NAME PHONEMES AND PERSONALITY TRAITS REVISITED

by CORREY D. MILLER

ABSTRACT

The purpose of this study was to continue to explore the connections between personality characteristics and first name phonemes. Participants (N = 200, female= 76%, M age = 19.8) completed a 120 question personality inventory measuring the Big Five personality characteristics and the defining facets of personality. Participants were then audio/ video recorded stating their first name or family nick-name. Each name was analyzed to identify the phonemes using the International Phonetic Alphabet. T-tests were used to compare personality characteristics with participants whose name did not contain a specific phoneme against those whose name did not bear the phoneme. Participants with /I/ phoneme had higher rates of openness to experience while participants with /s/ phoneme scored lower on openness to experience.

MENTOR
Dr. Amy Houlihan
Professor of Psychology
Department of Psychology
and Sociology
College of Liberal Arts

Keywords*: personality traits, phonemes, phonetic assessment, first names, International Phonetic Alphabet, personality*

INTRODUCTION

A person's name is one of the first things assigned to them at birth. No one selects the name they are referred to, yet it is arguably the biggest identifier of an individual. Some people bear the names of others before them such as family names, historic names, or religious names. Previous studies on the relationship between names and the personality or characteristics of those who bear them has been concentrated on the characteristics others attribute to the name bearer. Other researchers have examined how people feel about their own names. To date, only one study examined the phonetic qualities of a name (i.e., the specific sounds of the name) and the relation to personality characteristics. The aforementioned study was conducted by the researcher and the current study seeks to expand on the previous one.

The Five Factor theory, first proposed by McCrae and Costa (1985), maintains that personality is comprised of five basic dimensions: agreeableness, conscientiousness, extraversion, openness to experience, and neuroticism. These five characteristics have been the focus of personality research since its introduction and have

been empirically validated with supporting research for nearly 30 years (Chang, Connelly, & Geeza, 2012).

Names and Interpersonal Impressions and Communication

Researchers have studied the phenomena of names and how they can affect personal outcomes in life and interpersonal communications with others. The name-based interpersonal neglect hypothesis states that negative names create negative interpersonal reactions, which influence people's life outcomes and experiences (Gebauer, Leary, & Neberich, 2011). This research showed that more people had interests in others with positively viewed names rather than culturally common names. They called this the "Kevinism effect," which is discrimination against people who have culturally devalued names due to them becoming common (Gerbauer et al., 2011).

Names and Perceived Personality Characteristics of Others

Several studies have examined characteristics that others attribute to a bearer of a specific name. For example, people tend to attribute less ethical caring traits (e.g., trustworthiness, loyalty sensitivity, and kindness) and more successful characteristics (e.g., intelligence, ambition, assertiveness, and creativity) to men's names than to women's names (Meharbian, 2001). In addition, Laham, Koval, and Alter (2011) explored the phenomenon called "the name pronunciation effect," which maintains that people bearing names that are easier to pronounce in any given language within a culture are viewed more positively than people with names that are more difficult to pronounce. This is accredited to the fact that more easily pronounced sounds are processed more easily in the brain, according to the hedonic marking hypothesis, which states that processing fluency creates a positive state that is attributed to the easy-to-process stimuli (Laham et al., 2011). This has real world implications in that many higher ranking partners in law firms and chief executive officers in many large companies have easier to pronounce, culturally familiar names (Laham et al., 2011).

In another study, the perception of names based on previous personal experience with people bearing that name was studied based on physiological responses. Ofek and Pratt (2008) examined responses to the name stimuli as measured by the Peripheral Arterial

Tonus (PAT). The PAT shows an autonomic response to the stimulus name through electrodes placed on the body. These signals were sent by the autonomic system when the subject heard the name. The authors also created a questionnaire for quantifying the subjective significance of the name the person heard. The subjective significance of names was rated higher if the subject knew and cared for someone bearing that name, if they had recently had an interaction with someone bearing that name, or had recently come into contact with someone bearing that stimulus name. This indicated that people attribute characteristics to a new person based on previous knowledge of others with the same name. The PAT also showed activation if the subject had a negative experience with a bearer of the same stimuli name (Ofek & Pratt, 2008). All of these studies measured the biases that people hold for names as a result of previous life experiences with others.

Names and Self-Reported Personality Characteristics

In contrast to measuring perceptions of others, additional research has examined the relation between one's self-reported personality characteristics and liking of personal names. One study (Joubert, 1999) aimed to identify how the liking of names is associated with the Big Five personality characteristics. Participants completed a personality inventory before they were asked to rate a preselected list of 60 male names and 60 female names. The list contained common, uncommon, dated, and rare names. The results showed that common names were preferred to less common, dated and rare names; less common names were preferred over rare names; and overall, no one really liked rare names. Participants who scored higher in agreeableness and extroversion reported liking more personal names. Higher scores in both agreeableness and extroversion were associated with a stronger preference for both common and less common names, but not for rare and dated names (Joubert, 1999). The current study expands upon this research by measuring 30 different personality characteristics of each participant, allowing for a more detailed analysis of personality.

The study that is most similar to the current research was by Marlar and Joubert (2002) and measured the participants' liking of their own personal first and middle names and how it related to self-esteem as well as the Big Five personality characteristics. This study

discovered that the liking of one's own first name is positively correlated with conscientiousness. In addition, it showed that self-esteem was positively correlated with scores on agreeableness, conscientiousness, and extroversion and negatively correlated with neuroticism (Marlar & Joubert, 2002).

One of the more unique forms of analyzing names and personality characteristics, called Neimology (Wyeth, 2012), predicts personality characteristics solely by where the letters fall in a name. According to Neimology, the placement of each letter is crucial to specific traits, and each vowel also has its own characteristics associated with it depending on where it falls in a name (Wyeth, 2012). For example, if the first vowel in a name is an "a" then the person with that first vowel is likely to want people to be honest with them, value justice and wisdom, and be fairly self-reliant (Wyeth, 2012). However, there is not currently any empirical data to support this theory. Rather than examining the letters of names, the current study focused on the phonemes that comprise each name. In other words, it examined the actual articulation of the sounds that make up the name and their relation to self-reported personality traits. In addition, participants in the current study were asked to report whatever name their parent/guardian called them most often, not their legal name. Thus, some participants' phonemes were selected from a nick-name or family name.

Phonetics is the scientific study of the sounds of language, not the rules or grammar of the language. Phonetics deals solely with the sounds themselves and identifies the sounds using the International Phonetic Alphabet (IPA). The IPA is a comprehensive set of symbols that allows for transcription of the sounds of all the languages of the world by differentiating the sounds based on the physiology used to create the sounds. These individual and unique sounds are called phonemes.

Summary and Rationale for the Current Study

Several studies have explored associations between names and perceived personality traits of others as well as self-reported personality traits. People make inferences about others' personalities based on their names (Meharbian, 2001). People with higher scores on agreeableness and extraversion tend to report greater

liking of names (Joubert, 1999), and liking one's own first and middle names correlates with conscientiousness (Marlar & Joubert, 2002). To date, no research has investigated any relationship between personality and the phonemes of a person's name. Although Wyeth's method for identifying personality characteristics is lacking empirical support, her book comes relatively close to seeking to identify what the current study is suggesting. As far as this researcher is aware, only one study has studied any relationships between personality and the phonemes of each person's name. The researcher sought to identify any personality characteristics that may be associated with specific phonemes of the names that participants report being referred to as by their parents/guardians. The study compared scores of participants who had specific phonemes present against those whose names did not have that phoneme present. It was found that participants with the /n/ phoneme had lower scores on depression, particularly less depressive and immoderation traits. Participants whose name contained the /ə/ (shwa) had higher scores on neuroticism, specifically higher scores on anxiety and on vulnerability traits (Miller, 2014). The current study replicated this study with a larger sample size and seeks to expand the knowledge base on this subject.

METHOD

Participants

Participants were students currently enrolled at Texas A&M University-Corpus Christi (TAMUCC). The participants consisted of 47 male and 152 female students whose ages ranged from 18-43 years old (*M* age = 19.8). The demographics of the sample were 40.5% Caucasian, 48% Hispanic, 7.5% African American, 1.5% Asian American, 2.5% Native Hawaiian/Pacific Islander.

Procedure

Potential participants were informed about the current study by the researcher who made announcements in a variety of classes. Students who expressed interest in participating provided their contact information and were contacted later to receive instructions about the date, time, and location of the data collection.

Upon arrival to the conference room, participants were asked to read and sign an informed consent

page indicating their consent to participate as well as certifying that they were current students at TAMUCC and were at least 18 years of age. Once the consent form was completed, students were given a questionnaire containing demographic information and a personality inventory. Participants were allowed as much time as needed to complete the questionnaire and more students were brought in to the room on a rotating basis once other students had completed the questionnaire. The questionnaire asked participants to rate on a Likert Scale how well 120 statements described them. Participants were instructed to ask for clarification on any questions they did not understand and to skip any question or statements they did not wish to answer.

Upon completing the personality inventory, participants began the second part of the study. Students were asked to accompany the researcher to the next room and sit in a chair positioned in front of a video camera. Participants were instructed to read the following sentence while being video and audio recorded: "Hi, my name is ___ (first or family name)___, and I am a student at Texas A&M University-Corpus Christi." The recordings provided accurate and proper pronunciations and articulations of the participants' names. After the recordings were completed, the participants were thanked for their time and were free to leave the lab.

Measures

Demographic Characteristics. Participants were asked to indicate up to three ethnic identities from the following categories: Caucasian/White, Hispanic/Latino, African American/Black, Asian/Asian American, Native Hawaiian/Pacific Islander, American Indian/Alaskan Native, or Other. The participants were also asked to indicate the language their parents spoke when they were growing up. Lastly, students were asked to report their age and their binary gender identification.

First names. Participants were asked to print the name they were most often referred to by their parent(s)/guardian(s) during childhood and adolescence. Family nick-names were strongly recommended but not required.

Personality Inventory. Johnson's (2011) 4-Item IPIP Scales Measuring Constructs Similar to those in the 30 NEO-PI-R Facet Scales was used to assess participants'

personality traits. This inventory includes 120 statements that are indicative of 30 separate personality traits. For each item, participants rated the extent to which the statement described the following scale: 1 = strongly disagree, 2 = disagree, 3 = unsure, 4 = agree, 5 = strongly agree. The 30 traits are: anxiety (α = .68), anger (α = .74), depression (α = .72), self-confidence (α = .66), immoderation (α = .56), vulnerability (α = .72), friendliness (α = .76), gregariousness (α = .78), assertiveness (α = .81), activity level (α = .55), excitement seeking (α = .70), cheerfulness (α = .74), imagination (α = .80), artistic interests (α = .71), emotionality (α = .53), adventurousness (α = .70), intellect (α = .57), liberalism (α = .49), trust (α = .77), morality (α = .76), altruism (α = .52), cooperation (α = .75), modesty (α = .77), sympathy (α = .66), self-efficacy (α = .79), orderliness (α = .75), dutifulness (α = .58), achievement striving (α = .73), self-discipline (α =.68), and cautiousness (α = .89).

These thirty personality facets are derived from the Big Five personality traits. Openness to experiences is the combination of artistic interests, intellect, liberalism, imagination, emotionality, and adventurousness (α = 0.48). Neuroticism is the combination of vulnerability, anger, self-consciousness, immoderation, anxiety, and depression (α = 0.50). Agreeableness is the compilation of trust, morality, altruism, cooperation, modesty, and sympathy (α = 0.47). Conscientiousness includes orderliness, self-discipline, achievement-striving, self-efficacy, cautiousness, and dutifulness (α = 0.64). Extroversion is the compilation of activity level, friendliness, assertiveness, gregariousness, excitement-seeking tendencies, and cheerfulness (α = 0.54).

Phonetic assessment. The recordings of the participants saying their names in a sentence helped avoid cultural language and regional speech pattern biases. Names were analyzed and broken down into their phonetic phonemes using the International Phonetic Alphabet (IPA). A comprehensive list of all phonemes present in the participants' names was compiled, and all participants' names were coded on the presence of these phonemes (1= phoneme present, 0 = phoneme absent).

Only the eight most common phonemes were included in the data analysis (see table 2 for list of phonemes).

RESULTS

Descriptive Statistics

Table 1 contains the 30 personality characteristics with the mean scores, standard deviation, and the range of scores.

T-tests

Eight phonemes were identified as having the highest reported frequencies (see table 2). For each of the eight phonemes, t-tests were conducted to compare each of the Big Five personality scores between people whose name contained a given phoneme and those whose names did not. Generally, personality scores did not differ significantly between participants whose name contained a specific phoneme and those whose did not (*ps* >.07). However, participants whose names contained the /I/ phoneme had higher scores in openness to experience than those that did not (t(197)=-.513, *p*=.607). Additionally, participants whose names contained the /s/ phoneme scored lower on openness to experience (t(197)=.845, *p*=..399).

To further explore the differences, the researcher used t-tests to analyze the phonemes and the individual personality facets that comprise openness to experience (active imagination, artistic interests, emotionality, adventurousness, intellect, and liberalism). For the /I/ phoneme, participants whose names contained the phoneme scored higher on artistic interests (t(197)=.105, *p*=.917) and intellect (t(197)=.343, *p*= 733) compared other participants whose names did not contained the phoneme. For the /s/ phoneme, participants whose names contained the phoneme scored lower on artistic interests (t(197)=.144, *p*=.866) than those whose names did not contain the phoneme.

DISCUSSION

The purpose of the current study was to explore the relationship between the sounds of a name and personality characteristics. The study suggests the phonemes /s/ and /I/ are associated with openness to experience. This classification on the Big Five is divided into the facets of imagination, artistic interests, emotionality, adventurousness, intellect, and liberalism.

People who score low on openness to experience are called *closed to experience*. They are considered more conventional or traditional in behaviors and mindset and they tend to enjoy routine. Persons who score high on openness to experience tend to enjoy variety and have more liberal views than those that score low on openness to experience (Joubert, 1999).

It should be mentioned that any relationship between personality characteristics and phonemes does not indicate having a specific phoneme causes a person to develop a specific personality trait. For example, a person might have a greater predisposition for openness to experiences because his parents encouraged such traits, not due to the sounds of their name.

Limitations

One limitation of the current study was the population that was sampled from. The participants were comprised of mostly Hispanic and Caucasian young adults, limiting the variability of the phonemes present in the names that were collected. All of the reliabilities for the 30 personality facets were all relatively low.

To expand on the current data, reanalysis should be done to further expand the amount of phonemes compared and include more than just the top eight most frequent. A sociological comparison of the data from the current study to the ethnic populations in the sample may reflect cultural norms. Relationships between phonemes and different cultures needs to be examined. Reginal location may also need to be considered in replications of the current study. Any of these suggested comparisons may indicate a non-culturally or language-defined pattern present due to sound integration and the pairing with word meanings. If any relationship is present between a person's first name and their personality, a longitudinal study may be able to better determine if any causal or influence is present.

REFERENCES

Chang, L., Connelly, B., & Geeza, A. (2012). Separating method factors and higher order traits of the Big Five: A meta-analytic multitrait-multimethod Approach. *Journal of Personality & Social Psychology, 102*, 408-426. doi:10.1037/a0025559

Gerbauer, J., Leary, M., & Neberich, W. (2012). Unfortunate first names: Effects of name-based relational devaluation and interpersonal neglect. *Social Psychological and Personality Science, 3*, 590-596.

Joubert, C. (1999). Correlates of preferences for personal names with the NEO Five Factor Inventory. *Psychological Reports, 84*, 575-581.

Katz, W. (2013). *Phonetics for dummies*. Hoboken, New Jersey: John Wiley & Sons, Inc.

Kulig, J. (2013). What's in a name? Our false uniqueness! *British Journal of Social Psychology, 52*, 173-179.

Laham, S. (2012). The name pronunciation effect: Why people like Mr. Smith more than Mr. Colquhoun. *Journal of Experimental Social Psychology, 48*, 752-756.

Marlar, M. &. Joubert (2002). Liking of personal names, self- esteem and the Big Five Inventory. *Psychological Reports, 91,* 407-410.

Mehrabian, A. (2001). Characteristics attributed to individuals on the basis of their first names. *Genetic, Social, and General Psychological Monographs, 127*, 59-88.

Miller, C. (2014). Do parents pick more than a name? First name phonemes and personality characteristics revisited. *The Texas A & M University Corpus Christi McNair Scholars Journal 2014.* 37-40.

Ofek, E. P. (2008). A question for quantifying subjective significance of names: Physiological   validation with PAT. *Physiology & Behavior, 94*, 368-373.

Wyeth, S. (2010). *Know the name- Know the person: Decoding letters to reveal secrets hidden in   names.* Lexington, Kentucky : Lightkeepers.

TABLE 1.
Personality facets, means, standard deviations, and ranges

Personality facets	M	SD	Range
Neuroticism			
Anxiety	3.20	0.80	1.00 - 5.00
Anger	2.69	0.87	1.00 – 5.00
Depression	2.02	0.79	1.00 - 5.00
Self-Consciousness	2.72	0.89	1.00 – 5.00
Immoderation	2.82	0.76	1.00 - 5.00
Vulnerability	2.58	0.90	1.00 - 4.75
Extraversion			
Friendliness	3.78	0.83	1.75 - 5.00
Gregariousness	3.30	1.01	1.00 - 5.00
Assertiveness	3.53	0.91	1.25 - 5.00
Activity level	3.30	0.79	1.25 - 5.00
Excitement-seeking	3.51	0.82	1.25 - 5.00
Cheerfulness	4.00	0.76	1.50 - 5.00
Openness			
Imagination	3.73	0.97	1.00 - 5.00
Artistic interests	3.59	0.90	1.25 - 5.00
Emotionality	3.72	0.71	1.50 - 5.00
Adventurousness	3.11	0.87	1.00 - 5.00
Intellect	3.31	0.79	1.00 - 5.00
Liberalism	2.76	0.79	1.00 - 4.75
Agreeableness			
Trust	3.20	0.90	1.00 -5.00
Morality	4.32	0.70	1.25 - 5.00
Altruism	4.12	0.61	2.25 - 5.00
Cooperation	4.06	0.87	1.25 - 5.00
Modesty	3.58	0.93	1.00 - 5.00
Sympathy	3.87	0.79	1.75 - 5.00
Conscientiousness			
Self-efficacy	3.87	0.75	1.50 - 5.00
Orderliness	3.37	0.96	1.00 - 5.00
Dutifulness	4.02	0.66	1.25 - 5.00
Achievement-striving	3.87	0.86	1.50 - 5.00
Self-discipline	3.47	0.85	1.50 - 5.00
Cautiousness	3.35	1.11	1.00 - 5.00

TABLE 2.
IPA usage, example words containing the phoneme, and frequencies of the 11 phonemes included in the current analyses

Phoneme	IPA usage	Example word	Frequency
/i/	Close front unrounded vowel	"*I*ntroduction"	91
/n/	Voiced dental or alveolar nasal	"*N*eed"	84
/I/	Transitional cardinal vowel	"*I*ntroduction"	77
/ɛ/	Cardinal vowel, open mid front unrounded	"*E*xample"	74
/l/	Voiceless velar stop	"*L*ess"	74
/ɑ/	Cardinal vowel, open back rounded	"h*O*t"	72
/ɹ/	Voiced alveolar or post alveolar approximant	"a*R*ts"	68
/s/	Voiceless alveolar median fricative	"*S*wimming"	65

NOTE: Phoneme sounds are illustrated by the italicized letter in the example word.

I TESTED MY STUDENT – NOW WHAT?: GUIDING PRE-SERVICE TEACHERS TO USE ASSESSMENT DATA TO PLAN INSTRUCTION IN A UNIVERSITY-BASED TUTORIAL PROGRAM

by DANIELLE TEFFT

ABSTRACT

The purpose of this study was to determine how pre-service teacher tutors used results gathered from reading interest surveys and literacy assessments to plan instruction for their students. Four tutors who were enrolled in one section of a Diagnosis and Correction of Reading Problems course at a South Texas university participated in this study. The researcher used a qualitative content analysis to find patterns among tutors' assessment results, lesson plans, and lesson transcripts. Findings indicate that these pre-service teachers used the information gathered to help them build relationships with and plan activities for their tutees. Tutors mainly focused on teaching comprehension, phonics, and writing strategies and skills.

MENTOR
Dr. Bethanie Pletcher

Assistant Professor
Department of Educational
Leadership, Curriculum
and Instruction
College of Education

INTRODUCTION

As Emily reflected on the time she spent with her student during the tutorial sessions, she said, "I think [my student] was just very comfortable. I think he trusted me." It is evident that she understands the importance of a strong working relationship between tutor and tutee.

Paying close attention to a child's responses to assessments is paramount in delivering effective instruction. Teachers who closely examine these responses are able to figure out a way to grow student achievement. In this study, pre-service teachers enrolled in a Diagnosis and Correction of Reading Problems course were asked to do just this: use results from assessments to drive instruction. The researcher set out to answer the following questions: 1) What kinds of observations do pre-service teachers make while administering assessment protocols? 2) How do pre-service teachers use assessment results to plan a course of action for their tutees during the tutoring sessions? 3) In what ways do pre-service teachers build relationships with their tutees?

The participants in this study claimed that this course helped mold them into the teachers they wish to become. They also noticed victories during lessons with their students, even if they were small ones. Although the tutors indicated that they struggled, they prevailed

in the end, feeling more confident as they began their journey of becoming a teacher.

I myself was an undergraduate student in this reading course, so I have come to understand the importance of establishing a strong working relationship with a student and using what the student knows to teach him or her. I tutored a third-grade boy, and each tutoring session was so successful because we trusted each other and allowed ourselves to learn from each other. Planning for these tutoring sessions was not an easy task; what made it easier was reviewing the assessment results I gathered at the beginning of our eight-week-long tutoring period. Paying attention to these details not only helped me, but it helped my student as well.

LITERATURE REVIEW

Effectiveness of a One-to-One Reading Tutorial Setting

In a traditional school setting, children are taught in a large group environment each day, therefore not many students and teachers have the opportunity to work one-on-one. Individual tutoring is a preferable way of teaching and learning for many reasons (Christensen & Walker, 1991; Hedrick, McGee, & Mittag, 2007; Juel, 1996; Mokhtari, Hutchinson, & Edwards, 2012). First, students have different needs, and it is easier to address these needs one-to-one as opposed to in a classroom with twenty or more students. Second, the smaller setting allows for the teachers or tutors to get to know their students better. Several components must be present in order to make this one-on-one tutoring effective. Hedrick, McGee, and Mittag (2007) claim, "A one-on-one learning experience is considered the most effective method of instruction" (p. 48). If all of the components are strung together properly, the education process can be extremely beneficial.

Building Relationships with Students

Tutoring involves more than delivering instruction to a child; it involves caring for a child and wanting them to feel successful. Almost anyone can teach a child something, but it takes a special person to build a relationship with that child and watch her or him flourish as a reader. Seeing improvements in a child's learning can have a great impact on a future or practicing teacher's career. Knowing that their students are doing well because of their teaching can build an immense amount of growth and confidence in the teacher (Assaf & Lopez, 2012; Fang & Ashley, 2004; Jones, Stallings, & Malone, 2004; Malone, Jones, & Stallings, 2002). It is important for teachers to build relationships with their students in the classroom in order to know their strengths and needs; however, it is even more necessary to build a relationship with a student in a one-on-one setting. Individual tutorial sessions create the ideal environment for this, as the tutor and tutee are able to give their undivided attention to one another (Assaf & Lopez, 2012; Fang & Ashley, 2004; Lake, Al Otaiba, & Guidry, 2010; Leal, Johanson, & Toth, 2004; Massey & Lewis, 2011). Fang and Ashley (2004) write, "Teaching is not just helping children learn valuable knowledge, it's about making a difference in the life of a child" (p. 50). Knowing where their students accelerate and fall short allows tutors to scaffold instruction as needed, helping the child make great strides in literacy. The more observant tutors become with their students, the more they are able to provide them with instruction that works (Fang & Ashley, 2004; Leal, Johanson, & Toth, 2004; Massey & Lewis, 2011).

Responding to Assessments Effectively

Prior to beginning formal instruction in a tutorial situation, tutors administer several reading and writing assessments. These assessments help the tutor identify reading problems. It is then up to the tutor to make the most of these results and use them to plan lessons for the child. Also, during each tutorial session, the tutor continues to informally assess the tutee's work by noting how they respond to activities. This allows the tutor to understand more about the student's strategic work in text and how they can help further support this (Assaf & Lopez, 2012; Fang & Ashley, 2004; Lake, Al Otaiba, & Guidry, 2010; Massey & Lewis, 2011; Mokhtari, Hutchinson, & Edwards, 2012). Fang and Ashley (2004) assert, "Good instruction depends on being able to make sense of children's reading and writing behaviors" (p. 47). Proper instruction is not just about noticing weaknesses and strengths in a child's reading and writing; it is about learning how to use this information to create a plan of action. Understanding how to respond to and build lessons from a student's literacy behaviors requires thoughtful preparation and takes a variety of approaches to solve instructional problems (Assaf & Lopez, 2012; Christensen &

Walker, 1991; Leal, Johanson, & Toth, 2004). Using tutorial sessions to practice the cycle of assessment and instruction provides excellent practice for future teaching.

Gaining Confidence in Becoming a Teacher

Although many pre-service teacher tutors are fearful at the start of the tutoring sessions (Assaf & Lopez, 2012; Christensen & Walker, 1991; Malone, Jones, & Stallings, 2002; Massey & Lewis, 2011), this experience helps them gain confidence in, and a respect for, being a teacher. The tutoring experience allows many tutors to identify themselves as teachers (Assaf & Lopez, 2012; Fang & Ashley, 2004; Haverback & Parault, 2008; Malone, Jones, & Stallings, 2002; Al Otaiba, 2005). Assaf and Lopez (2012) state, "Tutoring can provide multiple learning opportunities for pre-service teachers to develop a positive sense of themselves" (p. 367). For this reason, the one-on-one setting enhances the tutors' learning experiences. Their knowledge of reading instruction is lifted along with the child's reading proficiency. As pre-service teachers grow during their tutoring experience, they become more confident in their ability to strengthen children's literacy skills.

METHODS

Participants

Participants of this study included four undergraduate, pre-service teachers looking to become teachers at the elementary school level. The undergraduate students attended a four-year university in South Texas and were enrolled in a reading course titled Diagnosis and Correction of Reading Problems, in which they tutored an elementary-aged student one hour per week for an eight-week period. The tutoring sessions took place on campus under the supervision of their professor.

Data Collection

The researcher collected several pieces of data during and after the tutoring sessions in the form of assessment protocols, lesson plans, lesson transcripts, and interview transcripts. The assessments included reading interest surveys, graded word lists and graded reading passages from the Bader-Pearce Informal Reading Inventory (2013), phonics tests, and a writing assessment. The pre-service teachers used the graded reading passages

to determine their students' reading levels by assessing their ability to decode and comprehend short stories at various levels of difficulty. During the Cassidy Informal Writing Inventory administration, the tutor shows the student several images, and the student chooses one and responds to it in writing. The phonics assessments allow the tutor to determine what students know about letter/sound relationships. After considering all assessment results, the undergraduate students were then able to plan lessons for their tutees.

The researcher collected the pre-service teachers' lesson plans in order to see if their plans included activities that were based on the assessment results. Several lessons were recorded using university-owned iPads. The lesson recordings allowed the researcher to hear the actual dialogue of the undergraduate students and their tutees. The researcher also listened to assessment administration as well as how lesson plans were followed.

At the end of the eight-week tutoring sessions, the researcher conducted informal, semi-structured interviews to learn more about the undergraduate students' tutoring experiences. Each interview lasted approximately 20 minutes, and the pre-service teachers were provided with the opportunity to review their assessments and lesson plans in order to answer the questions. The interview protocol is located in the appendix.

DATA ANALYSIS

The researcher used the collected data to answer the study's research questions:

What kinds of observations do pre-service teachers make while administering assessment protocols?

How do pre-service teachers use assessment results to plan a course of action for their tutees during the tutoring sessions?

In what ways do pre-service teachers build relationships with their tutees?

By viewing assessment results and lesson plans, listening to lesson recordings, and analyzing the pre-service teachers' responses to interview questions, the researcher was able to address the research questions.

First, the researcher analyzed the assessments and considered the pre-service teachers' observations. Then, each lesson plan was coded based on the observations made during assessment administration. Lastly, the researcher coded interview responses based on the themes derived from the assessments and lesson plans. Thus, the researcher searched for patterns across all collected data.

Ethical Considerations

Participation in the study was voluntary on the part of the undergraduate students, tutees, and the tutees' parents. Participation in this study did not affect the pre-service teachers' grades in the course or their academic standing at the university in any way. The researcher provided consent forms for all participants.

Trustworthiness

Two measures were taken to ensure trustworthiness of the data collected. The researcher sent each tutor's section of the study to her as a form of member checking (Carspecken, 1995). Two of the participants acknowledged that they received the findings section and, after reviewing it, gave their assent. Another step taken to ensure trustworthiness was the use of several kinds of data. The interviews and lesson recordings added another dimension to the collected assessment protocols and lesson plans.

RESULTS

Building Relationships with Students

The four tutors who participated in this study all mentioned that they had to build relationships with their students in order to get to know them. Doing so allowed the tutors to provide appropriate instruction and created a situation where the students wanted to participate. Amanda noticed her student's progress as they grew more comfortable with one another. Emily said, "Just by me listening to him, it allowed him to get more comfortable…I think he trusted me." This comfort level leads to a place where the student starts to share things, such as personal stories, interests, and academic strengths and weaknesses. Tutors also worked to build up student confidence. Nicole commented, "I just tried to compliment her as often as possible to make her see that she's not behind or as slow as she thinks she is."

This tutor understands that praise is part of the whole teaching experience.

These findings support Assaf and Lopez's (2012) report in which they state that "In order to design literacy lessons that connected with their buddies' lives and instructional needs, they needed to set aside time to listen." These tutoring sessions do not only provide a venue for learning, but also a time during which tutors have the opportunity to develop a caring relationship with their students (Assaf & Lopez, 2012; Fang & Ashley, 2004; Lake, Al Otaiba, & Guidry, 2010).

Using Assessment Data to Plan Comprehension Instruction

All participating tutors worked to strengthen their students' comprehension. They recorded their students' retellings and responses to comprehension questions while administering the Graded Reading Passage (GRP) of the Bader-Pearce Informal Reading Inventory (2013). Nicole conducted the GRP with her fourth-grade student and, although her student's comprehension was proficient at the second- and third-grade level, when she read the fourth- and fifth-grade selections, she struggled with comprehension. Nicole included in her lesson plan notes, "When [my student] completed the silent reading part of the GRP, her comprehension was significantly lower than when she read aloud." This tutor then used these results to implement comprehension instruction in the child's lessons, including inviting the student to retell or summarize the text or sequence events.

Tracy's first-grade student also demonstrated inadequate comprehension during the administration of the GRP; however, during tutoring sessions, Tracy read aloud to her student, and she realized that his comprehension skills were almost flawless. She wrote in her lesson plan notes, "[My student] made good predictions about the book. He was listening carefully to the story and every time we would read a new page he would go back and remember what happened on the previous page." During actual comprehension instruction – summarizing, answering questions, or drawing pictures about the story – the student proved his comprehension skills to be quite strong.

Emily's first-grade student struggled more with comprehension when he had to read silently. This

tutor said, "On the silent [reading portion of the GRP], I could tell he wasn't doing it. I would ask him to retell the story and he would start making things up." After seeing these results, Emily was able to plan comprehension instruction accordingly. While there were many comprehension activities included in their lessons, such as summarizing stories and drawing pictures based on what the student read, Emily did not record her personal reflection as part of her lesson notes, nor did she mention in the interview how the student responded to the comprehension activities.

After noticing that comprehension was a roadblock in their students' reading of texts, the tutors worked to problem-solve their students' difficulties within this area and invested time in finding ways to help (Fang & Ashley, 2004). By responding to the assessment data, each tutor was able to strengthen her student's comprehension skills in some way.

Using Assessment Data to Plan Phonics Instruction

Nicole's student read all words correctly on the kindergarten through third-grade word lists, but her accuracy dropped to 50% on the fourth-grade word list, and she did not attempt some of the words. After reviewing the results of this assessment, the tutor included a phonics activity in each tutoring session. They worked together to decode words, focusing on medial sounds and rhyming words. During her interview, Nicole said, "I saw a small improvement because she got more fluent towards the end; she spelled a little bit better." This tutor saw improvements in this area because she took notice of her student's responses on an assessment protocol.

Tracy observed her student's difficulties with decoding during the administration of the GRP protocol when she saw that he was not reading the words but rather inventing a story. She indicated, "The [assessment] that helped me the most was the [graded] word list, because I was able to identify the words [my student] was having trouble with…For each word he would sound out each letter and then he would say the actual word. It gave me a lot of information." Based on these assessment results, Tracy included a phonics and fluency activity in each lesson in which she asked her student to say the parts of words and write them down in order to hear the sounds.

Emily found the running record to be a useful assessment in helping her notice her student's areas for growth. A teacher takes a running record on a child's oral reading by using a code to record accurate reading, miscues, and self-corrections (Clay, 2005). When asked to discuss this, Emily answered, "[My student] did fairly well on the running record, but this is where I noticed some of his [issues with phonics]. He had a hard time with certain words and sight words." To address these concerns, she included a sight word activity in each session and was excited to report that she saw improvement in his recognition of these words by the end of the eight weeks. "I really didn't want to leave him behind. And I know it is just eight weeks, so I wanted to try to do as much as possible."

Each participant's care for their student's further development in reading supports the idea that wanting to see improvements, and actually seeing those improvements, can give a pre-service teacher more confidence (Assaf & Lopez, 2012; Fang & Ashley, 2004; Jones, Stallings, & Malone, 2004; Malone, Jones, & Stallings, 2002). Using assessment data to create lesson plans that target students' needs creates a feeling of accomplishment and helps to banish any self-doubt that existed prior to taking the diagnosis course.

Using Assessment Data to Plan Writing Instruction

All four children participating in this study demonstrated difficulties with writing as evidenced during the Cassidy Informal Writing Inventory (CIWI). Nicole stated, "The Cassidy Writing…showed me how much help [my student] needs with her writing. We talked about the picture for about ten minutes and she didn't write any of it." This tutor used these findings to determine the need for the inclusion of a writing activity during each lesson. She and her tutee shared the pen to write about what they read each week. They also completed free-writes together.

The CIWI revealed to Tracy that her student needed a tremendous amount of help with his writing, especially in the area of recording sounds in words. She incorporated an activity called "Read, Build, and Write" into every tutoring session. Here, the student had to read a word, build it with letter tiles, and write it down. She designed this exercise so that it would ultimately help build his writing fluency.

Emily stated that getting her student to write "was almost like pulling teeth." She noticed this struggle early during the administration of the CIWI, claiming, "The Cassidy helped me get more in depth because when it came down to the writing, I could see his struggle there, too." Emily also included a writing assignment during each tutorial session in which she asked her student to write down his feelings about a text they had just read. This provided him with a purpose for writing, thereby motivating him to put pencil to paper.

Amanda described writing as "a chore" for her student. She noticed this during the CIWI administration when her student was more concerned about time constraints than writing, and because of this, she ended up dictating for her student much of what to write. The tutor addressed this concern by inviting her student to free-write for two minutes at the beginning of each session. After reading, instead of asking the child to verbally answer comprehension questions, Amanda asked her student to write her responses, thus practicing both writing and comprehension.

Again, by using their assessment data, tutors were able to have a solid understanding of how to orchestrate writing lesson plans for their students (Anders, Hoffman, & Duffy, 2000; Assaf & Lopez, 2012; Fang & Ashley, 2004; Christensen & Walker, 1991; Juel, 1996; Lake, Al Otaiba, & Guidry, 2010; Leal, Johanson, & Toth, 2004; Massey & Lewis, 2011; Mokhtari, 2010).

Using a Reading Interview and Reading Attitude Survey to Choose Texts for Students

All tutors administered the Garfield Reading Attitude Survey (1999) and created their own reading interviews in order to gain information about their tutees as readers. Nicole's interview and survey results showed that her student knew she struggled with reading and also that she enjoyed reading different types of books. Because of these responses, Nicole brought in several different genres of books and worked to boost her student's self-esteem. Nicole said, "[My student] liked every book I brought which was good for me because I didn't have to worry about finding something that she likes to read."

Tracy's student indicated through his interview and survey answers that he loved the outdoors and enjoyed reading about animals. In her lesson notes, Tracy wrote,

"[My student] asked me to bring a poem about a dog for our next meeting." By honoring his request and bringing texts about animals, Tracy kept her student engaged during their tutoring sessions.

Emily mentioned that her student loved the book *Pete the Cat* based on his responses to the reading interview. So she made sure to have one of these books handy during every session. This made her student happy and excited about reading and made it easier for her to keep her active tutee engaged.

Through the reading interests interview, Amanda gauged her student's enjoyment of the science fiction genre. While she brought in books in this genre, she noted that, "When I would test him on his comprehension on the reading, it was hard for him to gather all of that information because he had to go back to the book to try to see where he was reading, versus a narrative book where [he] can probably better remember the scenes of the story." So, while the student enjoyed reading science fiction, a different genre may have better suited his reading weaknesses, as they may have been easier for him to comprehend.

The pre-service teachers' concern for their students' reading interests shows their dedication and devotion to becoming a teacher and catering to the individual personalities of students. After these tutoring sessions, the pre-service teachers felt much more comfortable with teaching, as evidenced in the way they responded to each of their student's needs, weaknesses, strengths, and interests (Al Otaiba, 2005).

DISCUSSION

The participants in this study linked their instruction and lesson plans to the assessment results for their students. Amanda stated that she was able to help her student more when they became more comfortable with each other, and during lessons she confirmed some of the assessment results. She said, "As we became more comfortable…I finally was able to decipher, 'okay this is what [my student] needs more attention in,' and I was able to work my assessments from there, after, I guess, five sessions later." Nicole also linked assessment data to instruction as she got to know her student as a reader. During her interview, Nicole said, "The miscue analysis chart definitely helped me see [her struggle

with] medial sounds, that's where I got [the idea for] some of the medial sound activities from as the sessions went on."

Although there were many instances where tutors successfully linked instruction to assessment data, there were also confusions. Emily learned about having to modify her lesson plan in the midst of a lesson. She mentioned, "[The tutoring experience] taught me that a child is not always going to want to do what you want them to do so we're constantly having to rework the lesson plans and the activities to accommodate that child." Amanda stated, "It was kind of difficult at first to see where [my student's] level was at because all of the different assessments." However, she eventually became more comfortable with how to use the assessments. Nicole commented, "I got from the results that she was on a fourth-grade [reading] level but I brought books on a fourth-grade level and she couldn't really read them that well," helping her to understand that assessment data is not always 100% concise and students' performance on tasks changes regularly.

LIMITATIONS

This study has several limitations. The researcher collected data from a small sample of students in one section of the course. The short duration of tutorial sessions – one hour per week for eight weeks during one semester – also yielded fewer results for analysis during one semester. Because of the limited and awkward space on campus used for the tutoring sessions, the tutors experienced some difficulty recording their lessons, making it a challenge for the researcher to transcribe the recordings.

CONCLUSION

In conclusion, the participants learned the importance of observing students' reading and behaviors during assessment administration and using the results for the purpose of planning instructional activities. Their time in the Diagnosis and Correction of Reading Problems course allowed them to experience authentic teaching situations. For example, Tracy shared, "Overall, I think [the tutoring experience] helped me a lot, having a child to practice with, actually putting in what I already learned from my classes and I think it was great to get the experience." From this research, it is apparent that

this reading course requires vigilant work, including conducting assessments, analyzing assessment data, and planning meaningful lessons for students. Speaking from personal experience, this experience can be difficult; however, learning how to tutor a child and pay attention to details can greatly boost pre-service teachers' confidence in themselves as teachers.

REFERENCES

Al Otaiba, S. (2005). How Effective Is Code-Based Reading Tutoring in English for English Learners and Preservice Teacher-Tutors? *Remedial & Special Education*, 26(4), 245-254.

Anders, P. L., Hoffman, J., & Duffy, G. (2000). Teaching teachers to teach reading: Paradigm shifts, persistent problems, and challenges. M. Kamil, R. Barr, P. Mosenthal, & P. D. Pearson (Eds.) *Handbook of Reading Research*, Volume III. Mahweh, NJ: Lawrence Erlbaum Associates, Inc., Publishers.

Assaf, L. C., & Lopez, M. (2012). Reading Rocks: Creating a space for preservice teachers to become responsive teachers. *Journal of Early Childhood Teacher Education,* 365-381.

Bader, L., & Pearce, D. (2013). *Bader Reading & Language Inventory* (7th ed.). New York, NY: Pearson.

Carspecken, P. F. (1996). *Critical ethnography in educational research.* New York, NY: Routledge.

Christensen, L. & Walker B. J. (1991). The teacher/researcher in preservice reading education. *College Reading Association*, 1-16.

Clay, M. M. (2005). *An observation survey of literacy achievement* (2nd ed.). Portsmouth, ME: Heinemann.

Fang, Z. & Ashley, C. (2004). Preservice teachers' interpretations of a field-based reading block. *Journal of Teacher Education*, 39-54.

Haverback, H. R. & Parault, S. J. (2008). Pre-service reading teacher efficacy and tutoring: a review. *Education Psychology Review*, 238-255.

Hedrick, W. B., McGee, P., & Mittag, K. (2007). Pre-service teacher learning through one-on-one tutoring: reporting perceptions through e-mail. *Teaching and Teacher Education,* 47-63.

Jones, B. D., Stallings, D. T., & Malone, D. (2004). Prospective teachers as tutors: measuring the impact of a service-learning program on upper elementary students. *Teacher Education Quarterly*, 99-118.

Juel, C. (1996). What makes literacy tutoring effective? *International Reading Association*, 268-289.

Lake, V. E., Al Otaiba, S., & Guidry, L. (2010). Developing social skills training and literacy instruction pedagogy through service learning: an integrated model of teacher preparation. *Journal of Early Childhood Teacher Education*, 373-390.

Leal, D., Johanson, G., & Toth, A. (2004). Increasing at-risk students' literacy skills: fostering success for children and their preservice reading endorsement tutors. *National Pingtung University of Science and Technology*, 75-96.

Malone, D., Jones, B. D., & Stallings, D. T. (2002). Perspective transformation: effects of a service-learning tutoring experience on prospective teachers. *Teacher Education Quarterly*, 61-79.

Massey, D. & Lewis, J. (2011). Learning from the "little guys": what do middle and high school preservice teachers learn from tutoring elementary students? *Literacy Research and Instruction*, 120-132.

Mokhtari, K., Hutchinson, A., & Edwards, A. (2010). Organizing instruction for struggling readers in tutorial settings. *The Reading Teacher*, 287-290.

APPENDIX

Interview Protocol

How do you feel about the overall tutoring experience, and what did you learn from it?

How did you build a relationship with your student?

What did you observe and what patterns did you see when administering the assessments?

In what ways did the assessment results help you to plan your lessons?

Which lesson activities resulted in thoughtful responses from your students?

How do you feel the tutoring experience helped you grow as a teacher?

TEXAS A&M UNIVERSITY-CORPUS CHRISTI
A BRIEF HISTORY

Texas A&M University–Corpus Christi began in 1947 as the University of Corpus Christi (UCC) which was affiliated with the Baptist General Convention of Texas. In 1970, Hurricane Celia causes more than $1,000,000 dollars in damage to the campus. In 1971, the Baptist General Convention of Texas sold UCC to the state of Texas and the Texas Legislature authorizes the Texas A&I University System to establish a state-supported upper-level institution of higher education in Corpus Christi. In 1973, Texas A&I University at Corpus Christi opens its doors on 4 September 1973 to 969 students as an upper-level institution of higher education. In 1977, the Texas Legislature changes the name of the University to Corpus Christi State University. In 1989, Corpus Christi State University joins the Texas A&M University System. In 1993, the Texas A&M University System Board of Regents renames the institution Texas A&M University–Corpus Christi and a year later it becomes a four-year comprehensive university and enrollment increases to 5,000 students. In 2004, the Board of Regents approves the College of Nursing and Health Sciences which opened in 2005. In 2005, Dr. Flavius Killebrew becomes President/CEO and initiates Momentum 2015, a ten year plan to establish Texas A&M University–Corpus Christi as the flagship university of South Texas. Today the University has over 10,000 students.

Today Texas A&M University–Corpus Christi is not only a proud member of the Texas A&M University System but it is also the premier public university in the region and is currently the only university in the United States to be situated on an island. Texas A&M University–Corpus Christi is currently a member of the Southland Conference under the NCAA division I.

All information on this page can be found at http://www.tamucc.edu.

Please direct information to:

TRiO
RONALD E. McNAIR
POST-BACCALAUREATE
ACHIEVEMENT PROGRAM