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.

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2019 McNAIR RESEARCH ARTICLES

PRESIDENT/CEO

DR. KELLY M. MILLER

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.

Dr. Kelly M. Miller
President/CEO

PROVOST AND VICE PRESIDENT FOR ACADEMIC AFFAIRS

DR. CLARENDA PHILLIPS

Texas A&M University-Corpus Christi is honored to host the McNair Scholars Program. Because the McNair Scholars Program prepares underrepresented students to pursue graduate degrees by emphasizing academic achievement, scholarly inquiry, and mentorship, we are excited to partner with the Program to develop the next generation of researchers. Research is a key activity for McNair scholars who seek to make a difference in the world by exploring an array of topics and finding solutions for the problems that face our world.

From educating our children to managing ocean resources, our scholars provide an in depth perspective on education, psychology, health, technology, engineering, marine science and other scientific fields. The scholars included in this journal are among the most talented students at the Island University. They are our future leaders in higher education, and we are proud of what they have already accomplished.

I am grateful for the students' commitment to scholarly inquiry and the discovery of new knowledge, the faculty mentors who have worked alongside these scholars, and the McNair Scholars Program staff. Reading through this journal, you too will see that the culmination of their efforts are exemplary.

Dr. Clarenda Phillips
Provost and Vice President for Academic Affairs

ASSOCIATE VICE PRESIDENT FOR ACADEMIC AFFAIRS

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
Associate Vice President for Academic Affairs

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2019

McNAIR

RESEARCH

ARTICLES

ANALYSIS OF ELASMOBRANCH FIELD IDENTIFICATION USING CO1

by ROBERT BRETZING-TUNGATE

ABSTRACT

Elasmobranchs, including sharks, skates, and rays, are of conservation concern and an increase in participation by citizen scientists has aided in increased data availability. Angler identification of sharks relies on the use of morphological characters, but because elasmobranch are morphologically conserved, misidentification is problematic. An annual catch-and-release tournament conducted in Texas and hosted by Texas Shark Rodeo aims to promote shark conservation by involving anglers in data collection and tagging of coastal sharks. Spaghetti tags and fin clip kits are provided to angler teams to help gather data. Since 2015, the Marine Genomics Lab at Texas A&M University - Corpus Christi has been receiving tissue samples from this tournament. The intent of this project is to quantify the rate of correct identification by anglers by sequencing a portion of the Cytochrome Oxidase I gene for approximately 200 angler identified sharks. By quantifying species for which identification is problematic, we hope to improve information provided to anglers on best practices for species identification.

Keywords: sharks, barcoding, citizen science

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INTRODUCTION
Shark Conservation

Chondrichthyes is a class of fishes characterized by cartilaginous skeletons and is comprised of about 1,000 species of sharks, rays, skates, and chimaeras. Elasmobranchii, a subclass of Chondrichthyes, only encompasses sharks and batoids (skates, rays and sawfish) (Musick et al., 2000). The life histories of sharks, batoids have been studied, and these animals have slow growth and late maturity, coupled with low fecundity (Camhi et al., 1998). Low fecundity, the inability to produce many offspring, and late sexual maturity make sharks and their relatives susceptible to overexploitation and thus are at an increased risk of population collapse. Overall, 32% of global sharks and rays are threatened, and 25% data deficient (Camhi et al., 2007). A confounding factor for shark conservation is misidentification of individuals particularly by user groups (i.e. commercial and recreational fishers). Species misidentification can lead to overrepresentation or underrepresentation of specific species in catch data changing the perception of management needs (Garcia-Vasquez et al., 2011). Genetic barcoding can counteract misidentification in the field by allowing for quick species identification to assess conservation status and add to biodiversity assessments.

Shark Fisheries

Sharks suffer greater threats than other chondrichthyans because they are targeted more often by high-sea fisheries. The 86 countries that partake in the shark fishery have reported a decrease in shark landings ranging from 20,000 to 30,000 annually. Globally, commercial fisheries have reported a 15% decrease in shark landings (Davidson et al., 2015). Reports presented by the IUCN pose that overfishing is the primary threat to shark conservation. Millions of sharks are fished each year, and of the 21 species caught regularly by high-sea fisheries, 52% are threatened (Davidson et al., 2015). The shark fin trade contributes largely to the shark fishing industry due to shark fins being a highly prized commodity, for example Holmes et al. (2009) analyzed trade data from Asian markets and estimated 1.7 metric tons of sharks were caught for the fin trade.

DNA Barcoding

According to a paper by Hebert et al. (2003) the goal of DNA barcoding is to use a single reference gene to assign unknown individuals to a species and enhance the discovery of new species. The genetic code contains many species-specific identifiers in the form of genes that are divergent among taxa, making molecular markers useful tools for distinguishing between morphologically conserved species (Ward et al., 2008). The mitochondrial cytochrome-oxidase 1 (CO1) gene is a suitable region for barcoding because of its relatively high inherent inter-specific variability, as compared to intra-specific variability (Greig et al., 2005; Fotedar et al., 2018), and because the gene is highly conserved and has a low mutation rate (Ward et al., 2008). In a forensic study of elasmobranch products sold in markets it was found that of the 833 samples, which were tested from the market, 722 successfully amplified and resulted in positive identifications (Ward et al., 2008). Of the samples tested a significant number of elasmobranchs species being sold were under-reported by longline vessels (Ward et al., 2008). In a study off the coast of Brazil, 313 carcasses were identified by sequencing Internal Transcribed Spacer 2 and four individuals were identified by sequencing CO1, again the results demonstrated misidentification, including retention of protected species (Domingues et al., 2013).

Citizen Science

The collection and analysis of data can be a daunting task for a single researcher or a group. Citizen science introduces the public sector to science by including members of the public in research projects, allowing for collaboration between scientists and citizens and increasing the rate of data collection. A review conducted by Theobald et al. (2015) concluded that by collaborating with millions of informed citizens it is possible to quickly assess large scale environmental issues, simply by having more access to community-wide or even world-wide data and observations. There has been an increase in citizen scientist aided publications because of the potential for citizen scientists to assist in research with little to no expense, while also ensuring adequate data quality (Dickinson, 2012). The Texas Shark Rodeo collaborates with local anglers in catch, photo, and release tournaments, as well as year-roundcatch assessments of sharks along the Texas coast.

METHODS
Extraction

A Phenol-Chloroform-Isoamyl (PCI) Alcohol extraction protocol was followed (Taggart et al., 1992) to extract high molecular weight DNA from shark fin clips provided by the Texas Shark Rodeo. Tissues were placed in 1.5 mL tubes and 515 µL of 10% SDS extraction buffer was added to each tube along with 30 µL of proteinase K. The tubes were then placed in an incubator set to 55°C and left overnight. On the second day, 500 µL of PCI was added to each tube and after vortexing for five seconds, placed in a centrifuge to be spun for five minutes at 15000 rpm. Once finished the supernatant (top aqueous layer) was pulled off and expelled into a second tube and 500µL of CI was added to tubes containing the aqueous layers. Each tube was again vortexed for five seconds, placed in a centrifuge, and spun for five minutes at 15000 rpm. Again, the top layer was pulled off and dispensed into a new tube. A fresh batch of 98% ethanol was made and 1000 µL pipetted into each tube, tubes were set in a freezer to precipitate for three hours to overnight.

After the DNA had sufficiently precipitated, the tubes were spun down again in a centrifuge for ten minutes at 13000 rpm until a pellet formed on the bottom of the tube. All liquid was then poured from the tubes and the tubes set out to dry. Once dried, 50 µL of molecular grade water was added to each tube to re-elute the DNA. Mag-Bing Total Pure NGS (Omega BioTek) beads were used to clean all samples, ensuring no unwanted organic compounds left over from extraction.

CO1 Amplification

The CO1 gene was amplified using standard fish primers and a polymerase-chain-reaction (PCR) protocol (Ward et al., 2008). PCR was carried out in 30 uL reactions containing water, 5 x GoTaq buffer, 1.5 mM magnesium chloride, 1% Tween, 2.5 mM dNTPs each, 0.25 mM of each primer, 0.03 units of taq and 1 uL of template DNA. Reactions were placed on a thermocycler and cycling was performed as follows: denaturation at 95 °C for 2 minutes, followed by 35 cycles of denaturation at 95 °C for 60 seconds, and extension at 72 °C for 90 seconds; a final extension was done at 72 °C for 10 minutes. Amplicons were cleaned again using the same bead protocol as before. To prepare the samples for sequencing, the samples were standardized to 10ng/uL in 10 mL of water and sent to Retrogen, Inc (San Diego, California) for Sanger sequencing.

Data Analysis

Raw sequences were uploaded to Geneious(C) and each sequence checked for quality and edited manually, leaving only the high-quality portions of each sequence. Edited sequences were then run through the NCBI BLAST database to obtain genetic identifications for the individuals. In R (R Core Team, 2014) a logistic regression test was performed to look for a relationship between total length of sharks and misidentification for all species. A multiple logistic regression was done with the samples that were genetically identified as sandbar shark (C. plumbeus) and blacktip shark (C. limbatus).

RESULTS

In total, COI was successfully amplified and sequenced for 154 individual sharks and eleven species were identified in the data. Six species were always identified correctly, while another five were frequently misidentified and overall rate of misidentification was 13.64% (Figure 1). Two sharks were never identified correctly by anglers, the bull shark, C. leucas, and the smalltail shark, C. porosus. Of misidentified animals, 57.14% were identified as C. limbatus (Figure 2). The results of logistic regression demonstrate a significant effect of body length on the percentage of sharks that were not identified properly, with the rate of misidentification decreasing as the total length of the fish increases ($X2 = 4.15$, $P = 0.042$; Figure 3). The two most abundant species genetically identified in the study were C. limbatus (90) and C. plumbeus (35), and there was a significant decline in misidentification rate across both species with increase length ($X2 = 16.55$, $P = 0.0009$). Individually both species showed a similar decline in misidentification rate with length, although the overall misidentification rate differed between species (Figure 4, Table 1).

Variable	Df	X²	*P*-value
Length	1	5.33	0.021
Species	1	7.90	0.005
Species x Length	1	3.33	0.068

Table 1. Chi squared values and respective p-values for effect of length on misidentification, species on misidentification, and the interaction between species and length on misidentification.
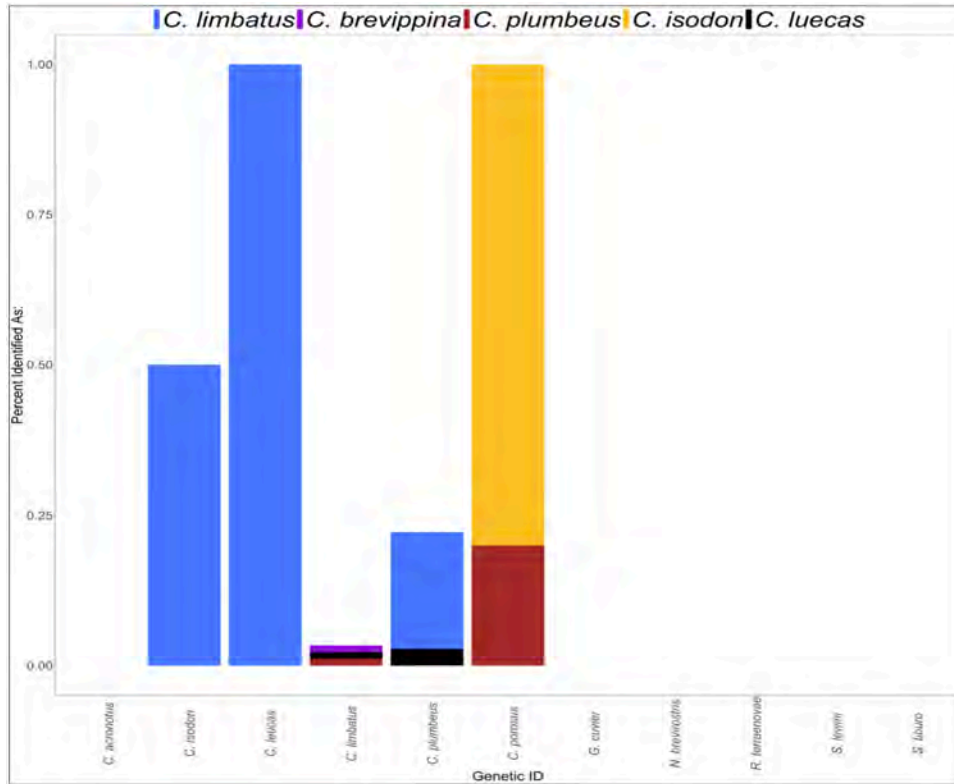
Figure 1. Total percentage of misidentification (on the y-axis) and genetic species identification (on the x-axis). Species that do not have bars above them were identified correctly 100% of the time.
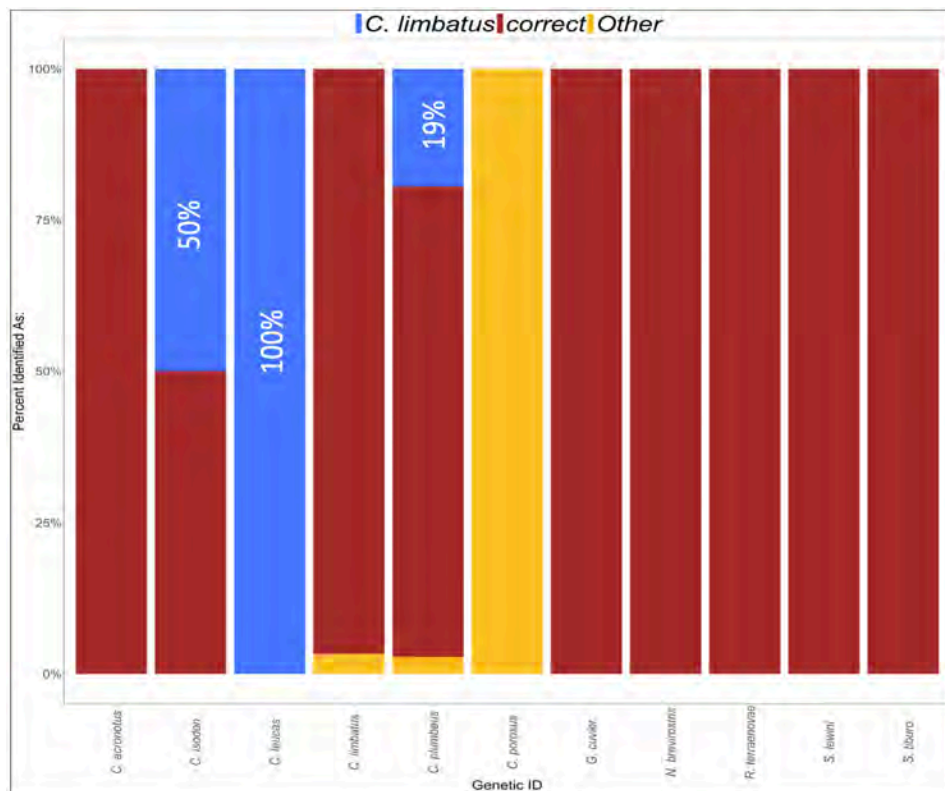
Figure 2. Proportion of species misidentification where angler identified species as C. limbatus.

14
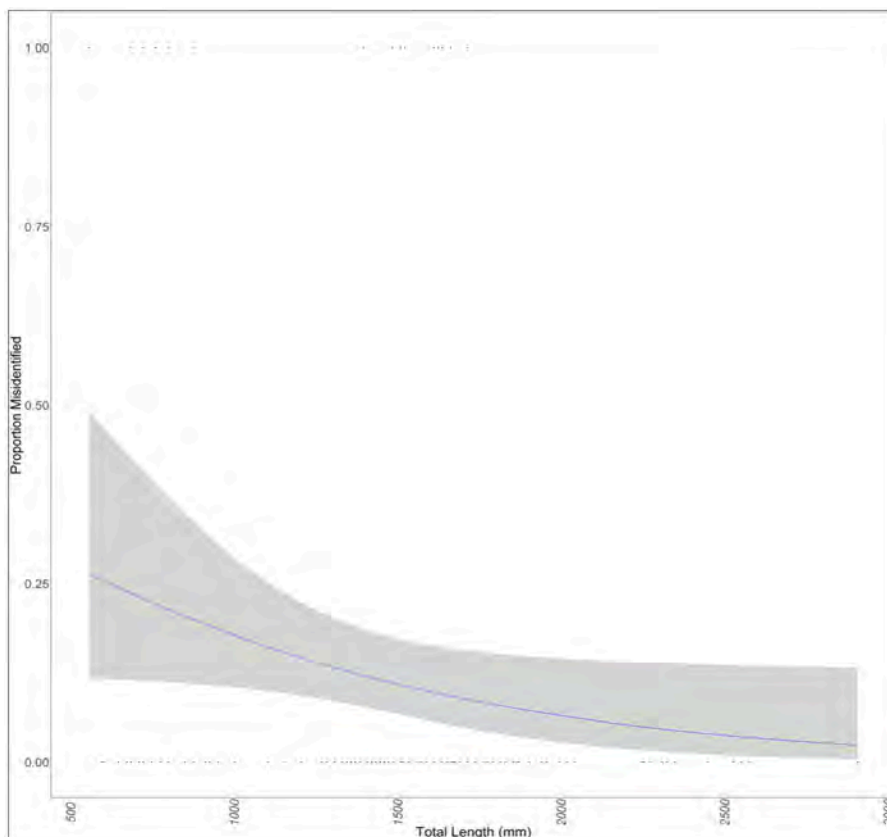
Figure 3. Logistic regression of misidentification rate (y-axis) vs total length in mm (x-axis) across species.
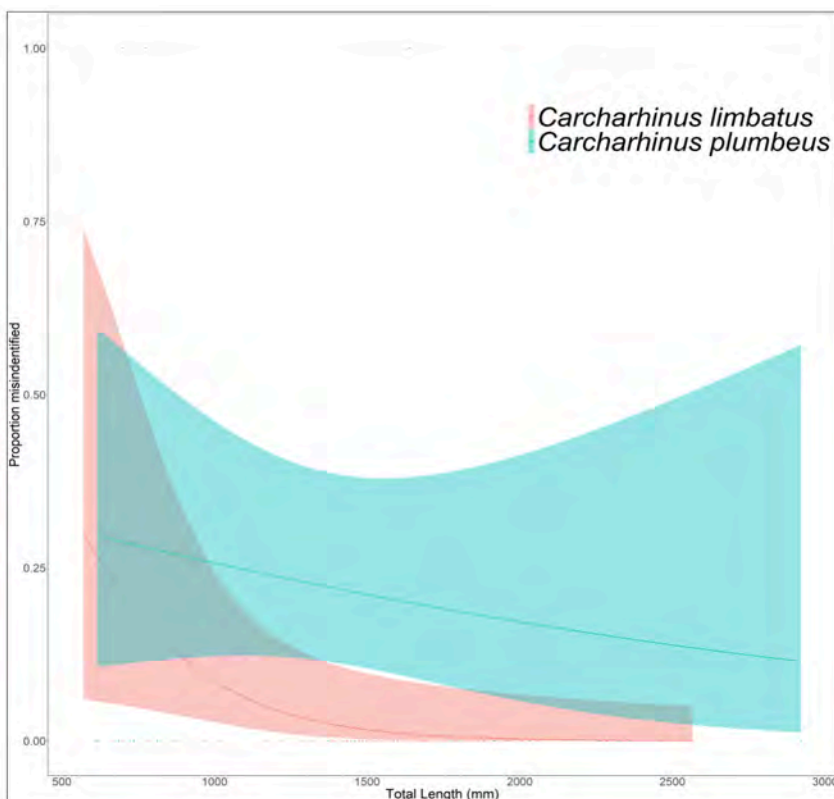
Figure 4. Logistic regression of misidentification rate (y-axis) vs. total length in mm (x-axis) for genetically identified blacktip (Carcharhinus limbatus) and sandbar (Carcharhinus plumbeus) sharks.

DISCUSSION

Angler Misidentification

Anglers seemed to have the easiest time identifying C. acronotus, G. cuvier, N. brevirostris, R. terraenovae, S. lewini, and S. tiburo, while having more difficulty identifying C. isodon, C. leucas, C. limbatus, C. plumbeus, and C. porosus. C. leucas and C. porosus were the most difficult for anglers to identify, while anglers misidentified C. limbatus the least. However, only one C. leucas was caught and C. porosus, which was only caught five times, is thought to be rare in Texas waters and therefore, may not have been present in field guides or training workshops. By contrast, 99 C. limbatus were identified by anglers, but only 87 were verified genetically, a misidentification rate of 12%.

Catch Identification Bias

Carcharhinus limbatus was the name used by anglers most often when species were misidentified. This could occur because the misidentified sharks look most similar to blacktip shark and/or because blacktip shark are very common in the Gulf of Mexico, making it the default species for anglers who were unsure of what they caught. Catch identification bias can stem from anglers having low confidence in identifying their catch and thus relying on what other anglers have identified in their catches within the same geographical area (Page et. al, 2012). This can lead to overrepresentation of certain species and underrepresentation of other species in abundance data. Anglers continue the cycle by referring to said species as valid identifications when they are unsure of their catches and in some cases perpetuating misconceptions about morphological features that identify species. Additionally, anglers may be undereducated on the biodiversity of sharks in the Gulf of Mexico, as is probably the case for C. porosus, leading to a heavier reliance on identification biases.

Total Length

Total length (mm) has some effect on angler misidentification rate. The data shows that for C. limbatus the total length of the fish has a great effect on whether an angler can properly identify it or not.

Because many of the species in the study are a part of the genus Carcharhinus and juveniles of closely related species often look more similar than adults, the relationship between size and misidentification rate is not unexpected. However, some characters like the presence/absence of an interdorsal ridge (ridgeback vs non-ridgeback respectively) are present at all sizes. Confusion between C. plumbeus (a ridgeback) and C. limbatus/C. leucas (non-ridgebacks), therefore, is not attributable to size alone.

Implications

While the overall misidentification rate was <14%, it is clear that anglers have problems identifying their catch. Anglers take part in catch and release tournaments through Texas Shark Rodeo and fin clips and photos of each animal are then sent to a 3rd party where they are used for various purposes. Anglers are also given data sheets where they record metadata such as: total length, fork length, sex, species, common name, etc. That data, along with a photo, is then uploaded to a public data base. When the tournaments are not occurring angler teams can continue to participate in catch, photo, and release data acquisition. While citizen science is an invaluable source of data, these data are only useful if correct and the results of this study indicate that training programs that focus on identifying key characteristics of shark species found in the Gulf may be necessary. Training programs should also address the issues of catch identification bias and should strive to educate anglers in the areas of shark biology, ecology, and biodiversity. It may be that Texas Shark Rodeo should partner with a separate entity to help with data quality control before anything is uploaded to public databases. For future projects a cohort study could be done over a five-year period to assess the effect of angler training on misidentification rate.

ACKNOWLEDGEMENTS

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ATTRIBUTIONAL BIASES IN CLOSE RELATIONSHIPS: FURTHER EVIDENCE OF A COUPLE SERVING BIAS AS A PREDICTOR OF RELATIONSHIP SATISFACTION

by ALISHA COWAN
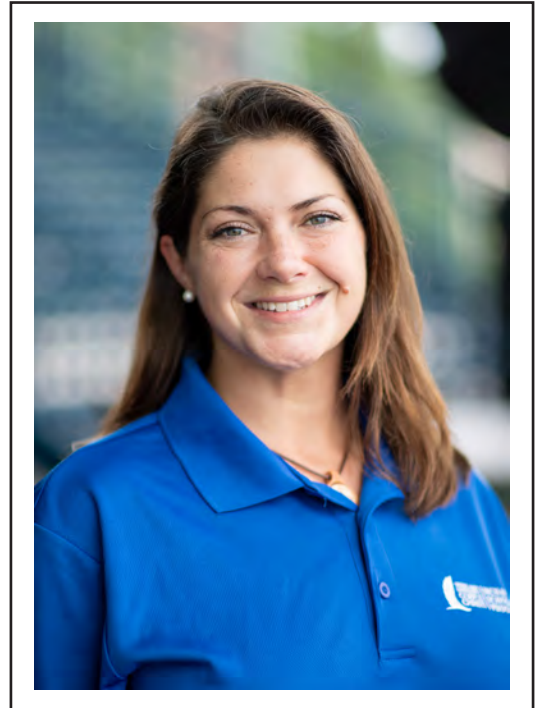
ABSTRACT

Previous research has implicated the self-serving bias as a tool for one's own self-preservation and esteem. The present project attempted to extend Castro and Seidel (2017) by replicating evidence for the couple-serving bias and using the magnitude of this bias as a predictor of relationship maintenance. Participants (n= 51) completed self-report surveys assessing their self- esteem, attribution styles, and frequency of relationship maintenance strategies.

Results supported evidence of a couple-serving bias but the size of the bias failed to predict maintenance strategies.

Keywords: self-serving bias, attribution style, relationship maintenance, couple-serving bias

INTRODUCTION

The continued trend of the dissolution of just under half of American marriages (Center for Disease Control, 2016) has left most of the public curious to what elements contribute to long, successful, and relatively happy romantic relationships. Numerous psychologists have dedicated their research in the field of close relationships to decipher people's values and motivations concerning one's self and one's partner, hoping to provide an outline of positive corollaries to aid in the development of healthy relationship outcomes, despite the proven

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declination of relationship satisfaction in marriage as time goes on (Kurdek, 1999; Lewis & Spanier, 1979). On the bright side, however, about 1 in 4 relationships appear to maintain high levels of happiness. Birditt et al., (2012) have suggested that couples who have been able to maintain happiness began their relationship happier than other couples to begin with and maintain the ability to negotiate the perils of conflict without elevated levels anger and stress.

Fritz Heider's early development of the Attribution Theory (1958) postulated people make causal explanations by perceiving the behaviors of others and themselves using different attributions of external or internal causes. The ideas of Internality (ability, effort) vs. Externality (luck, difficulty) concerned perceiver attributions and have been examined to help explain how people negotiate conflict in their relationships. The research of Bernard Weiner (1979) proposed three underlying dimensions of behavior: locus of control (internal/external perceptions of cause), stability (temporary/permanent), and controllability (internal/external perceptions of control) that aid in making self-perceptions and forming perceptions of others within the self to form causal explanations of behavior (Russell, 1982). In sum, externalizing failures and taking credit for successful outcomes is known as the self-serving attributional bias, another historical area of research studied extensively in social psychology, specifically in reference to motivational and cognitive factors, including easier perception of covariation between intended vs. actual outcome (Tillman & Carver, 1980; Miller & Ross, 1975).

From an evolutionary perspective, behavior can be explained as people's ways to decrease the likelihood of being ignored, avoided, or rejected and maintaining self-esteem with approval seeking, self-handicapping, and other ways of maintaining and improving social acceptance (Leary, 1990). Motivations of perceived self-esteem are closely associated to the locus of control and to the utilization of the self-serving bias. As cited by Leary in The Handbook of Theories of Social Psychology (2012), it was noted that the self-serving bias was generally a beneficial way to enhance and protect self-esteem and was found to be as strongly related to other people's beliefs about other people's perceptions and evaluations

of them as to their own self-perceptions, if not more so (Leary & Baumeister, 2000). For example, people who are falsely optimistic about the likelihood of succeeding on a difficult task (i.e. marriage) may set higher aspirations for themselves, work harder on the task, and be more likely to succeed at it than people whose self-assessments are lower but objectively more realistic (Fiske & Taylor, 1991).

Based on studies of the self-serving bias in relationships, people that are happy in their relationships have been found to engage in a "couple-serving bias" ---making relationship-enhancing attributions for their partner's success. Osterhout, Frame, and Johnson (2011) described people who are happy in their relationships use relationship-enhancing explanations that are internal, stable, and global for their partner's positive behavior while making external, unstable, and uncontrollable explanations for their partner's negative behavior. In this instance, a woman receiving a surprise gift from her husband would be explained as characteristic of his love and generosity. On the other hand, unhappy people used distress-maintaining attributions for their partner's outcomes, making external, unstable, and uncontrollable explanations for their partner's positive behavior while making internal, stable and controllable explanations for their partner's negative behavior (Fincham, 2001). For the same situation, the wife may garner suspicions of her husband's gesture. The present project attempted to assess the extent to which relationship partners held couple-serving or couple-defeating biases and the extent to which the magnitude of bias predicted their self-reported relationship satisfaction and relationship maintenance behaviors.

Using a modified version of the Attribution Style Questionnaire (Peterson et al., 1982), Castro and Seidel (2017) found the existence of the couple-serving bias; participants made higher internal, stable, and global ratings for their partners' positive events compared to negative events. Based on its correlation with relationship satisfaction, the size of the couple-serving bias appeared to be a better predictor of relationship satisfaction than self-esteem, largely considered the "sociometer" of relationships (Leary, 2012). Further, Castro and Seidel (2017)

couple-serving bias correlated significantly with self-esteem and indicated that it captured a large amount of unique variability in relationship satisfaction.

As a follow up to Castro & Seidel (2017), we sought additional data regarding couples' relational satisfaction from Relationship Maintenance Mechanisms (RMMs)--the strategic actions people take to sustain their partnerships (Miller & Perlman, 2009) with self-reported frequency analyses. Positivity (being polite, cheerful, remaining upbeat), Openness (encouraging disclosure of thoughts and feelings), Assurances (stressing commitment to relationship, implying future together), Sharing a Social Network (sharing common friends, showing willingness to be with partner's friends/family), Sharing Tasks (helping equally with tasks, doing fair share of work), Sharing Activities (spending time together, share specific routines), Support (seeking advice, finding comfort from partner), Conflict Management (apologizing when wrong, being patient and forgiving), Avoidance (respecting privacy or need for time alone, avoiding discussion of certain topics), Humor (teasing, calling each other by nicknames) are relational maintenance strategies (RMS) identified and extensively analyzed by social psychologists Dan Canary and Laura Stafford. A study performed by Canary, Stafford, & Semic (2002) found the perception of a partner's use of positivity, openness, assurances, social networks, and sharing tasks is positively correlated with relational characteristics of liking, commitment, and control mutuality.

The purpose of the present study was to explore the presence and function of couple-serving attributions in relationships. In particular, we predicted that the magnitude of the couple-serving bias would predict relationship satisfaction as it did in the Castro and Seidel (2017) study. In addition, we predicted that the magnitude of the couple-serving biases would be a good predictor of the frequency of relationship maintenance behaviors a partner engaged in.

METHODS

Participants

Our sample consisted of 51 undergraduate students enrolled at Texas A&M University-Corpus Christi.

This sample consisted of 34 females and 17 males with an age range of 18-32 years (M=20.35, SD=3.155). The primary origin of ethnicity was Hispanic (54.9%), followed by White (29.4%). Participants currently in a relationship comprised 58.8% of the sample (n=30), whereas 41.2% were participants whom were not in a current relationship but had experienced at least one romantic relationship (n=21).

Procedure

Participants were supplied a link from to the anonymous online survey and asked to complete self-reports of self-esteem, relational assessment, attribution style, and frequency of performance of relationship maintenance mechanisms. SmartLogic technology was used to prevent participants whom were underage and/or had not ever experienced a romantic relationship from accessing the survey. Both those who were in a current romantic relationship or that had been in a previous romantic relationship were allowed to participate.

Survey Measures

Self-Esteem Scale. Based on theories of self-perception and emotion, Rosenburg's (1965) Self-Esteem Scale (SES) was used to measure participants' global self-esteem and general feelings of self. The SES is a unidimensional 10-item self-report measurement consisting of five negatively and five positively phrased sentences scaled on four points: Strongly Agree, Agree, Disagree, Strongly Disagree. Responses to questions such as "At times I think I am no good" and "I feel that I have a number of good qualities" are coded for forward and reverse summation to produce scoring; a higher numeral positively correlates to increased self-esteem. The internal consistency for this scale generally ranges from 0.77 to 0.88 and test-retest reliability coefficients range from 0.82 to 0.85. Scale scores are negatively correlated with anxiety (-0.64), depression (-0.54), and anomie (-0.43). The scale is well known to have strong criterion validity.

Relational Assessment Scale. The Relational Assessment Scale (RAS) is an internally consistent 7-item self-report survey with coherent factor structure that measures relationship satisfaction with

'5' representing the highest level of satisfaction and '1' representing the lowest state of satisfaction. Participants rate questions that include "How well does your partner meet your needs?" and "To what extent has your relationship met your original expectations?" It has also been shown to encompass all relationship alternatives (Hendrick, 1988).

Attribution Style Questionnaire. Developed by Petersen, et al. (1982), the Attribution Style Questionnaire (ASQ) is a 12-item measure comprised of six positive events and six negative events in which the participant must vividly imagine a given scenario, name a cause for that scenario, and then rate their feelings about it on a 7-point scale used to assess habitual tendencies in the attributions of causes (e.g. internality, stability, and globality). We utilized a modified version the ASQ (Castro & Seidel, 2017) to represent events that would most likely occur in partner-relationship situations, while still maintaining internal consistency, stability, and content validity. A positive question included: "Your partner has been showing you more affection recently. Name the one major cause." A negative question asked, "You didn't get the job you applied for. Write down the one major cause."

Relational Maintenance Strategies. Based on their current partner (or if not applicable, their previous partner), participants were also asked to rate the frequency ("In the last week") of experiencing Relational Maintenance Strategies (RMS) or Relationship Maintenance Mechanisms (RMMs)--strategic actions people take to sustain their partnerships (Stafford, 2003): *Positivity* (e.g. was cheerful with partner, attempted enjoyable interactions); *Openness* (e.g. sought to discuss quality of relationship, encouraged disclosure); *Assurances* (e.g. stressed commitment to partner, implied relationship's future); *Sharing Tasks* (e.g. helped equally with tasks, did fair share of work); *Sharing a Social Network* (e.g. shared common friends, willing to do things for partner's friends/family); *Sharing Activities* (e.g. shared time and/or specific routines with partner); *Support* (e.g. sought advice and comfort); *Conflict Management* (e.g. apologized when wrong, was patient and forgiving with partner); *Avoidance* (e.g. avoided discussion of certain topics, respected each other's privacy; *Humor* (e.g. called each other by funny nicknames, teased each other).

The latest analysis of RMS (Ghezelseflo, Aghamiri, Aghamiri, & Hemati-Pouya, 2018) showed acceptable limits of confirmatory factor structure, reliability, and validity of the Relational Maintenance Strategy measures.

RESULTS

Reliability analyses were conducted on the Self-Esteem Scale (SES) ($\alpha = .81$), the Relationship Assessment Scale (RAS) ($\alpha = .90$), and the Relational Maintenance Scale (RMS) ($\alpha = .803$). All scales were found to be reliable. Index scores were computed by taking the average of the item responses on each scale. An independent samples t-test found that males (M = 4.4) reported higher satisfaction based on scores than females (M = 3.9) on the RAS, $t(49) = 2.134$, $p = .038$. No significant sex differences were found, however, for self-esteem or use of relationship mechanisms.

To explore attributional differences between positive and negative events, dependent samples t-tests were calculated on difference scores (attributions made for positive events − attributions for negative events) for ratings of internality, stability, globality, and importance. The average scores obtained for all positive events and average scores obtained for all negative events (for each of the 4 scales) were used to obtain these difference scores. For the events that did not involve a partner (self-scenarios), attributions of positive events were found to be more internal than external, $t(50) = 5.73$, $p < .001$, more stable than unstable, $t(50) = 10.014$, $p < .001$, more global than specific, $t(50) = 6.531$, $p < .001$, and more important, $t(50) = 6.933$, $p < .001$. Similarly, for events that involved partners (partner-scenarios), attributions of positive events were found to be more internal than external, $t(50) = 8.218$, $p < .001$, more stable than unstable, $t(50) = 9.486$, $p < .001$, more global than specific, $t(50) = 7.550$, $p < .001$, and more important, $t(50) = 5.599$, $p < .001$. See Table 1 for means and standard deviations for the different attribution measures.

The differences between positive and negative events (bias indices) for all four attributional dimensions were then averaged for the self-scenarios and the partner-scenarios to explore how well these difference scores predicted relationship satisfaction, self-esteem, and use of relationship maintenance mechanisms.

In addition, a difference score was calculated by subtracting the partner-scenario bias index from the self-scenario index to explore if one of these bias indices was a better predictor of relationship satisfaction, self-esteem, or use of maintenance mechanisms. Correlations were then calculated between the different bias indices and relationship satisfaction, self-esteem, and use of relationship maintenance mechanisms. As can be seen from Table 2, the use of maintenance mechanisms was only found to have a positive correlation with self-esteem, $r(51) = .339$, $p = .015$. While the bias index for the self-scenarios was not found to be correlated with relationship satisfaction, $r(51) = .021$, $p = .884$, a positive correlation was found for the bias index for partner-scenarios, $r(51) = .417$, $p = .002$. Further, a negative correlation was found for the bias difference between self and partner-scenarios, $r(51) = -.298$, $p = .034$,

indicating that participants that held greater bias for partner-scenarios reported higher satisfaction scores.

Despite the small sample size, several correlations of RMMs were found to predict relationship satisfaction with Sharing Tasks, $r(51) = .698$, $p = .000$ as the strongest predictor. Other correlations of significance included Support, $r(51) = .324$, $p = .020$, Avoidance, $r(51) = .281$, $p = .046$, and Sharing a Social Network, $r(51) = .279$, $p = .047$. The correlative links between self-esteem and RMMs were slightly less prominent. The strongest correlation found from our sample was Positivity, $r(51) = .495$, $p = .000$. Other correlations found were Assurances, $r(51) = .335$, $p = .016$, and Humor $r(51) = .323$, $p = .021$. (See Table 3.)

Table 1.

Summary of Means and Standard Deviations for Paired Samples T-Tests of Attributional Bias Style

	Attributional Cause Scenario	M	SD
Pair 1	Self: Positive/Internal	5.173	.821
	Self: Negative/External	4.148	1.056
*Pair 2	Self: Positive/Stable	5.261	.719
	Self: Negative/Unstable	3.997	.823
Pair 3	Self: Positive/Global	5.235	.849
	Self: Negative/Specific	4.118	1.121
**Pair 4	Self: Positive/Important	5.556	.654
	Self: Negative/Not Important	4.703	.901
Pair 5	Partner: Positive/Internal	5.441	.948
	Partner: Negative/External	3.552	1.172
Pair 6	Partner: Positive/Stable	5.294	.875
	Partner: Negative/Unstable	3.771	.881
*Pair 7	Partner: Positive/Global	4.818	.929
	Partner: Negative/Specific	3.490	1.164
***Pair 8	Partner: Positive/Important	5.454	.867
	Partner: Negative/ Not Important	4.732	1.045

Note: *$p < .05$. **$p < .01$. ***$p < .001$.

Table 2.

Summary of Intercorrelations, Means, and Standard Deviations for Scores on the ASQ, RAS, and SES to Investigate Relationship Satisfaction and Couple-Serving Bias

Measures	1	2	3	4	5	6
1. RAS-Satisfaction	1					
2. SES-Self-Esteem	.237	1				
3. RMS-Maintenance Mechanisms	.222	.339*	1			
4. ASQ Bias: Situations Concerning Self	.021	.181	.173	1		
5. ASQ Bias: Situations Concerning Partner	.417**	-.017	-.051	-.113	1	
6. ASQ Self vs. Partner Bias Difference	-.298*	.119	.140	.673***	-.811***	1
M (Female)	3.908	3.278	1.056	1.487	2.451	-.431
SD	.853	.407	.751	.957	.529	1.248
M (Male)	4.403	3.339	1.083	1.122	2.699	-.039
SD	.609	.424	.729	.854	.607	1.252

Note: ***. Correlation is significant at the 0.001 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed)

Table 3. *Summary of Intercorrelations and Scores of Relationship Satisfaction, Self-Esteem, Couple Serving Bias and Relationship Maintenance Mechanisms*

	Satisfaction	Self-Esteem	Couple Serving Bias
1. Sharing Tasks	.698***	.081	-.008
2. Sharing Activities	-.242	.019	-.238
3. Assurances	-.206	.335*	-.268
4. Positivity	-.068	.495***	-.270
5. Openness	-.021	.075	-.137
6. Humor	.125	.323*	-.094
7. Support	.324*	.165	.035
8. Avoidance	.281*	.158	-.019
9. Share a Social Network	.279*	.225	-.082

Note: ***. Correlation is significant at the 0.001 level

   **. Correlation is significant at the 0.01 level (2-tailed)

   *. Correlation is significant at the 0.05 level (2-tailed)

DISCUSSION

The objective of the project was a follow-up study to examine evidence of a couple-serving bias in which attributional biases are extended to cover's one partner in close relationships (an "attributional umbrella"). We predicted the extent to which people use internal, stable, and global attributions for their partner's successes and external, unstable, and specific attributions for their partner's failures would be associated with greater relationship satisfaction and greater frequency of performing relationship maintenance mechanisms. Results of the present study replicated the couple-serving bias results of Castro and Seidel (2017) in that the magnitude of couple-serving biases were predictive of relationship satisfaction. Further, evidence from the present study suggests that couple-serving biases are more predictive of relationship satisfaction than are self-serving biases.

Self-esteem, a construct known as the "sociometer" of close relationships (Leary, 2012), was not found to predict relationship satisfaction in the present study while the magnitude of couple-serving biases did. Although it should be noted that present study suffered from low sample size, the findings indicate that couple-serving bias measures are worthy of future study as they appear to be significantly connected to relational health.

Significant correlations were found concerning maintenance mechanisms, self-esteem and relational satisfaction, respectively. Satisfaction in a relationship strongly correlated to Sharing Tasks, Support, Avoidance, and Sharing a Social Network. The results are supported by Hohmann-Marriott (2006), whom found couples that disagree about the division of household tasks are more likely to break up compared to couples whom share a fair division of labor (Amato & Hohmann-Marriott, 2007). Correlations of relationship maintenance mechanisms and self-esteem were significant to Positivity, Assurances, and Humor. Past research has shown positivity, assurances, and sharing tasks as the best predictors of a happy relationship (Canary et al., 2002; Stafford, Dainton, & Hass, 2000). From our sample, we were surprised to find men experienced more satisfaction in their relationship (present or past). Despite lower satisfaction scores and slightly lower frequencies of RMMs, women were more likely to utilize a couple-serving bias. This result mimicked the findings of Osterhout et al., (2011) linking stronger attribution behavior more for women than men. Although we hypothesized that the couple serving bias would be a good predictor of maintenance behavior, the results of the present study failed to support this prediction.

Some limitations of our study include actor/observer effects and a relatively small sample size with limited variability of gender and ethnicity. We also recognized our battery of self-reports was lengthy, allowing the possibility for participant fatigue. Despite this, we were able to replicate previous findings from the array of research concerning close relationships (Castro & Seidel, 2017). The extensive research of attribution bias has proven its realizability as a theory to better understand the dynamics of close relationships, aiding couples with the tools and equipment to prevent and/or overcome the infinite problems that occur in everyday situations.

For example, Kubacka, Finkenauer, Rusult, & Keijsers's (2011) longitudinal study found that early behaviors of gratitude and partner responsiveness in marriage predicted the same behaviors later. Healthy, happy relationships tend to begin with easy, automatic behaviorisms of relational maintenance, but relationship longevity can be sustained by the repeated efforts of both parties. With this replicated study, extending an "attributional umbrella" by utilizing a couple-serving bias—making internal, stable, and global attributions for partner's successes and external, unstable, and specific attributions for their partner's failures—offers people another tool to encourage healthiness, happiness, and longevity in close relationships.

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COMMERCIAL ACTIVITY TRACKERS OVERESTIMATE STEP COUNT: IMPLICATIONS FOR AMBULATORY PHYSICAL ACTIVITY MONITORING
by ALBERT HERNANDEZ
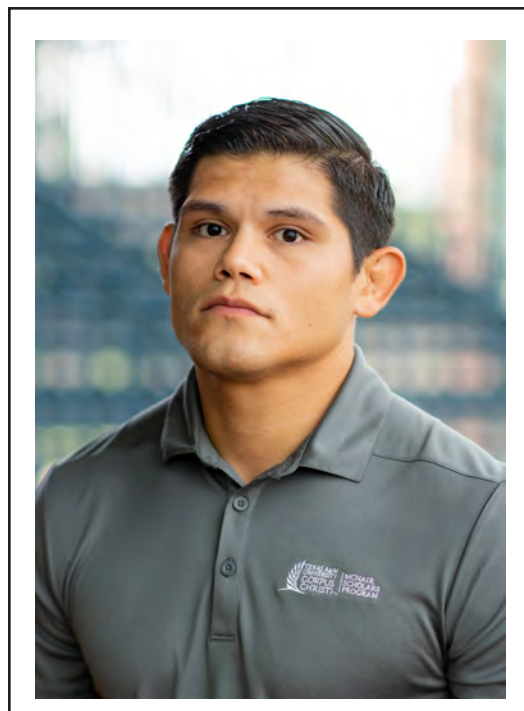
INTRODUCTION

Lack of adequate physical activity has been linked with several chronic diseases (Lauby-Secretan et al., 2015). Adults who are inactive are more likely to develop chronic diseases like type 2 diabetes, cancers, and cardiovascular disease, compared to physically active adults (Physical Activity Guidelines for Americans, 2018). It has been shown that changes in lifestyle, including adopting physical activity behavior during emerging adulthood, is positively linked with improved health later in life (Yougdeok et al., 2018). Physically active adults also report better mood (Physical Activity Guidelines for Americans, 2018). It is recommended that adults accumulate 75 minutes of vigorous-intensity activity or 150-300 minutes of moderate-intensity activity each week (Physical Activity Guidelines for Americans, 2018).

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Previously, the percentage of US adults who indicated meeting recommended levels of physical activity fell from 60% (self-reported) to less than 5% when physical activity was objectively measured (Herring at al., 2014). Therefore, activity trackers can assist in monitoring objective physical activity relative to recommended guidelines.

Using a pedometer, it was concluded that 12,000 steps per day was recommended for children as well as adolescents (da Silva et al., 2015. The authors showed a correlation between step count and physical activity recommendations (da Silva et al., 2015. Other research proposed 11,500 steps for preschoolers (De Craemer, 2015. There are different recommendations for physical activity across different age groups. As such, there are efforts, especially in population health research to identify activity tracker outputs/steps counts that correspond to recommended daily minutes of physical activity. A recent national survey showed that a big portion of adults in the US are less physically active during 18-25 years of age (Yougdeok et al., 2018. This period is very important as it represents emerging adulthood. Even with the vast increase in knowledge regarding the benefits of physical activity (Physical Activity Guidelines for Americans, 2018),

adherence with recommended levels of physical activity remains low. It is thought that activity trackers could help facilitate adherence by providing accurate insight into daily physical activity behavior and promoting individual goal setting. However, inaccurate activity tracker outputs could dissuade users, including slower walking community-dwelling older adults, thereby resulting in lower adoption rates (Wong, Mentis, & Kuber, 2018).

Activity trackers have grown in popularity and can provide users insight into their daily physical activity patterns; however, given the proprietary nature of the analytical methods used by different companies, it is unclear how these devices handle non-ambulatory tasks. Accelerometers use different amplitudes and frequencies to measure physical activity (An, Jones, Kang, Welk, & Lee, 2017). Since activity trackers have improved at analyzing aspects of physical activity behavior more accurately, more consumers seem to be using them. In fact, the activity tracker industry was worth $30 billion in 2016 and is projected to increase to $150 billion by 2026 (Bassett, Freedson & John, 2019). With the major increase in the number of individuals buying activity trackers, there is a need for more research on activity trackers and the accuracy of the parameters they output, especially relating to movement and step count across different activities. Previously, iPhones (independent of wear position) and Garmin Vivofit had the best validity for walking on a treadmill and free walking of all the devices tested (i.e., iPhone, Samsung Galaxy S6 Edge, Garmin Vivofit 2 wristband, ActiGraph xGTX+ devices) (Höchsmann et al., 2017). Given their consistence with wristwatches (often a staple sartorial piece in modern society), wrist-worn activity trackers like Apple Watch and Fitbit are very popular. However, it is unclear how wrist-worn activity trackers attribute step count to non-ambulatory movement tasks.

Prior research findings suggest inaccuracies in accelerometer-based estimation methods during slow speed walking (Höchsmann et al., 2017). Using five activity trackers (i.e., Nike Fuelband, Fitbit Ultra, Jawbone UP, BodyMedia FitCore, and Adidas MiCoach) a study found that activity trackers underestimated total step count by 4% on average during walking (Stackpool, Porcari, Mikat, Gillette, & Foster, 2014).

In the same study, when ambulatory patterns became more complex (i.e., agility-related exercises), step count error increased to an average of 18% (Stackpool, Porcari, Mikat, Gillette, & Foster, 2014). This shows that activity trackers can be inaccurate when movements other than walking and running are tracked. Koolman et al. (2015) found that Pulse and Fitbit Zip were the most effective at tracking activity during laboratory conditions, while Fitbit Zip was the most effective during the free-living conditions. Interestingly, Fitbit HR had the most error (i.e., mean error was 10.2% at all speeds tested). This suggests that the same brands can have different step count accuracy (Koolman et al., 2015). Sears et al. (2014) explored treadmill speeds of 0.89, 1.11, 1.34, 1.56, and 1.79 m/s while participants wore four wrist-worn activity trackers (Fitbit Charge HR®, Garmin Vivosmart HR®, Apple iWatch®, Jawbone UP3®) and the hip-worn Digi-Walker®. They reported that total step count estimation errors were lower at the slower speeds, whereas they were higher at faster speeds (Sears et al., 2014). While many studies have explored step count estimation across different wrist-worn activity trackers during ambulatory tasks (Dondzila, Lewis, Lopez, & Parker, 2018; Godfrey, Del Den, Barry, Mathers, & Mathers, 2015; Koolman et al., 2015), there is dearth of studies on step count attribution during non-ambulatory tasks.

Therefore, the purpose of the current study was to: (1) investigate differences in step count estimations between two wrist-worn activity trackers (i.e., Apple Watch and Fitbit Versa) and directly observed step counts during ambulatory tasks, and (2) and elucidate how wrist-worn activity trackers attribute step count to non-ambulatory tasks in college age individuals.

METHODS
Participants

Eight college age young adults (age: 29.75 ± 6.25 years; height: 174.21 ± 7.04 cm; mass: 84.35 ± 10.86 kg) participated in this study. The inclusion criteria included being between age 18–39 years and engaging in at least one 150 minutes of weekly activity. Additionally, participants were included, if they reported engaging in movements that strengthen the muscles at least three times each week. Participants completed an initial research eligibility criteria questionnaire to determine their eligibility.

All participants provided consent prior to participating in the study. Texas A&M University-Corpus Christi Institutional Review Board approved this study.

Protocol

Participants wore a Fitbit Versa (Fitbit, San Francisco, CA) and Apple Watch (Apple Inc., Cupertino, CA) on their left and right wrists. Participants walked a for a total of 50 steps and ran for a total of 100 steps, on a non-motorized single belt CURVE treadmill (WOODWAY, Waukesha, WI). Participants also completed 20 hand claps, 20 sit-to-stands, 20 vertical jumps, and 20 bilateral hops (at their preferred pace). A sit-to-stand task was explained as rising from a seated position in a chair (i.e., with the hips and knees at approximately 90° flexion) to a fully upright standing position (i.e., with the hips and knees at approximately 180° extension), then lowering back down to a seated position. Participants completed three separate trials of each for each task. The frequency of each task criterion, e.g., number of steps, number of jumps, and number of claps was counted by a direct observer.

Anthropometrics

Participants' average age, height, and mass (SD) are presented in Table 1. Following familiarization with the study protocol, a seca 286 dp wireless ultrasonic measuring station (seca, Hamburg, Germany) was used to measure each participant's standing height (cm) and whole-body mass (kg).

Measure	Mean(SD)
Age of Participants	29.8 ± 6.3
Male to Female ratio	6:2
Height (cm)	174.2 ± 7.0
Body mass (kg)	84.4 ± 10.9
BMI (kg/m^2)	

Table 1: Descriptive and anthropometric data (Mean (SD)) for participants

Data analysis

The number of steps on the respective device mobile application dashboards (Fitbit Versa (Fitbit, San Francisco, CA) and Apple Watch (Apple Inc., Cupertino, CA))

(Fitbit Versa (Fitbit, San Francisco, CA) and Apple Watch (Apple Inc., Cupertino, CA)) were recorded before and after each task. The difference between the beginning and the end step count was the number of steps credited to the task that was being done by the device. The tasks were repeated three times for and with the step count recorded along with the Mean and standard deviation (SD) recorded as well. Along with the Mean and SD the corresponding coefficients of variation (i.e., quotient of SD and mean expressed as a percentage) were also calculated. The directly observed step count and overall step count production from each of the two devices were calculated and the percent error was found.

Statistical Analysis

A series of independent samples t-tests were employed to examine differences between Apple Watch, Fitbit Versa and directly observed steps during walking and running tasks.

RESULTS

Walking

There was a significant difference (t(7) = -2.780, p = .027) between the number of steps attributed by Fitbit Versa and those directly observed during walking (Figure 1). There was no significant difference (t(7) = -1.200, p = .269) between the number of steps attributed by Apple Watch and those directly observed during walking (Figure 1).
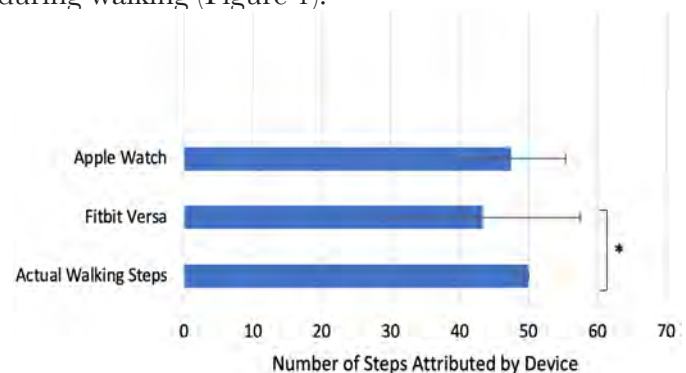

Figure 1. Step count attributed by Apple Watch and Fitbit Versa, and directly observed count during running. * indicates significant difference at p<.05.

Running

There was no significant difference (t(7) = -.869, p = .414) between the number of steps attributed by Fitbit Versa and those directly observed during running (Figure 1). There was no significant difference (t(7) = -1.920, p = .096) between the number of steps attributed by Apple Watch and those directly observed during running (Figure 2).
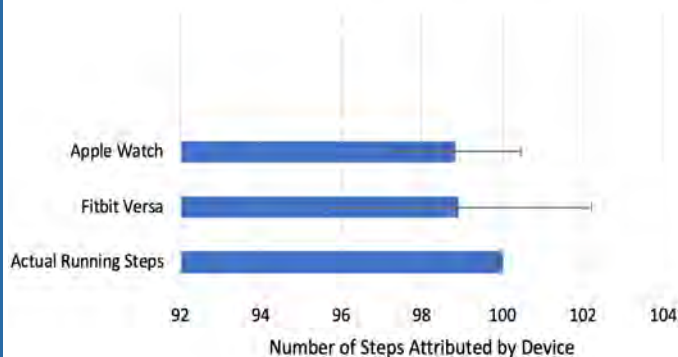

Figure 2. Step count attributed by Apple Watch and Fitbit Versa, and the directly observed count during running.

Non-ambulatory tasks
Sit-to-stand

Fitbit Versa attributed an average of 44 steps to 20 sit-to-stands. The corresponding CV was 17.27% across three repeated trials. Apple Watch attributed an average of 56.33 steps to 20 sit-to-stands with a CV of 8.20% across repeated trials (Figure 3).

Figure 3. Step count attributed by Apple Watch and Fitbit Versa, and the directly observed count during sit-to-stand.

Vertical jump

Fitbit Versa attributed an average of 44 steps to 20 vertical jumps with a CV of 4.81% across three repeated trials, whereas Apple Watch attributed an average of 51 steps with a CV of 10.86% across repeated trials (Figure 4).

Figure 4. Step count attributed by Apple Watch and Fitbit Versa, and the directly observed count during vertical jumps.

Bilateral hop

Fitbit Versa attributed an average step count of 25 steps to 20 bilateral hops with a CV of 11.32% across repeated trials. Apple Watch attributed an average of 31 steps to 20 bilateral hops. The corresponding CV across repeated trials was 12.34% (Figure 5).

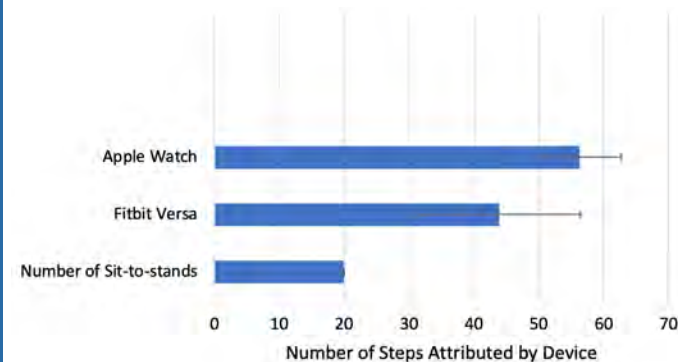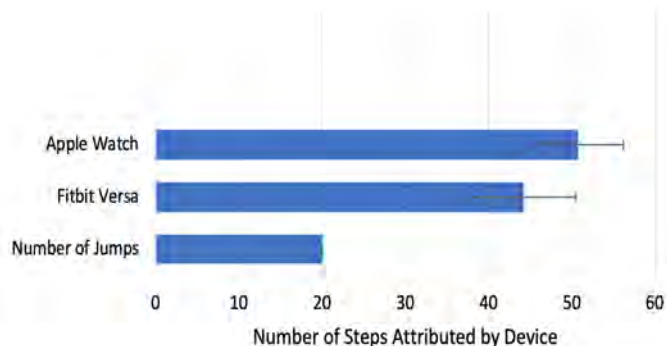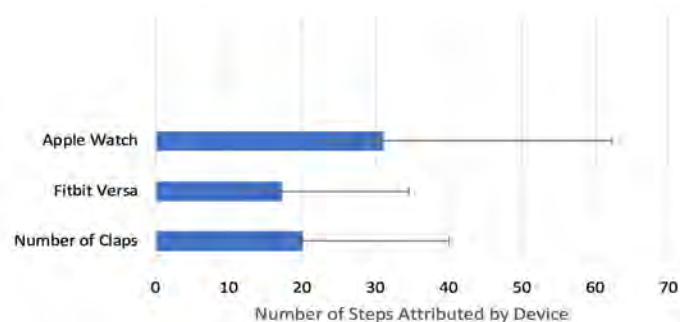**Figure 5.** Step count attributed by Apple Watch and Fitbit Versa, and the directly observed count during bilateral hops.

Clap

Fitbit Versa attributed an average step count of 17 steps to 20 claps with a CV of 9.23% across repeated trials. Apple Watch attributed an average of 32 steps to 20 claps, and the corresponding CV (across repeated trials) was 10.90% (Figure 6).
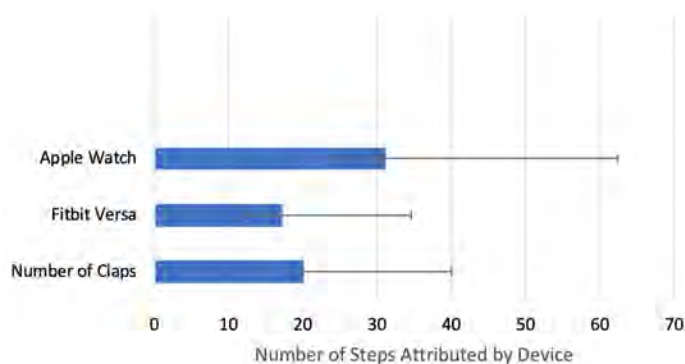
Figure 6. Step count attributed by Apple Watch and Fitbit Versa, and the directly observed count during claps.

DISCUSSION

The results presented showed no differences between Apple Watch and direct observation step counts during walking. Conversely, Fitbit Versa differed significantly from the direct observation output during walking. The average step count for both devices shows that Apple Watch's average of 48 steps was closer to the actual step count of 50 than Fitbit Versa, which output an av-erage step count of 43. The errors associated with Fit-bit Versa and Apple Watch during walking were -14% and -4%, respectively.

Previous research findings that other activity trackers have underestimated steps (Sears et al., 2014) are consistent with the present find-ings. One of the differences from the previous research by Sears et al. (2014) was that study had participants walk at different speeds, whereas participants in this study were instructed to walk at their preferred speed across the three sets of walking trials. The observed difference in CV values suggest that Apple Watch was more consistent at attributing comparable step count magnitudes across repeated walking trials than Fitbit Versa.

There were no significant differences in mean step count output from Fitbit Versa and Apple Watch compared to direct observation during running. The step count absolute error associated with both Fitbit Versa and Apple Watch during running was -1%. Previous research involving running on a treadmill showed a mean error rate of 4% across devices, namely Nike Fuelband, Fitbit Ultra, Jawbone UP, BodyMedia Fit-Core, the Adidas MiCoach, and NL-2000i, compared to direct observation (Stackpool, Porcari, Mikat, Gillette, & Foster, 2014). The high-end devices used in the current research differ from the ones used by Stack-pool et al. (2014); this may account for the lower error magnitudes than previously reported. Additionally, the fact that participants in this study only ran for 100 steps compared to 20 minutes of running in the study by Stackpool et al. (2014) may inform the discrepancy in estimated step count error between the devices.

Since sit-to-stand is a non-ambulatory task, the objective of the current study was to elucidate how activity trackers attribute step count (a traditional ambulatory measure) to non-ambulatory tasks. The results show that Fitbit Versa and Apple Watch attributed 44 and 56 steps to 20 sit-to-stands, respectively. No previous studies have examined activity tracker step count attribution during repeated sit-to-stand tasks. The only thing that was close was free living tracking with activity trackers. Hopefully this information can assist in looking into this specific non-ambulatory exercise. Fitbit Versa's attributed step count CV was 17.27%, which is higher than the Apple Watch's CV of 8.20%. This suggests that Apple Watch's step count magnitude was more consistent across three repeated trials compared the Fitbit Versa. As such, Fitbit Versa appeared less reliable in its step count output across repeated sit-to-stand tasks. In terms of validity, neither of the devices output 20 sit-to-stands.

Fitbit Versa and Apple Watch attributed 44 and 51 steps when participants performed 20 vertical jumps, respectively. Like the sit-to-stand, no previous studies had explored step count attribution to vertical jumps. However, it is interesting that the attributed step counts during vertical jumps appear comparable to those attributed during the sit-to-stand tasks (i.e., 44 and 56 for Fitbit Versa and Apple Watch, respectively).

These findings suggest a false equivalency between these likely non-metabolically equivalent tasks (i.e., sit-to-stand and vertical jump). Contrary to the variability magnitudes reported during sit-to-stand, Fitbit Versa was less variable (i.e., lower CV) than Apple Watch across repeated vertical jumps. This suggests step count variability differed between the devices depending on the task.

Fitbit Versa and Apple Watch attributed 25 and 31 steps, respectively, when participants performed bilateral hops. Bilateral hops are directionally consistent with vertical jumps, i.e., both involve vertical translation of the whole-body center of mass (COM) during a flight phase (i.e., the absence of stance) engendered by propulsive ground reaction forces. Interestingly, the magnitude of the steps attributed appeared to reflect the difference in arm movements between the tasks. Specifically, vertical jump is associated with greater COM displacement and arm swing compared to bilateral hops. The step count variability for Fitbit Versa and Apple Watch were 11.32% and 12.34%, respectively. This suggests neither activity tracker showed considerably greater step count attribution variability compared to the other during vertical jumping.

Clapping was the only task that did not involve movement of the lower body. Therefore, it will be insightful to explore how both devices attributed steps to this task. Fitbit Versa and Apple Watch attributed 17 and 31 steps to clapping, respectively. For Fitbit Versa, this was the lowest step count attributed across all the non-ambulatory tasks. Considering that arm swings/movements were likely smaller during clapping and bilateral hopping compared to vertical jump and sit-to-stand, the step count outputs from both devices appear logical within the context of tri-axial accelerometry. However, from the standpoint metabolic and movement demands, these attributed steps appear to create a false equivalency between performing 20 claps and 20 bilateral hops. While the current study did not evaluate metabolic cost or energy expenditure during the movement tasks, movements that involve more and larger muscle groups generally require more energy. This is especially important for consumers trying to be more active by accumulating a set number of steps a day. The CV magnitudes were comparable between both devices, suggesting similar levels of variability across repeated trials.

Fitbit Versa step count outputs were less variable across the different movement tasks except in the ambulatory exercise of running with the Apple Watch which was more accurate. Along with the accuracy of the activity trackers a comfort rating scale was also used to see which was more comfortable. The scale measured used was: emotion, attachment, harm, perceived change, movement, and anxiety. Three of the scales that were the same with the same averages were harm, perceived changes, and anxiety. It showed that devices were not painful or causing harm, all the participants felt secure when wearing the devices and no participant felt strange wearing the devices. Fitbit Versa was more comfortable in the emotion scale measure, more were worried on how they looked when wearing the Apple Watch. The Apple Watch scored better on the movement and attachment comfort scale than the Fitbit Versa. This meant that Fitbit scored worse when it came to how the device affected the way the participant moved with an average of 0.25 and when it came to the participants feeling of the devices moving while exercising.

Strengths and Weaknesses

The main strength of the current study is the fact that no other studies to our knowledge previously explored the extent to which step count attributions to non-ambulatory tasks might impact total step count output from wrist-worn activity trackers. This study has several limitations. The sample is small and was not informed by a priori power analysis. The participants were college age young adults, so findings may not generalize to other age groups like older adults and children.

CONCLUSIONS

Broadly, activity trackers are valuable for monitoring physical activity. However, for individuals who are specifically interested in ambulatory activity monitoring, they should be aware that the total step count output by wrist-worn activity trackers includes step count estimations that appear to be driven by arm swing across both ambulatory and non-ambulatory movements. Therefore, outputs create a false equivalency between likely non-metabolically equivalent tasks as evidenced by the attribution of comparable step counts to vertical jump and sit-to-stand tasks by both Fitbit Versa and Apple Watch.

Consequently, any energy expenditure models that rely on step count as a feature are likely grossly inaccurate and misleading.

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THE EFFECTS OF GROUP EMPOWERMENT DRUMMING ON STATE ANXIETY IN SELECTED POPULATIONS

by TONY LONG

ABSTRACT

Group Empowerment Drumming (GED) on State- Anxiety in selected populations was examined in this study to answer the research questions, (1.) Does group empowerment drumming lower state anxiety in college student athletes? (2.) Does group empowerment drumming lower state anxiety in clients at Charlie's Place (Corpus Christi, TX)? (3.) Does group empowerment drumming lower state anxiety in non-athlete college-age students? Eighty-Five adults were surveyed, ages between Seventeen and Forty-Five (28 students in a University Health Class, Eleven Women's Basketball team members, Twelve Men's Basketball team members, and Thirty-Four Charlie's Place patients). Charlie's place is a recovery center for addicts, people suffering from depression or a number of mental illnesses, or people in withdraw from quitting their drug of choice. Each subject performed a pretest and posttest immediately prior to and immediately following a Group Empowerment Drumming Program.

State Anxiety levels were then recorded. Conclusions of the statistical data of the study displayed an overall reduction of the perceived state anxiety levels mean in selected populations, along with seeing an average change of eight points in scores between the populations. The analysis showed a correlation between GED program administration and the reduction of state anxiety in selected populations. Overall, from the pre to post test measures across all selected populations discovered a movement toward the reduction of state anxiety due to the Group Empowerment Drumming Program. These test findings suggest that GED programs have a reduction effect on state anxiety and further research should be done to find out the extent that GED and music therapy programs alike can be incorporated into modern psychological therapy programs.

INTRODUCTION

Many people experience state anxiety every day, whether it is from the inevitable stressors of navigating their way around or actual danger. State anxiety can be best defined as a stressor that is occurring in the present time and place, not over a period of time (Gadberry, 2011). Anxiety can be detrimental to a person's health by exacerbating specific events or actions that overwhelm the brain with stimuli, often causing panic attacks in the short term and depression longitudinally.

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Music is able to divert stress energy to either be recycled into positive energy or alleviated by the effects of music therapy (Bittman et al., 2001). Extensive research has been done on the effects of exercise therapy and music therapy independently, but the subcategory of Group Empowerment Drumming and its effects on anxiety is less broadly researched. This study aimed to answer the research questions, (1.) Does group empowerment drumming lower state anxiety in college student athletes? (2.) Does group empowerment drumming lower state anxiety in clients at Charlie's Place (Corpus Christi, TX)? (3.) Does group empowerment drumming lower state anxiety in college-age students?

It is important to research the effects of Group Empowerment Drumming as a remedy for general state anxiety as anxiety is one of the top complained medical conditions in the world. Music's suggested patterns and repeated tones make it easier for the brain to remember information or stimuli coming into the brain because of the naturally occurring ability to know what comes next, promoting memory and processing information (Gadberry, 2011). One can know every word to a new song after listening to it a couple times, but reading a chapter in a textbook and asking one to remember its contents is seemingly impossible without note-taking and asserted effort. Music is rarely practiced independently or exclusive to one dialect. It can be translated across a myriad of cultures, ethnicities, religions and can span decades with its effect. Recent research suggests that community music therapy can have a lasting effect on social bonding and social communion (Pavlicevic and Ansdell, 2004). The lasting effects of group therapy can be seen in the expansion of the therapy field as new ways to implement strategies to better music therapy effects (Strange, Odell-Miller, Richards, & Trondalen, 2017).

Throughout time music has been a means to bond people on a level beyond traditional interpersonal communication. Music activates parts of the brain that traditional learning cannot, closely relating to the growth of the human experience and how we deal with high levels of stress in our everyday lives (Galinska, 2015). One study found that those who listened to a steady beat in times of high anxiety experienced a moderate alleviation of anxiety symptoms than compared to the group that did not (Gadberry, 2011).

As modern technology and advancements have developed, humans have seemingly lost the connection to music circles. Additional research suggests that music has the ability to alter our own cognitions to how one processes and handles stress, while also displaying the ability to promote and cause social change (Bittman et al,. 2001; Elliott et al., 2011; Pavlicevic & Ansdell, 2004).

Group music production was once an integral part of many ethnic traditions. Modern advancements in technology have reduced face-to-face communication and therefore close proximity social bonding. This is detrimental to the human experience and psyche, for humans need human interaction for proper mental processing (Matney, 2018). Dance and music therapy help rehabilitate a person's mental cognitions through the raising of self-esteem and improving one's own relationship with their physical body, giving them the psychological and even physiological strength to combat their anxiety or habit (Goodison & Shaffer, 1999). Music stands as a hierarchical compound language of time promoting cognitive functioning and communication, which in turn could bridge the gap or connect the neural pathways that other interventions fail to reach in a subject's brain (Gallinska, 2015). Beats are naturally attractive to the ears and brain. Systematic auditory patterns prove to make learning easier through understanding the chronological order of things according to corresponding beats. New music therapy techniques appear everyday, fielding new ways to manipulate parts of programs in order to yield better results (Faulkner & Oshinsky, 2017). Music therapy could be the missing link in therapy between recidivism and rehabilitation as new research suggests that people are more likely to be conscious of their own mental health and the effects of community activity on it (Ansdell & DeNora, 2016).

Participants

A total of 85 adults were surveyed, ages 17-65 (28 Health Class Students, 10 Women's basketball team members, 11 Men's Basketball team members, and 32 clients of Charlie's Place). Each subject performed a pretest and posttest immediately prior to and after conclusion of a Group Empowerment Drumming Program.

METHODS AND PROCEDURES

Verbal consent was asked of all subjects through reading the protocol for the study and signing the acknowledgment form. There were no pre-study questionnaires or scales to determine eligibility of participants. Data was recorded in a deidentified manner as to maintain the confidentiality of participants. All subjects were chosen by voluntary action and were not influenced by the PI or Co-PI (Primary Investigator and Co-Private Investigator) The scholar in this research acted as the Co-PI. The PI was to distribute the pre-State-Anxiety Questionnaire to all subjects and go over instructions how to fill it out correctly. The pre and post Anxiety Questionnaires are self evaluation questions that gauge the levels of anxiety a person feels at the present time before and after the selected intervention. There are 20 items on the adult questionnaire. The subjects then filled out a questionnaire and the Co-PI collected each one.

Next, subjects were seated in a circle and the PI (Primary Investigator) explained the Group Empowerment Drumming Program. Percussion instruments were then passed out to participants. After the percussion-related instruments were passed out (small drums, tambourines, woods, bells, shakers, triangles, and plastic tubes), the PI demonstrated how to play each one. The PI then facilitated the Group Empowerment Drumming program by playing easy mother rhythms (four beat rhythms) and invited subjects to play along. This portion lasted approximately 30 minutes, with variations in time according to population and extraneous circumstance. Upon completion of the Group Empowerment Drumming Program, the subjects took the post-State Anxiety Questionnaire and CO-PI (Co- Private Investigator) collected each. The investigators thanked each subject for their part in the research study. The procedure was performed one time through including the pre and post test measures and a debriefing.

STATISTICAL ANALYSIS

Measure 1. Overall State Anxiety Means				
Time	Mean	Std. Error	Lower Bound	Upper Bound
1. Pre	40.381	1.387	37.621	43.140
2. Post	31.446	1.549	28.363	28.363

Measure 2. Measured State Anxiety Change Means by Population

Group	Time	Mean	Std. Error	Lower Bound	Upper Bound
Health Class	1.	42.679	2.143	38.415	46.943
	2.	32.750	2.394	27.743	37.513
Female Basketball Team	1.	43.545	3.419	36.743	50.348
	2.	27.636	3.819	20.037	35.236
Male Basketball Team	1.	31.917	3.273	25.404	38.429
	2.	27.250	3.657	19.974	34.526
Charlie's Place	1.	43.382	1.945	39.513	47.251
	2.	38.147	2.173	33.824	42.470

Measure 3. Test of Within-Subjects Contrasts

Source	Time	Type III Sum of Squares	df	Mean Square	F	Sig.
Time	Linear	2668.105	1	2668.105	33.801	.000
Time * Group	Linear	592.436	3	197.479	2.502	.065
Error (Time)	Linear	6393.775	81	78.935		

Correlational Analysis

Statistics for this study were done in the SPSS software running a one sample T-test to compare the means of all populations together and each population individually to measure the changes in perceived state anxiety. The results of this study were a movement toward significance in that among the participants polled before and after Group Empowerment Drumming treatment, all populations showed a reduction in perceived State Anxiety.

Of the 85 subjects studied, 75 showed a movement toward reduction, as seen in Figure 1. Eight participants showed a higher score and two of the participants saw no change in mean anxiety levels measured. This suggests that community drumming can lower anxiety.

Statistics were run for individual populations to discover any differences based on population identity. The female basketball team members polled showed the most significant change in perceived anxiety scores, as seen in Figure 2. Among the Charlie's Place population, the difference in mean from pre to post test showed a positive relationship between the GED program and a reduction in state anxiety among those with already perceived psychological discrepancies. This was stronger than the participants on the male basketball team, which have no underlying anxiety condition of note. The Charlies' Place clients also displayed the largest standard deviation score among the selected populations, suggesting larger variation of anxiety scores among participants with already high levels of resting state anxiety. Finally, the University Student Health class displayed the second largest significance among the populations studied (see Measure 2), displaying lower resting levels of state anxiety. This finding suggests the generalizability of Group Empowerment Drumming as a treatment for State-Anxiety. Perceived state anxiety was reduced in all populations analyzed together, with a ninety-five percent confidence level, meaning the differences in scores can be credited to the Group Empowerment Drumming programs' effect on State-Anxiety (See measure 1). As seen in Measure 3, a Within-Subjects contrasts results yielded a significance level of .065 (see Measure 3) for relation between time (the GED program) and the Groups given. This suggests a slight significance for the GED program effectiveness in lowering state-anxiety.

DISCUSSION

The present study measured the perceived level of state anxiety in selected populations before and after the administration of a Group Empowerment Drumming Program. For those that took part in the study, it was found that engaging in the GED program reduced anxiety among the participants regardless of population classification. These findings were also supported by previous research in the field, whose results affirmed the question that: (1.) Does group empowerment drumming lower state-trait anxiety in college student athletes? (2.) Does group empowerment drumming lower state-trait anxiety in clients at Charlie's Place (Corpus Christi, TX)?

3.) Does group empowerment drumming lower state-trait anxiety in college-age students? One previous study found that GED reduces the duration of anxiety symptoms and even further reduces symptoms when one is able to choose the music being used. A single trial experimental intervention found that drumming circles can be used as a modulation device to redirect negative stress energy to elsewhere to be better managed through the changes in hormone responses that trigger stress. In turn, this activates lymphokine killer cells: cells that are engineered to rid the body of harmful stimuli and modulate specific neuroendocrine and neuroimmune parameters in a direction that is opposite to which the stimulus was expected to apply (Elliott et al., 2011). In this manner, music can either transform stress energy into positive energy or relieve stress energy with its effects (Bittman et al. 2001). The corresponding research only serves to support the findings of this study and further the advancement of the field of music therapy for anxiety patients.

In terms of depression and depressive symptomatology, music therapy is theorized to reduce depressive symptoms after three months of direct clinical intervention. In a study done by Albornoz (2011), those that received a three month treatment displayed significantly lower depressive symptomatology than those that did not undergo the three month treatment. In this case music therapy was seen to have a large clinical significance, displaying the effect that music therapy can have on the individual, group, and community overall. Music is able to activate parts of the brain that other intervention techniques may not be able to. It is a hierarchical compound language of time promoting cognitive functioning and communication, which in turn could bridge the gap or connect the neural pathways that other interventions fail to reach (Galinska, 2015). Although these were controlled trials and under clinical observation for the duration of the research, the experimenters were careful to display the significance and validity both inside and outside of their own research. This study illustrates the ability of music therapy to have a beneficial long term effect to hindered mental processing.

With literature highlighting Group Empowerment Drumming and music therapy's ability to reduce and/or divert stress and anxiety, what are the effects on people with high resting levels of anxiety like drug addicts? It is important to research the effects of Group Empowerment Drumming on this population. Goodison and Shafer (1999) research on dance and music therapy found that music can help rehabilitate a person's mental cognitions by raising self-esteem and improve their own relationship with their body, giving them the strength to combat their habit. The findings of the article support the conclusion that GED programs reduce state anxiety in selected populations. In a study done on addicts, music therapy alone can be a viable psychological intervention to be used to reduce anxiety in drug addicts during their rehabilitation stage of their recovery (Soleimani and Senobar, 2018). The results of this study suggest drug addicts can find an alleviation of relapse symptoms and an increase in rehabilitation success. With the presence of addiction and dependence, which can be a large obstacle in intervention programs for anxiety, music therapy is still found to have a positive effect (Strange et al., 2017). In a study done by Aldridge and Fachner (2010), the beneficial effects of Group Empowerment Drumming and the ability of music in coordination with group activity have positive cognitive benefits in the short term. Music therapy is able to reach parts of the brain that are linked to addiction and can function as a means of rehabilitation for recovery in brain dysfunction, damage, or losses to the brain. These acute adjustments to mental cognition can correlate the ability to prevent relapse of addiction. Additionally, Smith and Thy (2008) did research on the effects of music therapy in occupational settings. It was found that music relaxation decreased anxiety levels, though it is noted that more research is to be done on anxiety reduction in the workplace. Bensimon et al. (2018) measured music therapy's ability to lower state anxiety and anger and it was found that regardless of population and environment music therapy is a dynamic strategy to lower state anxiety and anger. The effect of music therapy is undeniable in this sense, with all populations being able to see the positive results of music on their anxiety and anger levels. This study displays the universal beneficial ability of GED programs.

Limitations

Limitations to the study such as number of participants per classification, the chance for objectivity during the test, and more are discussed along with the findings. The results are solely based on self-report data which can raise doubts to if the participants are answering to achieve the desired effect of the experimenter. It is unknown how much this affected the study. (What is known, however, is the level of state-anxiety they reported or were perceived to have.) There is no way of knowing if this is actually an accurate reflection of their health, for there were no medical reviews done of the participants.

The criteria for the study selected specific populations to study instead of more generalizable populations. For example, this study used populations like the Women's and Men's Basketball team at TAMUCC, leading to the question of extraneous events or circumstances that can alter their own perceived state anxiety or an unknown variable that could affect the results of the study.

Surveys were taken in different locations at different times of the day. It is worth noting the findings could be due to chance any given day. For example, some groups may have had outside influences while partaking in the study or had a distraction during the commencement of the program, which could have made it harder for participants to measure their own perceived State-Anxiety. This could explain the outlier variables that make up the Women's basketball team. Efforts in the future should investigate the true relationship between Group Empowerment Drumming Programs and their ability to alleviate state anxiety specifically and anxiety more generally in people with already high levels of state anxiety. Polled clients in Charlie's Place mean state anxiety levels were lower than that of the other selected populations that did not have pre existing high levels of anxiety. Further research into this topic is needed as GED does have an effect on people's measured levels of state anxiety, but results to this study do not give an explanation as to why Charlie's Place clients' measures differed from the other selected populations.

CONCLUSION

Collectively, Group Empowerment Drumming lowered anxiety levels among the subjects in the three selected populations, which is in accordance to past literature on the topic. Based on the data along with the additional research referenced in the article, the hypothesis that Group Empowerment Drumming would reduce State-Anxiety in selected populations was founded and supported. The data for this research stated a 95% confidence interval that the change from pre to post test would be statistically impossible to be any other variable other than the GED program being responsible for the reduction effect. Of the 85 subjects studied, 75 showed a lower score from the pre to the post measures. This result suggests that Group Empowerment Drumming can lower anxiety as a generalizable statement and did as the research concluded. Eight subjects showed a higher score and two stayed the same. The results as a whole population and the statistical analysis run on the test scores overall showed a movement toward reduction in state anxiety among the selected populations.

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CLASSROOM LATENESS AS A PREDICTOR OF EDUCATION QUALITY

by YADIRA MARTINEZ

ABSTRACT

The present study aimed to explore the relationship between classroom lateness and educational quality and satisfaction. Undergraduate students (N = 84) completed a survey measuring their perceptions of teacher lateness, student lateness, and personal lateness to college classes they attended. It was predicted that lateness would be negatively quality with lateness and satisfaction. Results were consistent with this expectation. All three types of lateness were negatively related to students' ratings of educational quality and satisfaction. A multiple regression analysis identified that instructor lateness accounted for a significant amount of unique variance over and above the other two lateness types. Ideas for how the results might inform future educational practices are discussed.

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Lateness has been culturally recognized as a disorderly behavior. In Western culture, timeliness is valued and expected. It should not come as any surprise then that out of the "Big 5" personality dimensions (Openness, Conscientiousness, Agreeableness, and Emotional Extraversion, Stability), conscientiousness has been found to be the best predictor of lateness in most occupations and for the most job related criteria (Aamodt, 2004). At work, an employee may be late to work or to a meeting, creating a negative impression on others and perhaps lowering productivity altogether. In college classrooms, students might have an instructor who is consistently late, fellow students who consistently walk in late to class, or they themselves may be consistently late for class. The present study attempted to explore what impact each of these types of lateness has on students' perceptions of the quality of education they receive.

Literature dating back to the closing of the twentieth century has discussed the general concept of being late to work as a type of withdrawal behavior (e.g., Koslowsky, Krausz, Aizer, & Singer,1997). In the majority of organizational settings, wasting time is generally deemed as unacceptable

with potential negative effects on factors such as attitudes, behaviors, and outcomes. As Koslowsky(2000) suggests, lateness, if left unchecked, may lead to the deterioration of work motivation and morale.

As defined by Kaplan, Bradley, Luchman, and Haynes (2009), withdrawal behaviors encompass the set of attitudes and behaviors used by employees that for some reason decide to maintain their job yet show a decrease in participation. Lateness and absence have been illustrated to be possible symptoms of the phenomenon of withdrawal. Theoretically, Blau(1995) explained lateness classified as tri-dimensional: chronic, unavoidable, and avoidable. The categories can be explained by analyzing antecedents (Shapira-Lishchinsky, 2012). First, chronic lateness is a response to a disadvantageous work situation. Examples of what may be antecedents of chronic lateness include "organizational commitment and job satisfaction". Second, avoidable lateness emphasizes arriving late due to situations that are controllable. The individual chooses to arrive late due to perceiving arriving on time as less important than other things. Positive antecedents of avoidable behaviors may be typical life factors like work-family conflicts. Last, unavoidable lateness are situations where the employee lacks control. Examples of situations that possess no control are accidents and the weather (Blau, 1995).

Work absence has been defined as "the lack of physical presence at a behavior setting when and where one is expected to be" (Harrison and Price, 2003, p.204). It can further be explained by dividing it into two categories: voluntarily and involuntarily. Voluntarily absences tend to be under direct control of the individual employee. These types of absences are often exploited for a diverse set of personal interests. Whereas involuntarily absences are not under the immediate control of employees. In addition to the individual's demographics, the organizational environment and social context also play a role. A traditional standpoint on withdrawal behaviors in an educational application highlights the factor of motivation.

Based on previous studies, a decline in teachers' job satisfaction leads to a higher likelihood of absence. Moreover, job dissatisfaction has been found to be correlated with decreased productivity which may manifest itself in a number of ways (Shapira-Lishchinsky, 2012).

Recently both practitioners and researchers alike have directed an increase of concern towards workplace deviance. One specific deviant behavior is time theft that entitles the waste of time to complete any task outside employees' roles. Time theft may be linked to a decreased morale and lower productivity. Research has attempted to categorize factors that contribute to time theft. Although time theft is known to have a list of possible negative outcomes it still remains understudied. Tyler and Blader (2003) proposed that organizational injustice triggers time theft through an individual's perceived sense of oneness with the organization (Liu & Berry, 2012). Furthermore, as the sense of oneness with organization lowers employees lose concerns for the organization resulting in behaviors based on self-interest. Other proposals have connected unfavorable experiences to understand time theft (Liu & Berry, 2012).

The application of time theft to meeting latency explores the idea that it does not only affect the organization as a whole, rather, it also affects individuals. In more detail, the individuals who are often kept waiting are affected more. Koslowsky (2000) analyzed the negative psychological messages conveyed by the behavior of arriving late. This form of behavior may be perceived as disrespectful and illicit similar behavior among others in the organization. In support of this, a recent study by Mrozz and Allen (2017) discussed how individuals associate strong negative attributions to those individuals that do not arrive on time. Cascio (1991) summarized similar findings and stated this kind of behavior decreases employee motivation and morale (Allen, Lehmann-Willenbrock, & Rogelberg, 2018).

Deviance goes beyond temporal factors, another form of deviance that has recently been attached to concern is coworker deviance.

Today's collection of research on this topic breaks down the pathways of influences into three different categories: direct impact, vicarious impact and ambient impact. The outcomes of these influences can be analyzed through various theoretical perspectives. Stress theories are currently the most dominant theories, utilizing concepts such as Lazarus's transactional theory of stress and coping (Robinson, Wang, & Kiewitz, 2014). Another theory that is often widely associated with coworker deviance is the social exchange theory. This theory is particularly useful in dissecting deviant responses to mistreatment. Further deviance may result as the outcome of temporal deviance. Meeting lateness is linked to the deviance of rudeness, while other factors may be a feeling of disappointment (Rogelberg et al., 2014). Resentment can arise from an unexplained cause of lateness. Typically, in natural organization settings, time is not addressed to provide an explanation. This creates space for a process of rumination where individuals are left endlessly wondering what may have attributed to the lateness. In tum, this creates interpersonal strain in addition to the possible outcome of deviant behavior toward other coworkers.

The existing literature considers adverse effects of meeting lateness in various aspects. These effects can be analyzed in terms of affective, cognitive, and behavioral reactions. Individuals who arrive late seem to be categorized with negative psychological messages. Such negative messages can be attributed by others to a lack of respect for work. Supporting such argument, Cascio (1991) linked being late to work to a decrease in work morale and motivation. Furthermore, when employees ruminate about these negative attributions interpersonal strain may inadvertently be created. Typically, in organizational practice, there is no time to explain lateness, resulting in the potential of lingering resentment for individuals who are late. Rudeness and disappointment are among the top attributions to individuals who are late. Moreover, these attributions illustrate deteriorating interpersonal relationships. Previous research has compared being late to disruptive meeting behaviors like running off topic or complaining.

More specifically, being late can be interpreted as a disruptive behavior. Overall, meeting lateness can lead to less available time and consequently affect the attendees' perception of effectiveness. Meeting lateness can have social behavioral consequences. In terms of social effects, the literature has examined attendees' communicative behavior and emergent communication partners in response to lateness. The effect of deviant behaviors on other employees was previously mentioned counterproductive behaviors both directly and indirectly affect others through vicarious or ambient impact. For example, employees working in teams where antisocial behavior thrives will more easily display negative social behavior themselves. Another line of research links negative social consequences to group norms. Group norms undeniably linked to social interactions and teams. They can explain the possible negative effects on group member behavior and processes of interactions within the meeting. Repeated lateness can establish a counterproductive behavior in the group. This can be reflected in terms of negative group interaction dynamics. The idea of "setting the tone" has been discussed in a series of work. When comparing meetings that start late versus on time, an observable difference in communication patterns exists (Allen, Lehmann-Willenbrock, & Rogelberg, 2018).

Despite meeting lateness being a prevalent phenomenon, there are only a few research efforts aiming to understand its effects. Recent research by (Allen, Lehmann-Willenbrock, & Rogelberg, 2018) has greatly contributed to the advancement of understanding this phenomenon. First, results have aligned with the findings of previous research supporting that individuals anticipate and genuinely experience lower meeting satisfaction. In experimental studies, meeting lateness was discovered to have a significant negative impact on employees' attitudes about the meeting and its results. Moreover, this includes the terms of both anticipated meeting effectiveness and post-meeting results. Ultimately this aligns with attribution theory mechanisms. Second, manipulation of lateness and interaction dynamics showed detrimental social consequences of meeting lateness.

Findings concerning the pre-meeting phase suggest that participants' engagement in negative socioemotional behaviors increases as lateness drags on. This may be explained by possible frustration the longer they were kept waiting. Under manipulation, groups were initially polite and simply generally wondered about the meeting, they seemed to grow continuously annoyed as the waiting period stretched. Additionally, a comparison of negative socioemotional communication practices within the manipulated meeting showed that meetings that start late sufferfrom a more significant number of interruptions. Collectively, negative interaction dynamics established in the waiting period carried over to the actual meeting period. This aligns with the previously mentioned idea of "setting the tone" proposed by other established literature. Third, it was found that the magnitude of lateness is a key characteristic to consider when studying meeting lateness. This may be traced back to group norms. For example, starting a meeting five minutes late may still fall under the acceptable bounds of a given group norm. Whereas, 10 minutes late seems to be considered a violation for appropriate behavior in relation to meetings. However future research should encourage the expansion of the lateness variable in order to arrive at a more nuanced investigation (Allen, Lehmann-Willenbrock, & Rogelberg, 2018).

Another form of an organizational group may be the learning environment of a classroom. As a social environment it influences the information the learners retain, idea formation, and what associations are created and/or lost in the process of gaining new knowledge. All social interactions have deviations in what constitutes normal behavior or "good manners". This can be observed at any social level and can vary in perception of offensives depending on individual's culture, history, and generation. A specific factor that has sparked curiosity is generation. Students from generations X, Y, and Z are stereotyped to have a belief that they should not be held or hold anyone accountable to society's expectations. These generations seem to be defined by a sense of individualism and the freedom to express it. Other influences may be preferences for rules or exceptions to rules and inner or outer directedness.

A study conducted by Hartley and Stork (2011) set out to investigate student perceptions of professor behavior. Post-test results indicated that keeping the class overtime was one of the top offensive behaviors. Only three other behaviors seemed to be more offensive than extending the class overtime: "not helping students when assignments or tasks are unclear to them", "hitting on a student", and "humiliating, intimidating students". Although arriving late to the class did not make it on the list of offenses, "starting class early" was listed as relatively offensive. The researchers, however, claim their data cannot be used to make any specific claims on offensive levels as their instrumentation lacked validity.

Meeting lateness tends to be pervasive and possibly significantly consequential for individuals in groups and organizations. In the present study, we set out to investigate the classroom equivalency of meeting lateness. First, we predicted perceptions of teacher and student lateness to class would be associated with negative views educational quality. Lateness carries a signaling quality to others (Koslowsky, 2000), it conveys a sense of disrespect for work and inspires neglect in others. Through this implication it may be assumed that classroom lateness will be related to negative qualities of a professor. Further, we hypothesized that perceptions of classroom lateness would be associated with lower educational satisfaction. Anticipations have the power to affect the actual individual performance that follows. According to Porath and Erez (2007), routine task and creative performance along with helplessness decreased even when participants only imagined others' rude behavior. Moreover, we argue that students will report putting in less effort to the degree that they perceive that the course professor is frequently late. As such, we predicted that the measures oflateness would likely be correlated with one another.

METHOD
Participants

Participants in this study included 84 Texas A&M University-Corpus Christi students. All participants in this study were volunteers recruited from undergraduate courses, participants included 60 females and 24 males, with a mean age of20.9 (minimum 18 and maximum 47).

Participants described themselves as Hispanic/Latino (69%), Caucasian/White (13%), Black/African (9%), and Asian (4%). Moreover, 15 of the participants were first year college students, 30 were sophomores, 15 were juniors, and 24 were seniors. Among all participants, 15 students identified themselves as STEM students (Science, Technology, Engineering, Math students).

MATERIALS

A flyer was created that provided students with information about the study (task description, risks and benefits, assurance of anonymity) they would need to make an informed decision about volunteering to participate. To volunteer, participants were provided with a link to an online Qualtrics survey. Students were first asked to answer a set of questions about the quality of their instructors and education quality. This was followed by a measure of how satisfied students were with their education in general. Fallowing these assessments, students were asked questions about their experiences with instructor lateness, student lateness, and self-lateness. All of these measures were obtained using a 5 point Likert scale (Strongly Disagree to Strongly Agree). The remaining part of the survey analyzed demographics such as age, sex, ethnicity, class level, and major.

PROCEDURE

Participants were asked to complete an online survey by clicking the link provided on the flyer supplied to them by the experimenter. The link on the flyer took students to the Qualtrics survey which began with the information sheet material designed to help participants make an informed decision to participate. As mentioned above, the survey contained measures designed to assess participant perceptions of educational quality, instructor quality, and perceptions of instructor lateness, student lateness, and self-lateness along with relevant demographic items (Sex, Age, ethnicity, etc.). All data was collected anonymously.

RESULTS

A reliability analysis was conducted on the eleven measures of instructor quality used in the present study. This analysis found that these items were highly reliable (alpha= .93).

These items were then combined to create a general instructor quality measure for use with later analysis. Similarly, 4 items were chosen to measure educational quality. A reliability analysis of these items met reliability requirements (alpha= .702) and were combined to create a general educational quality measure for later analysis.

To compare the impact of different types of lateness on their ability to predict student ratings of instructor and educational quality, correlations were calculated between the 2 quality measures (instructor and educational) and measures of instructor lateness, other student lateness, and student's personal lateness (please see Table 1). As can be seen in Table 1, instructor lateness, other student lateness, and personal lateness were all strong negative predictors of instructor quality, rs (84) = -.883, -.829, and-.456 respectively,p's < .001, and strong negative predictors of educational quality as well., r's (84) = -.795, -.678, and -.497 respectively,p's < .001. Simultaneous regression models were conducted using the 3 predictors to predict instructor quality and educational quality. For instructor quality, lateness measures accounted for 80.9 percent of the variance when combined with instructor lateness accounting for the greatest amount of unique variance, ,B = .561, t = 4.692,p < .001. For educational quality, lateness measures accounted for 64.1 percent of the variance when combined with instructor lateness accounting for the greatest amount of unique variance, ,B = .615, t = 3.751,p < .001.

A series of independent samples t-tests were conducted to examine possible sex differences in measures obtained in the present study. As can be seen in Table 2, female participants reported higher ratings of instructor quality, t(82) = 6.731,p < .001, educational quality, t(82) = 6.397,p < .001, and daily attendance, t(82) = 6.316,p < .001. Male participants reported higher ratings of being distracted by other students, 1(82) = 2.545,p = .013, estimates of the proportion of other students who walked in late to class, t(82) = 4.887, p < .001, the proportion of classes instructors were late for, 1(82) = 5.188,p < .001, and number of classes missed, 1(82) = 5.021,p < .001.

Table 1. Correlations between Classroom Lateness Measures, Instructor Quality, and Educational Quality.

	Instructor Quality	Educational Quality	Instructor Lateness	Peer Student Lateness
Educational Quality	.897"			
Instructor Lateness	-.883"	-.795"		
Peer Student Lateness	-.829"	-.678"	.836"	
Personal Lateness	-.456"	-.497"	..557"	.241'

** $p < .001$

* $p < .05$

Table 2. Means and Standard Deviations for Quality and Attendance as a function of Participant Sex

	Male	Female
Instructor Quality	2.784 (.616)	3.732 (.569)
Educational Quality	3.04 (.493)	3.80 (.493)
Class Attendance	63.75 (6.797)	73.583 (.81)

Numbers in parentheses represent standard deviations.

DISCUSSION

It was predicted that teacher lateness, peer student lateness, and self-lateness would all be negatively associated measures of instructor quality, educational quality, and educational satisfaction. The results of the present student are consistent with these expectations. All three lateness measures were found to be predictive of lower instructor and educational quality along with lower educational satisfaction. The results of the present study are consistent with previous studies which have indicated lateness to be meaningfully consequential for individuals in groups (Blau, 1995). Literature has established a specific connotation for lateness. Lateness conveys a message to others (Koslowsky, 2000), it sends a sense of disrespect for work and inspires neglect in others. One example is research linking negative social consequences to group norms. This line of research utilizes the concept of group norms to explain how repeated lateness can establish a counterproductive behavior in the group. Many works have described "setting the tone", which is reflected in terms of negative group interaction dynamics (Allen, Lehmann-Willenbrock, & Rogelberg, 2018). Moreover, a classroom is a social environment and therefore influences the information the learners retain, idea formation, and what associations are created and/or lost in the process of gaining new knowledge (Hartley & Stork, 2011). All social interactions have differences in what qualifies as normal behavior. Offensives may vary depending on factors like individual's culture, history, and generation. For example, X, Y, and Z generation students are stereotyped to believe that they should not be held or hold anyone accountable to society's expectations. Among these, another influence may be attitudes towards rules and directedness.

As mentioned previously, Porath and Erez (2007) found that ordinary task performance and creativity decreased as a result of simply imagining the rude behavior of others. In so far as teacher lateness and peer student lateness are viewed as rude behavior, he perceived that these forms of lateness would be correlated with personal lateness, which would suggest that people put less effort into a class as a result of perceiving the lateness of others.

Consistent with this idea, we found that all lateness measures were correlated with one another. As the evidence is only correlational in this study, however, we cannot conclude that the lateness of others "causes" personal lateness.

Although gender differences were not predicted, distinct observations were made. Males were found to be more distracted by other students who walked in late to class than females. Moreover, males also reported greater estimates of professor lateness, student lateness, and self lateness. Previous research has not drawn detailed conclusions regarding gender differences. The findings of gender differences in this study may not represent accuracy given that a number of males participating in the survey was rather low (N = 24).

Some limitations for the conclusions of this study should be noted. The sample was comprised mostly of Hispanics/Latino students with other ethnicities underrepresented. The mean age of participants was 20.92, which appears consistent with college students. Unfortunately, many of the students participating were either first year students or sophomores who may have not had as much educational experience as juniors and seniors. In the future, similar studies should aim to include a more diverse sample and focus on senior level students. Given the sex differences that were discovered in the present study, future research might also consider exploring the validity of these findings and further explore explanations for such differences.

The present study findings are significant for various reasons. An increase in awareness of such negative effects may encourage changes in instructor or student behaviors so that small changes may bring increased perceptions of effectiveness, greater student achievement motivation, and greater satisfaction with classroom education offered. Ultimately, this may add to the knowledge base of the Psychology of Teaching and suggest ways that classrooms and meetings in general can be redesigned to maximize their effectiveness. The results suggest that simply by having a teacher make a point of coming to class 10 minutes early every day, the potential payoff for building a more effective educational experience for students is likely. The finding that teacher lateness accounted for more unique variance that the other two measures suggests that the

effect of teacher lateness can be separated somewhat from the effects of student lateness and personal (self) lateness. Future research should assess both teacher lateness and student lateness in models designed to predict educational quality and satisfaction.

In conclusion, the results of this study provide strong evidence that both student and teacher lateness contribute to the deterioration of the educational process. The relationship of lateness to poor educational outcomes is rather an obvious point, however, the results of the present study are offered as a beginning to explore the means by which lateness may be minimized in the classroom. As an instructor, modeling good attendance behavior provides heightened expectations of conscientious behavior which may encourage more students to follow the instructors example.

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SALIVARY CORTISOL AND TESTOSTERONE RESPONSES TO A FARMER'S WALK

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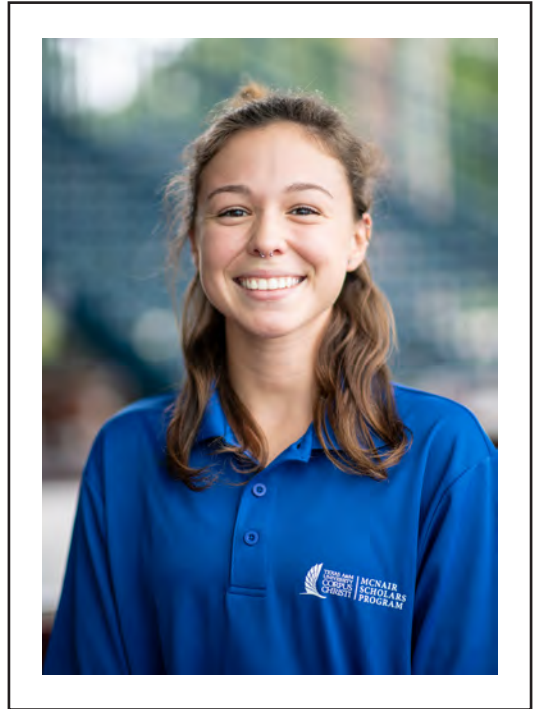
ABSTRACT

It is quite common that numerous populations must often carry large amounts of weight while moving (military, law enforcement, firefighters, farmers, and laborers) and/or benefit from the physiological stresses imposed on the body during occupational demands. An exercise, such as the Farmer's Walk (FW), may provide beneficial results for these individuals by supplementing the demands encountered during the completion of these tasks within a training environment. Limited information is available concerning the hormonal responses associated with performing the FW and the amount of physiological stress that may occur as a result of repeated efforts has not been investigated. **PURPOSE:** *The purpose of the study is to investigate the impact of the FW on cortisol and testosterone measures when compared to an individual's unloaded walking pattern.* **METHODS:** *Fifteen subjects (mean age ± SE = 21.6 yrs. ± 0.45; height = 172.53 cm ± 2.34; weight = 81.80 kg ± 4.01; body fat percentage = 28.80% ± 2.10; 1RM deadlift = 121.24 kg ± 9.42)*

participated in two exercise sessions consisting of a 20-meter FW carrying 70% of their 1-RM deadlift (Farmer's walk condition; FWC) or a normal (unweighted) walk condition (NWC) for 5-sets of 2-repetitions. Saliva samples were collected before the exercise protocol, immediately and one-hour after exercise, and at 24-hour intervals for three days post-exercise. **RESULTS**: *No significant differences between conditions for cortisol, testosterone, or testosterone to cortisol (T/C) ratio were shown.* **CONCLUSION:** *The lack of differences in cortisol, testosterone, and T/C ratio suggests that the FW was not of great enough intensity or duration to result in elevations in hormonal responses. This suggests that the FW as performed in this study could be used by individuals without causing changes in catabolic or anabolic metabolism.*

INTRODUCTION

It is quite common that numerous populations (military, law enforcement, firefighters, farmers, and laborers) must often carry large amounts of weight while moving and/or benefit from the physiological stresses imposed on the body during occupational demands. Strongman type exercises integrate various complex movements into training programs, and exercises such as the Farmer's Walk (FW) have been suggested as useful training technique due to its functional demands.

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The FW requires an individual to carry a specified amount of weight while walking a set distance, typically 20-50 meters, as quickly as possible (Ghigiarelli, et al., 2013; Keogh, et al., 2014; Winwood, et al., 2015) or the individual may be asked to travel as far as possible for a predetermined duration (Waller, et al., 2003, Winwood, et al., 2011). The FW has been shown to challenge an individual's entire musculoskeletal system in terms of strength, stability, and physiological demands (Windwood, et al., 2014). The physiological stress that results from the FW can result in the activation of the sympathoadrenal axis from acute psychological stress resulting in increased circulating catecholamines such as epinephrine and norepinephrine (Allen, Stoney, Owens, & Matthews, 1993; Boone 1991; McAdoo, Weinberger, Miller, Fineberg, & Grim, 1990). In addition, physiological stress also activates the hypothalamic pituitary adrenal axis (HPA), which then fuels the release of adrenocorticotrophic hormone (ACTH) from the anterior pituitary which stimulates the release of cortisol from the adrenal gland. The response to physical challenges in the HPA axis results in significant increases in cortisol at moderately high intensities of aerobic exercise (80% $VO2_{max}$; Hill, Zack, Battaglini, Viru, Viru, & Hackney, 2008; Wittert, Stewart, Graves, Ellis, Evans, Wells, et al., 1991) or longer durations at moderate intensities (60 min at 70% $VO2_{max}$; Inder, Hellemans, Swanney, Prickett, & Donald, 1998).

Cortisol is a catabolic hormone secreted by the adrenal cortex in response to physical and psychological stresses (Webb, Campbell, Tangsilsat, McLeod, Acevedo, & Wax, 2013; Webb, Rosalky, McAllister, Acevedo, & Kamimori, 2017). Cortisol influences metabolism and maintenance of blood glucose levels during exercise by acting on skeletal muscle and adipose tissue to increase the mobilization of amino acids and lipids as well as by stimulating gluconeogenesis (Galbo, 2001; Wolfe, 2001). Conversely, testosterone is considered an anabolic hormone and is important for the growth and maintenance of skeletal muscle, bone, and red blood cells (Zitzmann & Nieschlag, 2001). Similar to cortisol, testosterone levels increase linearly in response to physical exercise intensity, with peak concentrations generally occurring at the end of physical activity (Wilkerson, Horvath, & Gutin, 1980).

The testosterone-to-cortisol (TC) ratio has been used to analyze the balance between anabolic and catabolic processes. Since testosterone shows anabolic effects and cortisol promotes catabolic effects, the TC ratio is considered as a marker of muscular growth or degradation, dependent upon the ratio present. When testosterone levels are greater than cortisol level, muscular hypertrophy can occur. However, when the opposite is present, muscular atrophy is often seen.

In a study investigating two Strongman Training protocols and hypertrophic protocol, testosterone spikes were observed in all three different protocols (Ghigiarelli, Sell, Raddock, & Taveras, 2013). A study investigating resistance exercise performed to failure with different rest intervals showed an increase in testosterone response in the protocols that had longer rest periods between sets (Rahimi, Qaderi, Faraji, & Boroujerdi, 2010). Crewther, and colleagues (2012) found that the expression of force and power may be dependent on individual variation in salivary free testosterone concentrations and on existing strength or power levels.

One study examining the hormonal difference between unilateral and bilateral upper-body resistance exercise had a decrease in cortisol during recovery for the unilateral condition while testosterone was not affected by either protocol (Migiano et al., 2010). In a study investigating the utilization of short rest intervals (60 and 90 seconds) between sets of strength and hypertrophic protocols, testosterone was shown to increase after every protocol while there were no significant changes in cortisol for either protocol (Villanueva, Villanueva, Lane, & Schroeder, 2012). Further, a study examining acute testosterone, growth hormone, and cortisol responses to a kettle bell swing exercises showed that a single 12-minute session of kettle bell swings increased testosterone, growth hormone, and cortisol for up to 30 minutes post-exercise (Budnar, Duplanty, Hill, McFarlin, & Vingren, 2014). An additional study was conducted in order to determine the relationship between changes in resting and exercise-induced serum testosterone, cortisol, or cortisol/testosterone. This study concluded that there are significant correlations being observed between changes in pre-exercise testosterone/cortisol and changes in competitive weightlifting (Fry, Kraemer, Stone, Koziris, Thrush, & Fleck, 2000).

Although these previous studies suggest that the FW should result in increases in cortisol and testosterone level, no previous studies have specifically investigated the impact of a FW on cortisol or testosterone responses. Therefore, the purpose of this study is to investigate the impact of a Farmer's walk on cortisol and testosterone. It is hypothesized that both cortisol and testosterone levels will increase in response to the FW when compared to a non-weighted condition, but that testosterone will demonstrate greater increases than cortisol, and thus the T/C ration will suggest anabolic responses to the FW exercise.

METHODS

Fifteen apparently-healthy individuals were recruited for the participation in this study from the general university population. Demographic characteristics are presented in Table 1. All methods and procedures were approved by the Texas A&M University – Corpus Christi Institutional Review Board (IRB) prior to initiation of data collection and during the initial session, researchers obtained a written informed consent and health history questionnaire from all participants.

The population for this study was selected from a set of specific inclusion criteria that must have been met for participation. These subjects must have: a) fallen within the age range of 18-45 years old, b) been considered healthy with no current contraindications or use of medications excluded from this study, c) were not currently supplementing with any pharmacological aid that may have enhanced their performance, d) were not pregnant, and e) were free from any musculoskeletal injury sustained over a six-month time period previous to participation. This information was analyzed through the use of a health-history questionnaire and physical activity questionnaire completed in association with the study's consent documentation. Participants completed a total of three separate data collection sessions over a time period of at least three weeks during their involvement with this study design, with Sessions 2 and 3 counterbalanced between conditions. Session 1 involved the participant meeting with a research team member where the research design was explained in full detail along with the provision of any answers to questions that may have been asked during the process. The participant was then asked to read and sign an IRB (Institutional Review Board) approved informed consent form. Once completed they were asked to complete a health history questionnaire (HHQ) and physical activity questionnaire (PAQ) to evaluate inclusionary/exclusionary criteria. Once qualification for inclusion was confirmed and all questions had been answered, measurements were collected.

Session 1 served as subject screening completed to ensure each subject's ability to participate in the study along with baseline testing and demographic measurement collection. Written consent was obtained along with the completion of Health History Questionnaire (HHQ) and Physical Activity Questionnaire (PAQ) documentation required for this specific project. Upon completion, anthropometric measures were collected including height and weight through use of a stadiometer and balance-beam scale, respectively, (Detecto Model 439; Detecto, Webb City, MO) along with Dual X-Ray Absorptiometry (DXA) technology (iDXA, Lunar Prodigy; GE Healthcare, Madison, WI) which was used for body composition analysis. Subsequently, the participant's one-repetition maximum (1RM) was assessed for the HHB deadlift exercise while following previously cited protocols for testing (Lockie, Moreno, Lazar, Risso, Liu, Stage, Birmingham-Babauta, Torne, Stokes, Giuliano, Davis, Orjalo, & Callaghan, 2018). This exercise was completed while using a forty-five-pound HHB (Rogue Fitness, Columbus, OH) with additional weight supplied using rubberized Olympic bumper plates (Fringe Sport, Austin, TX; Body-Solid, Forest Park, IL). Before concluding, the session included a familiarization process for the individual to the FW exercise to be performed in either session two or three of the research protocol.

The second and third session was randomly counter-balanced among participants between the two conditions. The subjects arrived at their designated time with procedures explained once again and a confirmation of understanding obtained from the participant before proceeding. The session began with the first saliva sample (-50) being collected.

Next, another saliva sample (PRE) was collected while being escorted to another laboratory to complete the exercise portion of the protocol.

The exercise portion of the protocol consisted of five sets of two 20-meter walks while either carrying (FWC) or not carrying additional weight (NWC). During the FWC protocol, 70% of the subject's HHB 1RM dead-lift was used during each repetition, while attempting to complete the task as quickly as possible. When completing the NWC, the participants were instructed to self-report and maintain a consistently normal walking pace. At the completion of each set's initial repetition (20-m walk) the participant sat down in a chair adjacent to each finish line, while thirty seconds of rest were provided. At the cessation of each set (two 20-m walks), the participants were again instructed to sit and given two minutes of rest.

After the completion of the protocol's exercise bout (the last 20-meter walk [10th repetition]), the participant provided a third saliva sample (IP). The subject was allowed to rest comfortably in the lab, with a final saliva sample of the session being collected 60-minutes post-exercise (R60). Subsequent to the FWC and NWC sessions; saliva samples were collected at 24-hours, 48-hours, and 72-hours post-completion time of the FWC and NWC.

Saliva Analysis

Seven saliva samples for analysis of cortisol and testosterone levels were obtained 50 minutes prior to exercise (-50 min), immediately before the initiation of exercise (0 min), immediately after completion of the exercise portion (IP) and 60 minutes after the conclusion of exercise (R60). Saliva samples were also obtained 24 hours (R24), 48 hours (R48), and 72 hours (R72) after the completion of the exercise protocol. Saliva samples were frozen at -80° C and stored until analysis via ELISA technique (ALPCO, Salem, New Hampshire) according to manufacturer's specifications for each assay type. Assays were performed in duplicate and interassay coefficient of variation for cortisol analysis was 3.25% and the intraassay coefficient of variation was 3.07%. The standard curve for the range of 0 to 10,000 pg/ml had a correlation coefficient of 0.994.

The interassay coefficient of variation for testosterone analysis was 3.25% and the intraassay coefficient of variation was 3.07%. The standard curve for the range of 0 to 10,000 pg/ml had a correlation coefficient of 0.994.

RESULTS

Demographics

Fifteen volunteers completed the two conditions in the protocol associated with the study. The sample population consisting of eleven college-aged males and four college-aged females who claimed various ethnic backgrounds (Caucasian [7], African American [4], Hispanic [3], Other [1]) participated in both the FWC and NWC in this study. Each condition was randomized and counterbalanced for each of the fifteen subjects in order to ensure that there was no order-effect in selection of the conditions. Eight of the subjects began the protocol with the FWC and the remaining seven individuals began with the NWC. There were no order effects seen for any of the proceeding variables listed and additional demographics of the subjects can be found in Table 1.

Table 1. Participant demographic characteristics.

Variable	Mean ± SEM
Age (years)	21.60 ± 0.45
Height (cm)	172.53 ± 2.34
Weight (kg)	81.80 ± 4.01
Percent Body Fat (%)	28.80 ± 2.10
Lean Body Mass (kg)	55.23 ± 2.77

Cm = Centimeters. Kg = Kilograms.

Comparison of Weight Carried and Walk Time Between Conditions

A paired-sample t-test was ran in order to compare calculated 70%1RM and actual 70%1RM load carried during the FWC study. There was no significant difference found ($t[14] = 1.46$, $p > 0.05$) in the weight calculated (84.87 ± 25.54kg) versus the actual weight carried (85.15kg ± 25.55kg) during the farmers walk exercise.

A paired-samples t-test was conducted in order to compare the time it took to complete each repetition of the walk in the FWC and NWC. A significant difference (t[14] = 6.964, p < 0.0001) was found between the two conditions, with participants completing the FWC (10.24 ± 0.78 sec) at a much faster pace than the NWC (16.70 ± 0.77 sec).

Cortisol

A 2 (condition) by 7 (time) repeated analysis of variance (RMANOVA) with a covariance for the date range of collection was performed to investigate changes in cortisol levels between conditions across time. The date range of collection was standardized via covariance, as data collection occurred during midterm and final exams due to cortisol's sensitivity to psychological stress. No significant interaction effects or main effect for time or condition were revealed (see Figure 1).
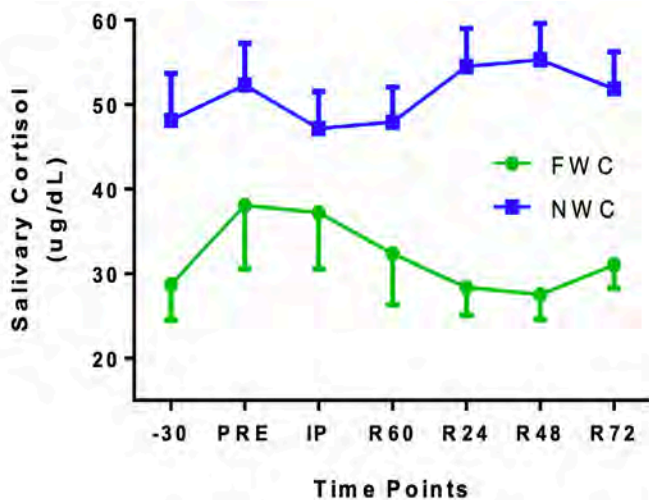

Figure 1. No significant interaction effects or main effect for time or condition were revealed for cortisol responses.

Testosterone

A 2 (condition) by 7 (time) RMANOVA was performed to investigate changes in testosterone levels between conditions across time. No significant interaction effects or main effect for condition or time were demonstrated (see Figure 2).
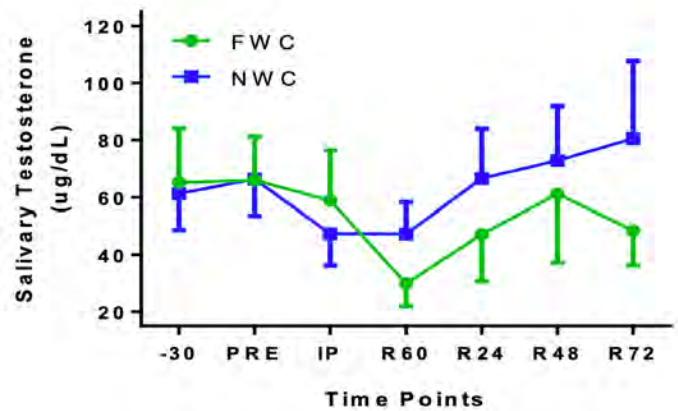

Figure 2. No significant interaction effects or main effect for condition or time were demonstrated for testosterone responses.

T:C Ratio

A 2 (condition) by 7 (time) RMANOVA was performed to investigate changes in the ratio of testosterone to cortisol (T/C) ratio. No significant interaction effects or main effect for condition or time were demonstrated (see Figure 3).
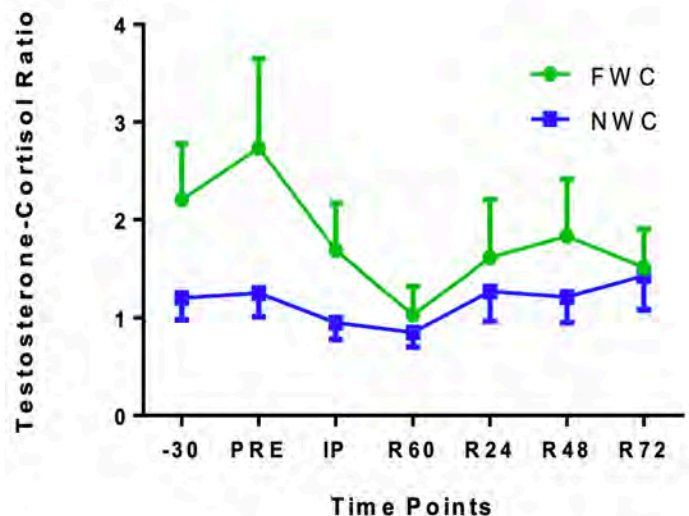

Figure 3. No significant interaction effects or main effect for condition or time were demonstrated for the testosterone to cortisol (T/C) ratio.

DISCUSSION

This purpose of this study was to investigate the effect of walking with a relatively heavy weight (70% of an individual's maximal capability) on cortisol and testosterone levels when compared to performing the same exercise without this weight. While cortisol and the T/C ratio appear to be significantly different between the FWC and NWC, when the data collection dates were used as a covariance, this response appears to be a result of increased psychological stress due to midterm and final exams rather than from physiological perturbations. Thus, it was determined that no significant differences occurred between conditions or across time based upon the demands placed upon participants by the FW condition.

This study used a 70% HHB deadlift 1RM intensity exercise with overall short duration of activity (<2 min), and the data suggests that the FW protocol did not yield significant differences when compared to the NWC in terms of cortisol or testosterone level changes. Both testosterone and cortisol have been shown to increase with physiological stress (Hill et al, 2008; Inder et al, 1998; Wilkerson et al, 1980; Wittert et al., 1991), however there is less known about cortisol and testosterone responses to a FW. While studies with longer durations of resistance training (Budnar at al (2014) or greater amounts of weight have been shown to increase cortisol and testosterone levels (Kraemer & Ratamess, 2005), lower volumes of resistance training loads have shown mixed results (Migiano et al., 2010; Villanueva et al., 2012).

The cortisol response to resistance exercises seems to be dependent on factors such as the amount of muscle contraction that occurs, the total amount of muscle tissue stimulated, and rest interval that occurs between the sets (Kraemer & Ratamass, 2005). The findings of the current study suggest that these factors suggested by Kraemer and Ratamass were not great enough to produce a cortisol response.

Whereas resistance training is able to cause an increase in testosterone levels, to do so, the resistance training protocol must be relatively high in both volume and intensity, as well as utilizing large muscle group and concentric muscle actions (Ahtiainen et al. 2011; Baker et al. 2006;

Bird et al. 2006; Cadore et al. 2008, 2009; Hansen et al. 2001; Roberts et al. 2009; Tremblay et al. 2004; Yarrow et al. 2007).

While the level of intensity may not have been great enough to elicit the expected responses, it could also be that the duration of rest intervals may also need to be considered. In a study conducted by Villanueva and colleagues (2012), utilization of short rest intervals between sets of resistance training protocols were investigated and testosterone was shown to increase after every protocol while there were no significant changes in cortisol for either protocol. Thus, it is possible that the rest intervals used in the current study may have been too long to result in changes in testosterone value, as a previous study has demonstrated that shorter rest intervals than the ones used in this experiment yielded changes in testosterone, but not necessarily in cortisol. Therefore, the resting time between sets and reps of the FW effecting the hormonal responses may have been overlooked. Additional influential factors that may have been unnoticed and contribute to the different outcomes from this study are the use of different intensity loads, and/or muscle activation patterns/types.

Limitations and Future Implications of the Research

The FW protocol was performed at an intensity of 70%1RM for ten repetitions with varying intervals of rest between each repetition, and thus did not result in changes in cortisol or testosterone values, which would be indicative of physiological stress. The results from this study should take into account considerations such as the intensity and rest intervals utilized when practitioners implement FW exercises for strength building or rehabilitation protocols.

One limitation of this study was that data collection occurred during the time frame of scholastic midterms and finals for the university. This may have altered the stress levels in the individuals undergoing the protocol. Additional research should be conducted on hormonal responses to greater intensities (≥75%1RM) when administering exercise protocols such as the FW from this study. Research should also focus on the duration of the exercise and work being done in order to understand the true effects of them on physiological stress hormones.

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UAV DESIGN FOR NONDESTRUCTIVE COLLISION IMPACT

by: RUDY SALOMON

ABSTRACT

The goal of this research is to introduce a novel UAV design that can quickly deploy a UAV to keep intact in a collision incident to become operational in air by the UAV pilot. Today, for UAV operation, much time is designated for a pre-flight inspection and set-up for the pilot to become operational in airspace. Dependent on the size such as a fixed wing UAV, preflight planning can take days and weeks for a single flight operation. In today's rapid advancement of sensor systems and technology, UAV's become smaller with much more capabilities, constantly testing the limits of what we may be familiar with today. Some UAV's that can fit in the average palm of a hand can require an average of 20-30 minutes for power on, flight set-up and take off for the UAV to be operational in the airspace. When seconds and minutes are paramount for situations of natural disaster emergency, military applications, inspection for infrastructure, agriculture, public transit emergencies and so forth, this research aims to utilize spherical shaped UAV design for quick deploy ability and reduce collision damage that will allow for the UAV pilot to become operational in air in a few seconds.

INTRODUCTION

Operators and pilots of small Unmanned Aerial Vehicles (UAVs) have expressed interest for a platform that is easily assembled/disassembled and with a less complex electrical hardwire setup. State-of-the-art multi-rotorcraft UAV prototypes incorporate wires traveling from the power source, commonly located in the interior of the UAV body, to each one of the motors. Additionally, wires sharing data between the UAV autopilot and the motor's Electronic Speed Controllers (ESCs) also follow a similar path along the structure of the arm. This design severely limits the potential of UAVs when considering its assembly/disassembly and repair processes. Indeed, the assembly/disassembly process of a UAV alone is a time-consuming process that involves numerous wire setups (soldering, connecting, and organizing) that must be done properly in order to prevent malfunctions. These designs allow an area of opportunity to achieve improvements in the way multi-rotorcraft UAVs are designed.

MENTOR

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With the application of spherical shaped UAV's, the practical implementation of multi-rotorcraft UAVs for emergency situations, disaster recovery, mapping, and military applications can become greatly simplified.

The primary goal of this project is to create a novel UAV structure that reduces the amount of complexity it takes for a user to assemble or repair a quadcopter UAV by introducing a spherical shape design approach. This novel approach utilizes existing technology such as Power over Ethernet (PoE), which is commonly used to transmit data and power to electronic devices. The idea is to redesign the way UAVs are deployed to drastically reduce preflight inspection and set-up time using spherical model applications. Specifically, the UAV will be designed to instantaneously deploy into the air such as a tossing a baseball and take a collision impact with very little to no damage. This will allow the UAV operator to quickly be in flight, reduce the risk of no flight ability in the incident of a collision and perform the application necessary for aerial flight.

Furthermore, the design of the UAV will allow for component protection utilizing a cage system in the spherical design approach. In designing the thruster area where the 4 tubes are located in the lower chassis, the fan blades will not be exposed to the outer area of the UAV in comparing to a traditional quadcopter design, allowing for improving safety features during operation. This approach makes it easy and intuitive for any user (expert or not) to perform the power and communication connections of the UAV thrusters. Assembly, disassembly, and repair tasks can be performed in seconds, allowing for tactical, emergency or everyday consumer applications of UAV to be performed more effectively. Ultimately, this project will introduce a UAV that will allow the UAV industry to concentrate on the high-level emergency requirements of a mission, instead of on the encumberance of assembling, disassembling, or repairing a robotic platform.

PREVIOUS WORK

According to the Journal of Vibroengineering in 2013, A spherical aerial vehicle was developed in the School of Automation, Beijing University lab, which is shown in Fig. 1 and Fig. 2.

The article states that spherical aerial vehicle can complete the six degrees of freedom of movement for spherical aircraft in the air and move flexibly on the ground. It shows that it has a unique structure and is composed of five parts: long-axis motor, short-axis motor, spherical shell, inner flying device and inner frame.

As illustrated in Fig. 2, the top left part is the short-axis motor, which makes relative rotation of the spherical shell and the inner frame around the short axis to realize changing the direction of rolling movement on the ground and swinging flight in the air; the bottom left part is the inner flying device, which can realize the flight function for the vehicle, and the control rudders are set at the bottom of this part; the top right part is the meshed spherical shell made from the carbon fiber, and this meshed spherical shell can make the vehicle roll with a full range of attitude on the ground; the middle right part is the long-axis motor, which makes the inner flying device rotate around the long axis as a pendulum to make the vehicle move forward on the ground or make the aerial vehicle fly forward in the fight motion; the bottom right part is the inner frame, which is a frame to connect the spherical shell to the inner flying device with the long-axis and short-axis motors.

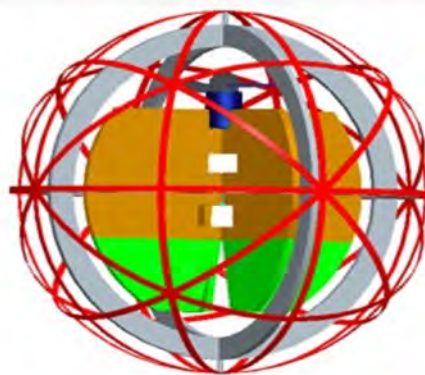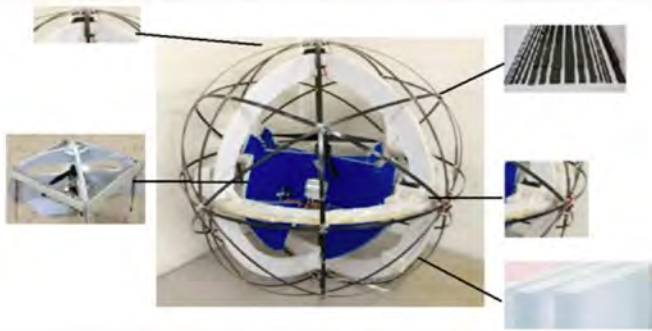**Fig. 1.** Schematic of spherical aerial vehicle's structure

Fig. 2. Prototype of spherical aerial vehicle

Figure 2. Top part View

METHODS/ DATA ANALYSIS

The UAV spherical design experimentation was first designed in Autodesk inventor with some trial and error. The design was derived for the UAV operator to be able to throw the UAV in the air similar to tossing a tennis ball in the air. This design allows for "out of the box" set-up and quick deployment by the operator that is only a 2-part assembly that can be put together in an average of 10 seconds. The design is a spherical cage style designed to protect electrical components and power supply which will be housed in the bottom cage in figure 1, which is the lower part assembly with tube thruster housing & figure 2, which is the top cage housing design for impact protection.
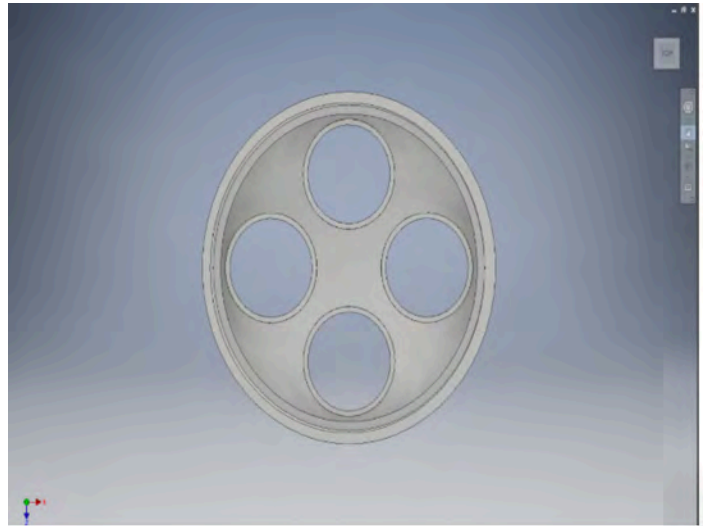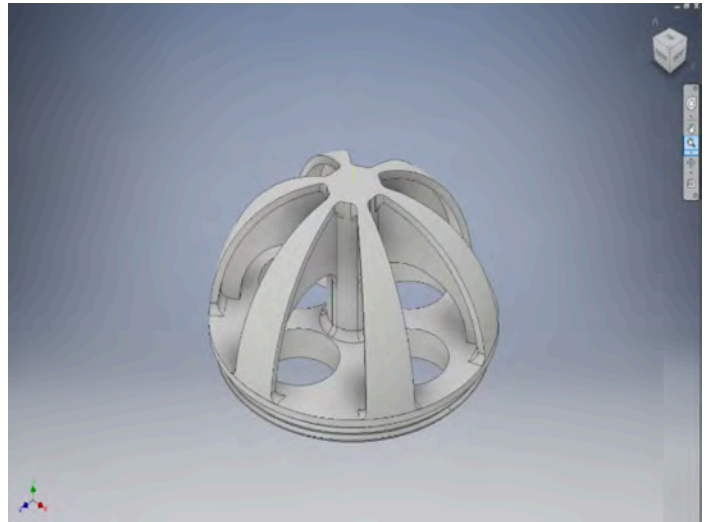

Figure 3. Top Side View
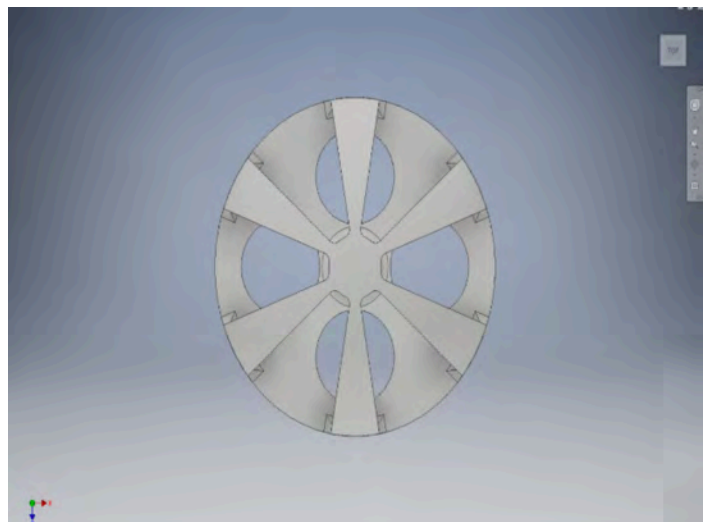

Figure 1. Lower tube part View

Figure 4. Top View

Figures 1 & 3 are the 2-part assembly which require a one-step assembly for the UAV, placing both parts together and screwing on for operation. The bottom cage in Figure 1 shows 4 tube shaped spheres on the chassis which is the area for the thruster housing. This design will allow for zero blade contact mishaps to occur with the UAV operator or bystanders during takeoff & flight operation. The model designed in Autodesk inventor was 3D printed to test the cage structure design. Future suggestions will be to use soft plastic or rubber material for testing as 3D plastic weighs too much for flight take off depending on thrusters chosen by future researchers.
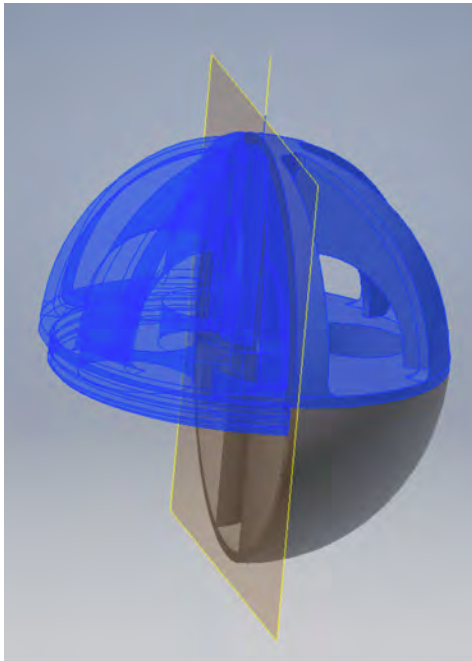
Figure 6

Figure 5

Figure 5 shows the 2-part assembly mentioned above assembled in the module simulation. A gasket will be required in between the part assembly for water proofing to allow for operational flight over water areas.
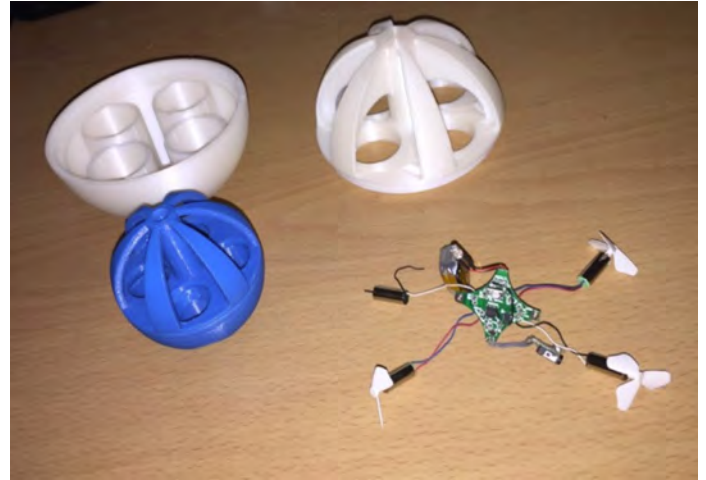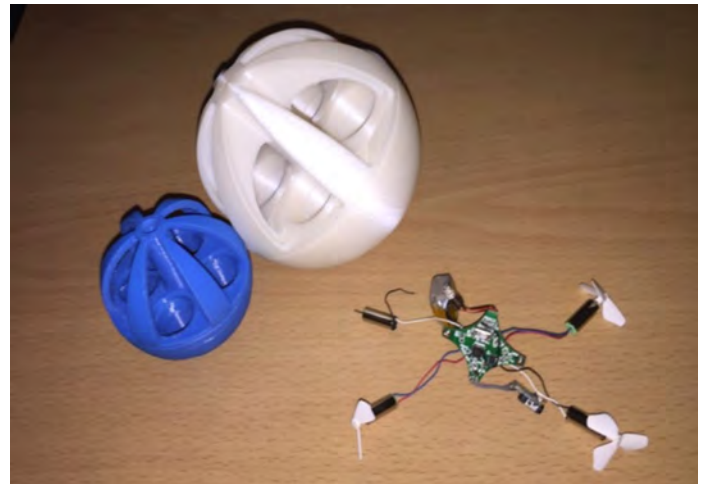
Figure 7

The smaller Blue model first was printed as a single piece for experimentation & test sizing capabilities. Figure 6 show the 3D model printed that was created in Autodesk Inventor in 2 parts. A drop test was conducted to test the top cage safety features for the components that will be housed on the bottom cage using the smaller blue prototype. Figure 7 shows the larger UAV assembled with the 2 component designs fitting together.

DISCUSSION & RESULTS

In focus of the spherical shaped UAV design, the experiment compared standard UAV design with a quadcopter UAV design that utilizes 4 single prop motors and blades shown in figure 1A. If collision happens during flight operation with the quadcopter shown below, the outer components such as propellers, leg extensions, and motors have a high result of becoming damaged causing a crash and stop of flight operation dependent on flight altitude when in contact with foreign objects during flight operation.

Figure 1A

Figure 2A

The spherical shaped design aimed to become a protective structure and many designs have been implemented utilizing statics applications shown such as the example in figure 2A. As a result of the design shown in Figure 3A & 4A from the design created in Autodesk Inventor, this UAV is a 2-part assembly that was able to withstand a drop of 15.25M still being intact due to its **wall thickness.**
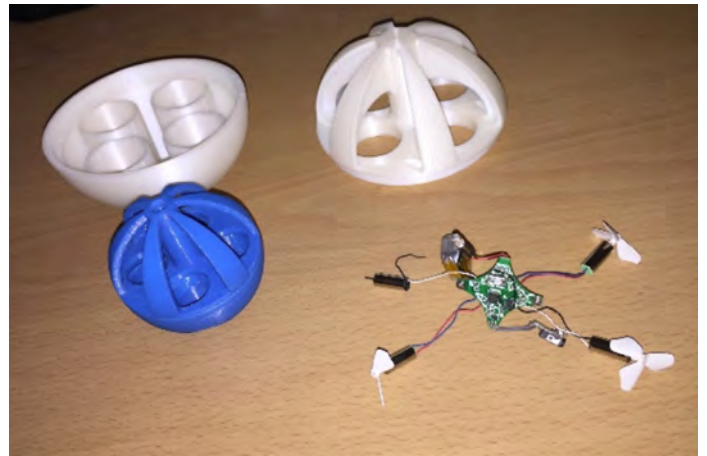
Figure 3A

Figure 4A

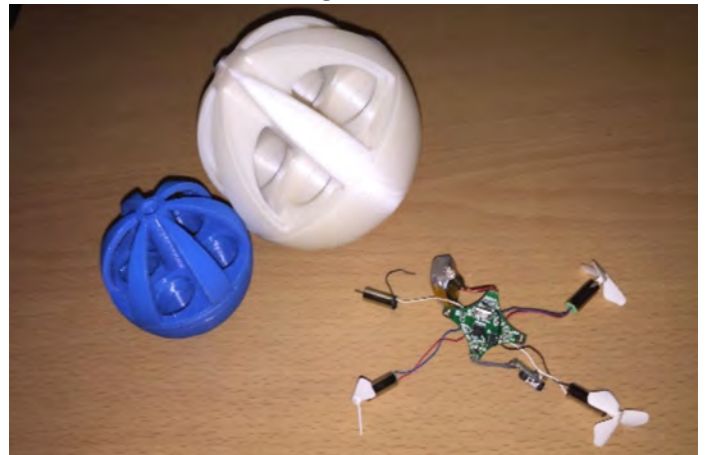2 spherical shaped sizes were tested. The blue structure which is much smaller than the white structure in comparison took more damage in comparison to the larger design experiment on the top joint connections, which the Larger structure took no damage at all. There was also no damage to internal components for testing only. No flights took place. The drop experiment was conducted on the roof of a 4-story building.

Figure 3A shows the bottom cage in a disassembly with the 4 barrels. The 4 barrels are designed for thruster positioning to allow placement for the motor and propeller. This design will allow for no foreign object damage or possible injury to the operator allowing for reduction in collision damage which will allow for maximum flight operation and performance. This design has resulted in allowing the UAV operator to have no flight interference during flight operation.

CONCLUSION

After conducting the drop test, the impact force did create a crack in the blue model which lead to add a wall underneath the joint connections. 3 drop tests were then conducted after re-design and no damage was found on the larger model. The primary key was evaluating the wall thickness of the printed model. The material chosen to construct the design was Polylactic Acid (PLA) material widely used for 3D printing. For future experimentation it is suggested to use the 3D model as a cast for rubber bonding if possible, for much more flexibility in the structure & lighter weight capability. Future experiments must also choose proper hardware (motor, propeller and control system).

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PRIMARY GRADE TEACHER ATTITUDES TOWARD USING E-BOOKS IN THE CLASSROOM

by: CERINA RAMIREZ
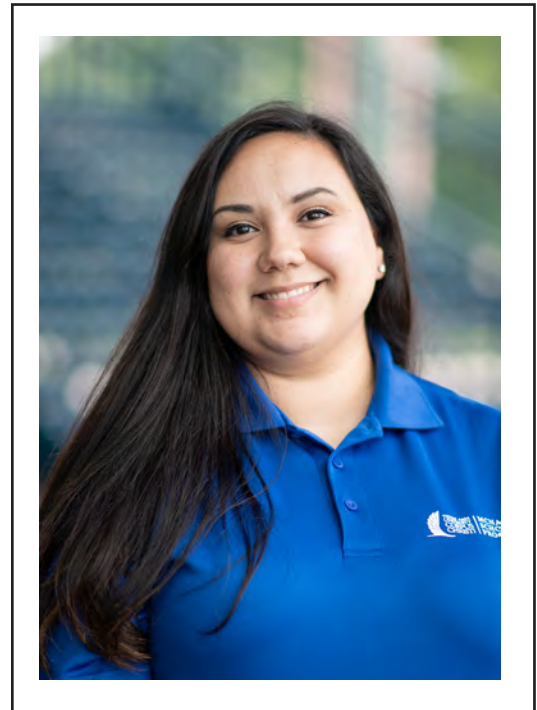
ABSTRACT

The purpose of this study was to examine the perception and attitudes of primary school teachers regarding the use of e-books in their classrooms to support literacy development. Kindergarten, first-, and second-grade teachers from an elementary school in South Texas were given an opportunity to participate in the study by completing a survey, participating in classroom observations, and attending a professional development session. The study supports previous research that shows primary school teachers gain con-fidence and are more willing to use e-books to enhance their stu-dents' literacy skills when provided with supportive resources and professional development.

INTRODUCTION

Technological advances in the last decade, specifically mobile technologies, have significantly impacted the world and transformed the way humans communicate, the majority of which now takes place electronically.

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Much of the text read electronically contains hypertext, hyperlinks to online text with embedded multimedia features that "challenge readers to comprehend the original text along with the other information," thus requiring a skill known as digital literacy or new literacy (Frazier, 2014, p. 27). People have taken notice of this and it is transforming education globally as societies advance to prepare future generations for the expectations of the 21st century. In the United States, our educational standards, which vary by state, require the integration of technology, including those that align with Common Core State Standards (McDermott & Gormley, 2016). E-books, or electronic books, are becoming instrumental assets for incorporating technology and supporting new literacies (Frazier, 2014). There are also, however, many opponents for technology-integrated classrooms and the inclusion of e-books for reading instruction. These opponents often view technology as a means of distraction, and therefore an unreliable teaching aid (McDermott & Gormley, 2016). This study intended to explore teachers' attitudes related to using e-books in the elementary classroom with students in grades kindergarten through two.

LITERATURE REVIEW

As literacy and communication continuously evolve for students outside the classroom, educators need to take notice and plan to meet their students' needs accordingly. New to the list of skills teachers are to prepare students with are "new digital literacies" (Larson, 2015, p. 169). According to Larson (2015), teachers are still to teach traditional literacy skills, but students will also be learning via e-books and tablet computers. With the increase in available educational digital reading material and the adoption of e-books and tablets in more schools, the purpose of this literature review was to examine what primary school teachers think about using e-books in their classrooms.

Educator Attitudes Regarding E-books

The invention of the Amazon Kindle in 2007 helped propel the popularity and market for e-books (Martin, 2016). Since then, there has been an escalation in interest regarding educator opinions of the instructional practices and benefits of using e-books in schools for supplemental and integrated technology support. While e-book technologies evolve as teaching tools, their popularity has influenced the number of digital libraries and electronic textbooks made available to schools for their built-in support features and functions (Yen-chen, Liu, & Kinshuk, 2017). Additionally, there has been an expansion in open-sourced reading material made available to educators, at no cost of their own, to be used and shared with students for educational purposes (Bates et al., 2017). As electronic reading materials have become more accessible in recent years, the curiosity surrounding e-book usage in school settings has prompted multiple studies aimed at analyzing the embrace of these resources by educators, or their possible disregard due to mixed fillings about integrating reading and technology.

Numerous researchers have studied this topic, surveying librarians, (Martin, 2016), teachers (Yen-chen et al., 2017; Zipke, 2013), and preservice and student teachers (Larson, 2012; Tosun, 2014; Yalman, 2014) to examine their personal and professional opinions on e-books.

According to Martin (2016), school librarians, surveyed in a study about their attitudes toward e-books, agreed that "technology supports literacy skills" (p. 117). However, some librarians reported they felt threatened by e-books due to their unfamiliarity with the technology and others lacked adequate professional development to address their reservations or operational difficulties (Martin, 2016).

In several studies where researchers interviewed or surveyed teachers, they found that many teachers acknowledged the potential educational value of using e-books, such as student engagement, especially with reluctant readers (Brueck, 2014). However, teachers also shared apprehensions for using e-books with students, which often stemmed from their unfamiliarity with the technology (Zipke, 2013).

Consistent with the views of the experienced teachers, the preservice teacher participants in several studies recognized the benefits of using e-books for engaging students and getting them interested in reading (Larson, 2012). In the studies implicating preservice and student teachers, a common finding was that the future teachers often did not read e-books and favored reading traditional books because of their partiality for physically handling them (Larson, 2012; Tosun, 2014; Yalman, 2014). According to Tosun (2014), this may be because many preservice teachers are "digital hybrids," people born between 1990-1994 who use new technology but are not as familiar as their students who are often referred to as "digital natives," people born after 1999 who have only grown up in a time where the technology already existed (p. 26). This aligns with Larson's (2012) observations that preservice teachers often preferred the familiarity of paper texts, while children appeared to navigate more easily between print and electronic text. According to Tosun (2014), despite the preservice and student teachers' preferences for paper text, they agreed that e-books are a means of accessing reading material when the "hardware and software needs are met" first (p. 26). An example of this would include having enough devices to display e-books and a reliable network to connect the devices to.

Concerns and Difficulties with E-books

Elementary teachers in one study who were surveyed expressed feeling comfortable with using e-books in their classrooms but relayed some difficulties which included a lack of operational devices for students to use (Martin, 2016). While some teachers found ways to combat this dilemma by using an Internet connected overhead projector or adopting the practice of "Bring Your Own Device (BYOD)" (Bates et al., 2017, p. 401), both methods still require reliable network and shareable Wi-Fi access to support the devices. Another dilemma with bring-your-own-device policies is that many impoverished students may not have devices to bring (Martin, 2016).

Some teachers who have access to enough e-book capable devices avoid using them out of fear their students will damage or break them (Zipke, 2013). E-book capable tablets and e-reader devices have the convenience of portability but include added risk of being stolen or damaged and require the daily responsibility of charging the devices. Aitken and Dewey (2013) found the answer to one of these issues was charging the devices in a "lockable charging station" (p. 390).

As found in the literature, many of the teachers' uncertainties with e-books stem from lack of professional development or unfamiliarity with technology. According to Brueck and Lenhart (2015), this is especially relevant "for teachers who received their training before the advent of mobile technologies and cloud computing" (p. 374). For many of these educators, access to supportive resources and technology-related professional development may boost their confidence and increase their likelihood of including the e-book technology in reading lessons. While some professional development can be costly to schools and districts, there are many free webinars and collaborative platforms that can provide teachers with additional support (Brueck & Lenhart, 2015).

Most of the other concerns that educators have about e-books revolve around their functions and features. A common thread amongst these concerns involved the narration functions which either sounded "too robotic" (Zipke, 2013, p. 435) or prevented students from using context clues (Martin, 2015).

Other features that educators were unsure about were the illustrations and photos in the e-books. According to Martin (2015), educators were indecisive on an appropriate amount of e-book illustrations and photos to discern between what students would find engaging or distracting. Functional hotspots, or designated areas that students click to activate sounds, pronunciations, animated images, or links to video, can become a "cognitive overload" for some students (McNelly, 2018, pp. 24-25). These hotspots are sometimes displayed as hypertext. According to Frazier (2014), hypertext is another e-book feature that can be both helpful and hindering because, when it is clicked, it can sometimes take the user to another page or website which may interfere with comprehension of the text. Students having unrestricted access to the Internet through a hypertext or e-reader/tablet device can expose them to inappropriate content. Additionally, student access to some applications or digital libraries can also have its own repercussions because students may intentionally or inadvertently come across reading material that is not age-appropriate (Martin, 2016). Therefore, restrictions and content blockers are imperative when using e-books in the classroom.

Many teachers have reported feeling unprepared when implementing new technology in the classroom (Schugar, Smith, & Schugar, 2013). Some teachers are reluctant to use technology and e-books due to "technical difficulties when using electronic devices and programs for literacy instruction" (Fludd, 2017, p.145). According to Fludd (2017), teacher and student frustrations with technology malfunctions can result in loss of engagement for students and instructional time for teachers. Teachers sometimes view the inclusion of technology as a distraction for their students, especially when they must focus on "the usability of the device instead of the content they [are] trying to teach" (Schugar et al., 2013, p. 618).

Recommended Practices for Teachers Using E-books

Most of the educators' concerns can be addressed or likely avoided by following recommended best practices for choosing and using e-books in the classroom. According to Larson (2015), many teachers feel that their students know more about technology than they do and are self-conscious about appearing

inexperienced with technology in front of their students. However, teachers can use this opportunity to learn from or with their students as they have more adept students share their knowledge and familiarity with technology devices (Larson, 2015). Not all students are familiar with technology to the extent their teachers may assume. It is a common misconception of teachers that students who are "digital natives are comfortable using tablet devices…[and] their experiences have prepared them for the unique demands required of the [student] to access and read an e-book" (Schugar et al., 2013, p. 618). On the contrary, according to a study by Zoch, Langston-DeMott, and Adams-Budde, (2014), students may have constrained access to technology at school and at home with the majority of "students' technology know-how limited to game-play, basic word processing, and Internet searches" (p. 34). Therefore, teachers should allocate time for introducing and scaffolding the technology skills students require for working with a device (Schugar et al., 2013). Before the students even touch the e-reader devices, teachers should demonstrate how to hold and use them appropriately (Aitken, & Dewey, 2013). Additionally, teachers should set and relay explicit rules and expectations for students about using the devices are intended to be used(Aitken, & Dewey, 2013).

Teachers should familiarize themselves with the types of e-books on the market, as they are accessible in many different formats (e.g., downloadable files, web-based digital libraries, and application-based digital libraries) (McNelly, 2018). It is also important for teachers to examine the functions and features of the e-book, app, digital library, and e-reader/tablet device that will be used for displaying and reading the e-book (McNelly, 2018). Some functions possess the ability to be disabled by the teacher. According to Zipke (2014), teachers should identify which e-book features they find helpful, examine reviews of the e-book or app before downloading, and try "lite or free versions of an [e-book or] app" before they download it (pp.35-38). Teachers should assess the functions and features of e-books along with the quality of the story in the same way they would with printed text (Cahill, & McGill-Franzen, 2013). With the popularity of e-books, a substantial volume of children's literature is being published or converted to e-books and included in

digital libraries. Therefore, the number of quality e-book texts should take precedence over the high quantity of e-books included in a digital library, for teachers considering a subscription. According to McNelly (2018), teachers, especially early childhood teachers, should consider e-books with functions and features that can be controlled by the teacher, that are designed for instructional use, that support emergent and early literacy skills, and that students can operate easily and independently (McNelly, 2018). While these functions are helpful, such as the read-aloud feature, teachers should also keep in mind that an "interactive e-book does not replace a good teacher" (Schugar et al., 2013, p. 623).

The Benefits of E-books

According to Cahill and McGill-Franzen (2013), e-books are beneficial to young children because they support traditional literacy skills such as vocabulary development, advance "trans-literacy development," and comprehension across multimedia sources (Cahill & McGill-Franzen, 2013, p. 31). In comparison to traditional books, e-books also support fundamental literacy skills (e.g., phonemic awareness, phonics, concepts of print, etc.) (Cahill & McGill-Franzen, 2013). Unlike traditional texts, the multimodal features of e-books engage readers and provide teachers with opportunities to differentiate instruction. E-books can also potentially change the way students read and connect with texts "because of their interactivity and convenience" (Schugar et al., 2013, p. 615). Text highlighting features during narrations of e-texts are studied using eye-tracking technology to examine children's attention of supportive e-book features and technologies such as these (Guernsey & Levine, 2016). Teachers, however, have already relayed the value of narration in e-books, similar to books on tape used in past years to help build reading fluency (Guernsey & Levine, 2016). While the initial purchase of an e-reader or tablet device can be more costly than the purchase of a printed text, e-books can also be cost-effective in the sense that they allow students, parents, and teachers to expand their libraries more easily by housing an abundance and variety of texts, some of which are free to access through public domains or open sources (Bates et al., 2017).

In a study by Huang, Liang, Su, and Chen (2012) in which they evaluated the usability and functionality of e-books with 166 elementary school students, "the e-book was found to be more acceptable than the printed book" (p. 719). According to Cahill and McGill-Franzen (2013), interactive images in e-books "can motivate reluctant or low-endurance readers" and support struggling readers' comprehension skills, allowing them to read texts that would otherwise be considered "frustrational" if read traditionally (p.33). When e-books were integrated into a sixth grade classroom in one study (Larson, 2015), the students reported less fatigue and longer endurance for reading lengthy text with the support of the Kindle Fire features, such as audiobook, background light, and the dictionary. After adopting the e-readers in the class and allowing students to take them home to utilize, the students' teacher substantiated the students' claims and reported that he had witnessed an increase in the students' reading time over a five-week span (Larson, 2015). The findings of Larson enforce the notion that the objective of integrating e-books is not to replace print; rather the objective is to acknowledge a change in students' literacy education because of technology influences and encourage teachers to adapt their classroom practices to include e-books to support students' development of new literacies.

METHODS

This convergent parallel mixed methods study used both quantitative and qualitative data to answer the following research questions.

    1) What are one school's kindergarten, first, and second grade teachers' attitudes toward using e-readers in the classroom as measured on a survey?

    2) What are one school's kindergarten, first, and second grade teachers' practices regarding the use of e-readers in the classroom as observed across one semester?

Primary grade teachers completed a survey that inquired about their current practices and perceptions of using e-books in their classrooms.

The researcher also conducted classroom observations of two teachers' existing approaches to using e-books and compared notes from these observations to a second round of observations after the teachers were provided with

a professional development workshop on best practices with e-books.

Participants and Setting

The participants in the study included kindergarten, first, and second-grade teachers from an elementary school in a small South Texas school district. All participants in the study voluntarily signed a consent form to participate in a survey regarding e-book usage in their classrooms. See Table 1 for demographics of the teachers who completed each survey. The two teachers who participated in the observations identified as Hispanic females who taught first and second grade and had zero to two years and five to 10 years of teaching experience. The school was a Title I elementary school in South Texas that served 563 students in grades prekindergarten through two. The demographics of the school's student population served by some of the teachers in this study were 84% Hispanic, 13% Black, and 3% White, with 96% of the students eligible for free or reduced lunch and descending from low-income households.

Table 1

Participant Demographics Survey (n = 21)

Variable	Percentage
Grade Level	
Kindergarten	29%
First	33%
Second	38%
Years of Experience	
0-1 years	10%
2-3 years	19%
4-5 years	22%
5-10 years	19%
10-15 years	10%
16-20 years	10%
More than 20 years	10%
Gender	
Male	10%
Female	90%
Ethnicity	
White	10%
Hispanic or Latino	76%
Black or African American	10%
Asian	0%
American Indian or Alaska Native	0%
Native Hawaiian or Pacific Islander	0%
Other	0%
Wishes Not to Disclose	4%

DATA COLLECTION

The data collection process spanned over three months. The first teacher surveys were administered and collected in late February 2019. Following the surveys, the first classroom observations were carried out in March 2019. The professional development workshop was conducted in early May 2019 as were the second set of classroom observations.

Survey. The survey included 12 Likert scale items concerning teacher familiarity with and dispositions related to e-books that influence usage in their classrooms (see Table 3 and 4). These questions were developed based on the information found during the review of the literature, such as distinguishing if books in digital form can be utilized to enhance students' digital literacy (Zoch et al., 2014) and identifying if the teachers thought students may become distracted by the multimodal text features found in some digital texts (McNelly, 2018). The survey included four demographic questions: grade level taught, years of teaching experience, gender, and ethnicity. The survey was reviewed by three professors for content validity and was piloted with four elementary school teachers prior to being distributed to the participants in the study.

The first survey was administered on February 28, 2019, during the teachers' grade level Professional Learning Community (PLC) meeting. The survey and consent forms were distributed during the last ten minutes of the meeting and were collected the same day. Twenty-one teachers completed the first survey. Two teachers chose to read over the survey further and their surveys were collected later the following week. The second survey was administered on May 3, 2019 during the first fifteen minutes of the participating teachers' grade level PLC meetings, directly following the e-book resource and application professional development workshop provided by the researcher. Twenty-one teachers completed the second survey.

Classroom observations and observation protocol. Two teachers volunteered for the researcher to conduct observations in their classrooms during times when the teachers would be using e-books with their students.

The researcher followed an observation protocol (see Table 2) to examine the alignment between the teachers' usage of e-books and current best practices of e-book integration, such as "changing and manipulating the settings to best support students' reading" (Bates et al., 2017, p. 410).

Additionally, the same two teachers who agreed to host the researcher in their classroom for the first observation also agreed to a second observation following the delivery of the professional development session. Using the same observation protocol, the researcher examined the alignment between the teachers' usage of e-books and current best practices. The information gathered was compared with the data recorded during the first observation. This data was then analyzed to determine if any changes occurred in the teachers' techniques of e-book inclusion from those observed during the first observation.

The observation protocol included six items that were intended to provide information about the teachers' current practices with e-books. These practices include how the teacher scaffolded the use of the technology, how the e-books were used, the appearance of the teachers' comfort and proficiency with the technology, and any technical issues and how the teacher managed them (Larson, 2015).

The first observations were conducted in a first grade classroom and a second grade classroom the week following the distribution of the beginning of study surveys in March. The researcher sat in the back of the classroom with the observation checklist and observed instruction for ten to fifteen minutes, which comprised the duration of the time the e-book was used in the lessons. The second round of observations in the same two classrooms was conducted in early May, the week following the distribution of the second survey and the informational workshop provided by the researcher. The researcher followed the same procedure as the first observation and used the same observation protocol.

Workshop. The teachers were given the option to learn more about e-book usage by participating in a voluntary workshop.

The researcher offered this professional development session for the teachers with the purpose of addressing concerns, sharing resources, and suggesting techniques for incorporating e-books in the classroom. The voluntary workshop took place on Friday, May 4, 2019 during the first 10 minutes before the grade level Professional Learning Community (PLC) meetings. Twenty-one teachers attended the workshop.

DATA ANALYSIS

The researcher collected the survey responses of the teachers prior to and following the e-book workshop.

The researcher also observed two teachers' application of e-books integration in their classroom lessons before and after the e-book workshop. After collecting the data, the researcher organized the data into two tables for analysis purposes. The researcher then examined and compared the survey responses of the teachers to reveal if the teachers' attitudes differed from their initial responses. The data collected from the classroom observations of the two teachers was also analyzed, using a priori codes (see Table 2) taken from the review of literature regarding best practices suggested for using e-books with elementary students.

Table 2

Structure for Classroom Observation Analysis

The Teacher	Observations in Classroom
Familiarity with using e-books to support literacy instruction	Whole group (e-books read aloud), small group (e-books used for guided reading/ supported reading), or independent (students instructed to read independently with e-books)
Familiarity with technology	How e-book is displayed (e.g., tablet/e-reader, computer, projection screen, etc.) Introduction/scaffolding of device functions Confidence with using technology Technology malfunction or user error?
Familiarity with e-books	E-book function usage (e.g., highlighter tool, read-aloud tool, zoom in/zoom out, glossary, bookmark tool, etc.) Introduction/scaffolding of e-book functions Acknowledgement of "hotspots" (i.e. hyperlink with clickable activation)
Familiarity with resources	Digital library or application used to display e-book Technology used to display e-book

Ethical Considerations

Participation in this study was voluntary and the participating teachers were provided with consent forms. All consent forms stated the researcher's intentions for the study, in addition to the risks, (indirect) benefits, and option for the participant to withdraw from the study at any time. The researcher's contact information, as well as the mentor professor's contact information, was included in the consent form and a copy of the signed consent was presented to the participants. Pseudonyms are used throughout this report to protect the identity of the participants.

Trustworthiness

Two types of data, quantitative and qualitative, were collected for this study. Quantitative data was collected using a teacher survey created to assess teachers' perspectives concerning e-books in their classrooms. Qualitative data was collected through classroom observations using an observation protocol that allowed the researcher to compare the observed teachers' integrated e-book methodologies with those that are advised in the relevant literature. Peer review was used to ensure the reliability of the data analysis process.

RESULTS

The results of the study indicated that the teachers had conflicted feelings associated with e-book usage in their classrooms and had personal preferences. Before the workshop, many of the participating teachers recognized the potential for using e-books with their students but were still reluctant because they saw e-books as potential distractions, were not confident with the technology component, or were unaware of the resources available to them. The observed teachers who were already using e-books were still unfamiliar with the range of potential which they had yet to discover for incorporating e-books into the classroom. After the workshop, many of the teachers indicated that they were more likely to use e-books given additional resources.

Primary School Teachers' Dispositions Toward E-books in Their Classrooms

Tables 3 and 4 present the survey responses of the teachers before and after the workshop presented by the researcher. The responses in these tables reflect the teachers' familiarity with the benefits of using books in digital form in their classroom, with 80% of the teachers conveying they currently use e-books in their classrooms in the first survey. Additionally, 20% of the 21 teachers surveyed admitted they would prefer to only use books in paper form in their classrooms before the workshop. A possible influence for classroom teachers' preference for traditional texts may be their perception of multimodal text features that may cause distractions or cognitive overload for students (McNelly, 2018). The notion of text-features being a potential distraction for students was shared by 43% of the surveyed teachers in the first survey. Other possible influences for teachers' preference for traditional books over e-books included the teacher's familiarity and knowledge of supportive resources provided to them by their school library or through outside sources (Martin, 2016). The first surveys indicated that 90% of the teachers were familiar with the e-book and digital library resources provided by their school but only 67% were familiar with outside sources available freely to classroom teachers. Additionally, the teachers' confidence with using technology for integrating e-books into their lessons and using electronic reading devices can often influence their willingness and enthusiasm to utilize those resources in their classroom (Brueck & Lenhart, 2015). The teachers' initial survey responses revealed that 57% felt confident using technology, such as electronic tablets for reading e-books, while 67% felt supported using this technology and e-book resources provided by their school. After the workshop provided by the researcher, the teachers' responses to the second survey indicated that 86% felt confident using technology like electronic tablets for reading e-books and 71% felt supported using the school's resources.

Despite the teachers' personal preferences, 99% agreed on the second survey that there should be a balance of digital and traditional books in their classrooms.

This is a promising example that demonstrates that although the teachers may still have reservations regarding e-books, they understand the importance of not allowing their personal preferences to interfere with their students' exposure to new literacies (Larson, 2012). The teachers' understanding of the benefits of e-books for teaching digital literacies was also apparent in their willingness to learn more about e-books and how to teach with them. Ninety-nine percent of the teachers on the first survey indicated that they would like to learn more about how to effectively use digital texts in their classrooms. The workshop conducted by the researcher was created with the intention of offering support and resources for the teachers as well as addressing some of the concerns regarding e-book usage, such as displaying the book using the projector when the devices are in short supply (Bates et al., 2017).

While some teachers were still unsure about integrating e-books into their lesson plans, many of the teachers surveyed were more confident in choosing e-books to support students' digital literacies, and their assurance increased from 86% to 90%.

Additionally, the teachers' confidence in using e-books increased from 57% to 86%. This improvement in teacher confidence with e-books was also reflected in the teachers' survey answers, with more teachers choosing the "Strongly Agree" option for their position on the influence of e-books on digital literacies and their confidence in using electronic tablets to support reading instruction. The researcher also found that after the workshop, there was an improvement in the teachers' understanding and confidence with e-books regardless of their personal preference of traditional books over digital. According to the surveys, there was also an increase (95% to 100%) in how teachers feel e-books can support students' digital (new) literacies, as well as an increase from 90% to 95% in their support for having a balance of digital and traditional books in the classroom. The influence of professional development or continued support through approaches like the workshop conducted by the researcher positively influenced the teachers' willingness to understand and attempt e-book inclusion in their classrooms (Brueck & Lenhart, 2015).

Table 3

E-book Survey 1 (n = 21)

Statement	Mean*	Standard Deviation
I prefer to only use books that are in paper form in my classroom.	3.05	1.28
Students can become distracted with the multimodal text features included in some digital texts.	2.95	1.15
I feel confident using electronic tablets for reading texts in my classroom.	2.67	1.11
I am familiar with *Epic* and other digital libraries available to me as a classroom teacher.	2.43	1.32
I feel supported using electronic tablets for reading digital texts in my classroom.	2.38	0.80
I am familiar with the benefits of using books in digital form.	2.19	1.03
I feel confident choosing digital texts to be implemented as part of my lessons.	2.19	1.03
I am aware of the digital libraries available through my school's subscriptions.	1.95	1.12
Books in electronic form can be utilized to enhance students' digital literacy.	1.90	0.83
I currently use books in digital form in my classroom.	1.81	0.60
I would like to learn more about how to effectively use digital texts in my classroom.	1.74	0.56
There should a balance of books in digital form and books in paper form used in the classroom.	1.71	0.96

Note. *1=Strongly Agree, 2=Agree, 3=Disagree, 4=Strongly Disagree, 5=Don't Know

Table 4

E-book Survey 2 (n = 21)

Statement	Mean*	Standard Deviation
Students can become distracted with the multimodal text features included in some digital texts.	2.76	1.26
I prefer to only use books that are in paper form in my classroom.	2.67	0.91
I am aware of the digital libraries available through my school's subscriptions.	1.95	1.16
I am familiar with *Epic* and other digital libraries available to me as a classroom teacher.	1.95	0.74
I feel supported using electronic tablets for reading digital texts in my classroom.	1.90	0.83
I feel confident using electronic tablets for reading texts in my classroom.	1.86	0.96
I currently use books in digital form in my classroom.	1.86	0.77
I am familiar with the benefits of using books in digital form.	1.48	0.51
I would like to learn more about how to effectively use digital texts in my classroom.	1.43	0.60
I feel confident choosing digital texts to be implemented as part of my lessons.	1.38	0.59
There should a balance of books in digital form and books in paper form used in the classroom.	1.29	0.56
Books in electronic form can be utilized to enhance students' digital literacy.	1.24	0.44

Note. *1=Strongly Agree, 2=Agree, 3=Disagree, 4=Strongly Disagree, 5=Don't Know

Current Approaches Teachers Use to Integrate E-books in Their Classroom Instruction

The two teachers who participated in the classroom observations showed growth in their confidence and pedagogy related to the use of e-books after attending the workshop. The researcher constructed and used a classroom observational protocol checklist during every classroom observation to help identify what ways the Teachers were using e-books in their classrooms (see Appendix). Both teachers used e-books for whole class instruction during observations, displaying them on overhead projectors during the observations. When the researcher observed both teachers for the first time, they experienced technical difficulties with their e-book library selections. The first-grade teacher was using the school's *MyOn* subscription to support science instruction about plants, displaying a book titled *Plants in Spring* by Martha Elizabeth Hillman Rustad. The teacher used the read-aloud feature (i.e., the book was read to the students by the computer and the text was highlighted as the story was narrated). She paused the story occasionally as she engaged students in a discussion about the text. The teacher appeared confident while using the e-book with the class; however, she did experience technical difficulties when the book's narration froze toward the end of the story.

The second-grade teacher displayed an e-book, *Dr. Martin Luther King, Jr.* by Bea Silverberg, on the projector using the school's Reading A to Z subscription to support a social studies lesson. She used the highlighter feature to highlight important information within the e-book and, although she did have some difficulty with this tool, she used it to demonstrate for the students how they could use the same process using printed copies of their own texts. Both teachers displayed confidence and some reluctance despite technical difficulties during their lessons. They demonstrated resourceful strategies for using e-books in the classroom when there is a shortage of devices for all students (Bates et al., 2017).

For the second round of observations, both teachers used the e-books with the whole group, again using the projector. Both teachers used Epic, a free digital library subscription available to educators, for their second observation. This was one of the (free for educators) resources shared with them during the workshop provided by the researcher.

The first-grade teacher again used e-books to support a science lesson, sharing *Frogs* by Gail Gibbons. The teacher used the read-aloud feature again and displayed the book on the projector (whole-class), but this time invited the students to practice reading along with the e-book as the words were highlighted with the narration. The teacher paused the book occasionally and used the zoom feature so that students could see the details in the illustrations. They then compared them with a diagram of the life cycle of a frog they had on an anchor chart taped to the white board. The teacher did not experience any technical difficulties during the observation. After the read-aloud was finished, the teacher instructed the students that the book was compatible with Accelerated Reader and that they would be able to complete a test on it. The teacher commented to the researcher that she favored this new resource to which she had been introduced and was planning on using it more often by encouraging her students' parents to take advantage of the free at-home trial subscription over the summer to encourage reading. The second-grade teacher read the e-book Arctic Tern Migration by Kari Schuetz and displayed it using the projector during a whole-group lesson to support the science topic of migration.

The teacher utilized the definition (hotspot) feature to help students understand new vocabulary. As the teacher came to a new vocabulary word with which the students were unfamiliar, the teacher would roll the mouse cursor over the word and click the unknown or bolded world to display the definition. The teacher also used the zoom feature to enlarge the photographs and look closer at the diagrams and maps of migration to support the students' comprehension of those text features. This teacher also did not experience any technical difficulties during this lesson and commented to the researcher after the lesson about how helpful the new digital library resource was and how the vast library of e-books would be useful when planning future lessons.

DISCUSSION

After analyzing the teachers' initial responses to the attitude surveys regarding e-book usage in their kindergarten, first-, and second-grade classrooms, in addition to the classroom observations of practices with e-books in those classrooms, the researcher developed a voluntary workshop to share resources and techniques with the teachers for using e-books in their classrooms. The concerns and inquiries of the teachers were considered during the planning of the workshop and it was constructed to address these concerns and demonstrate how e-book inclusion can be a useful tool in the repertoire of the modern teacher (Brueck & Lenhart, 2015). A secondary survey was administered to the teachers as well as a second round of classroom observations. This data was then compared with the first survey and observation results to examine if the workshop and the approach of sharing supportive resources influenced the teachers' confidence and consideration for using e-books in their classroom (Larson, 2015).

It became apparent during this research that the workshop may have influenced many teachers to view the potential for e-books differently in their classrooms, even if they started with the mindset that e-books could be distracting (McDermott & Gormley, 2016). The researcher constructed and presented the professional development workshop to demonstrate the most efficient practices for integrating e-books and digital texts into lessons that follow the Technological Pedagogical Content Knowledge (TPACK) framework

that encouraged the teachers to build their confidence and expand on what they already know about teaching literacy (Brueck & Lenhart, 2015). Following the workshop, there was a growth in confidence in the teachers' views of potentially using e-books and the possible benefits e-books could have for their students. Likewise, after the workshop the participating teachers who were already familiar with using e-books were more efficient and had become more familiar with the resources and functions as similarly mentioned in Larson (2015).

Implications for the Classroom

As the common medium and consumption of text continues to shift in the direction of electronic/digital publishing, teachers must adapt to support their students' new literacies by incorporating e-books and other digital texts in their classrooms. To this end, administrators should support their teachers, especially those who are less confident or familiar with teaching with technology, by purchasing resources for their classrooms and encouraging them to participate in professional learning experiences to learn how to best utilize these resources (Lenhart, 2015). School librarians and administrators can support teachers and students by choosing digital library subscriptions with quality books, updating technology that supports electronic books, and demonstrating for teachers how to utilize new and updated technologies/resources. Nevertheless, as e-books and digital libraries continue to evolve, so will the teachers' required skillsets, even for those who learned about e-books as preservice teachers. Subsequently, teachers will likely also become responsible for their own continued education regarding up-to-date practices using e-books (Larson). In preparation, teachers should familiarize themselves with the resources available to them through webinars, instructional videos, scholarly articles, and digital tours built into the resource or digital library upon subscription.

Implications for Research

In the future, the preference of upper elementary teachers (third, fourth, and fifth grade) regarding e-book inclusion may be explored and compared with the inclinations of the lower elementary grade teachers in the same school district. Also, prekindergarten teachers were not included in this study but it would be worthwhile to learn about their perceptions regarding e-books for teaching emergent reading skills. This information could then be compared with the Fludd (2017) preschool e-reader & technology integration study.

One of the resources the researcher suggested to the group of teachers who attended the workshop included Reading IQ, a digital library free to educators that includes e-books for students who are pre-readers and emergent readers as young as the age of two. It would be beneficial to examine teachers' practices of using e-books in classrooms for whole group instruction, independent reading instruction, and guided reading instruction. Then, teachers could be asked to compare student engagement and comprehension data with classrooms where only traditional (printed) text is used. Finally, it would be helpful to explore teachers' positions on e-book usage and how they integrate these with their current curriculum in a district that serves a predominantly low-income population. This information could be compared with similar data collected from a more affluent school district to see if there is a disproportion of resources (such as e-readers or tablets for e-books) and if this influences teachers' opinions and the implementation of those resources in the classrooms.

Limitations

One limitation of the study included the use of only kindergarten, first-, and second-grade teachers at one South Texas elementary school. Also, due to time and human resource constraints, the researcher was able to conduct only two observations each with two teachers. The time frame of the study was limited because of the short amount of time available to conduct it and because of the limited time the teachers had in their busy schedules to devote to the survey and observations.

CONCLUSION

The research has demonstrated that this sample of participating primary teachers understands the potential benefits using e-books in their classroom has on influencing their students' literacy development.

Many, however, are hesitant to embrace these technologies because of personal preferences for traditional (printed) books. This may be due to their unfamiliarity with these technologies or intimidation by them. The study revealed, though, that professional development and supportive resources can be instrumental in influencing teachers' attitudes and willingness to embrace contemporary methods of teaching literacy that prepare students for the future. Despite whether they have conflicting preferences, teachers are mindful of professional expectations and want to learn how to use e-books and incorporate technology and digital texts. The findings of this study confirm that, with professional development and supportive resources from librarians and administrators, teachers can feel confident and motivated to use e-books in their classroom to encourage wide reading.

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APPENDIX

Classroom Observational Protocol Checklist

1.   How are e-books being used to promote digital literacy (e.g., whole group, small group, independent reading, etc.)?
2.   Did the teacher give special instructions or scaffold the use of technology prior to e-book engagement?
3.   Does the teacher appear confident in using the e-books in the classroom?
4.   Are digital text features being utilized? If so, how are they being used?
5.   Which digital library is the teacher using for the e-book(s)?
6.   Did the teacher experience any technical difficulties involving the e-book, e-reader/tablet, or digital library? If so, what kind?

CHANGES TO AHA/ACC/ HRS GUIDELES FOR THE MANAGEMENT OF PATIENTS WITH ATRIAL FIBRILLATION

by: ANGELIA VAL
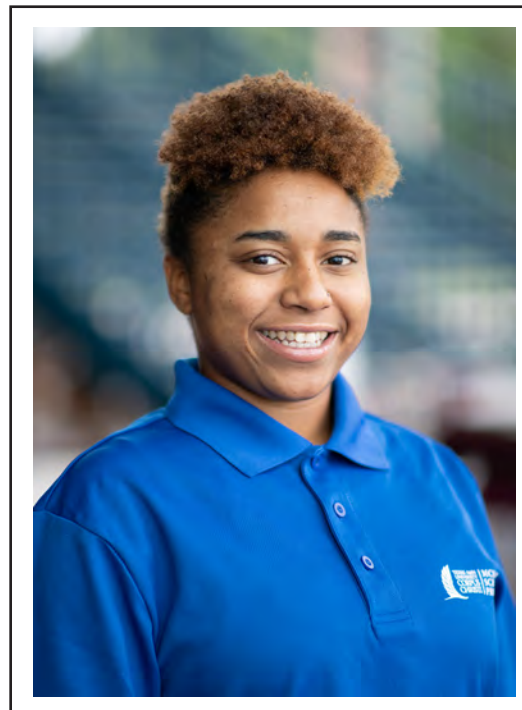
INTRODUCTION

Atrial fibrillation (AF) can be managed/treated several ways. One option is pharmacological treatments such as anticoagulants for blood clot prevention and antiarrhythmics for heartbeat rate control. Another option are electrophysiology treatments such as high frequency cardiac ablation. These two categories of treatments, pharmacological and electrophysiological, are the main changes to the 2014 treatment guidelines and the 2019 revision to those 2014 treatment guidelines. This paper will discuss the specific treatment changes that fall under these two treatment options and the rationale behind these treatment changes in the treatments. This will also discuss some electrophysiological treatments that were not changed but are important to note as well as some combination treatments. The study will investigate these changes and differences in the old versus new drugs in the 2014 treatment

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guidelines compared to the updated 2019 guidelines. It will look at how biologically these treatments affect the body and why new treatments are used.

Pharmacotherapies

Anticoagulants

In the 2014 treatment guidelines, section 4.1.1 in the selection of antithrombotic regimen, the 2019 updates states, the oral anticoagulants recommended for high stroke risk AF patients now include Edoxaban. Edoxaban is a new, direct factor Xa inhibitor. Studies were done to show that when compared to Warfarin, it was non-inferior in the prevention of stroke and systemic embolism. Edoxaban also showed a significant reduction in the risk of hemorrhagic stroke, cardiovascular mortality, major bleeding, and intracranial bleeding. (Bounameaux and Camm 2014). Xa inhibitors are anticoagulants that selectively blocks the activity of factor Xa, preventing blood clots, and are reversible. Oral anticoagulants such as Warfarin, Dabigatran, Rivaroxaban, Apixaban are recommended to AF patients with a 2 or greater in men or 3 or greater in women on the CHA2DS2-VASc score, due to the recent approval of the new Xa inhibitor, Edoxaban. CHA2DS2-VASc is a clinical prediction set of rules for estimating stroke risk in patients with non-rheumatic atrial fibrillation.

The scoring scale is from 0-10. A score of 0 indicates low stroke risk, 1 indicates moderate, and any score above 1 indicates a high risk. The score is determined from a number of factors that make up the meaning of the acronym; Congestive Heart Failure (one point), High blood pressure (one point), Age (two points if above 75 and one point if between 65 and 74), Diabetes (one point), Previous stroke or clot (two points), Vascular disease (one point), Sex (one point if female). These factors help cardiologists evaluate the stroke in AF patients. For AF patients with end-stage chronic kidney disease, Dabigatran, Rivaroxaban, and Edoxaban are not recommended. NOACs, (novel oral anticoagulants), are recommended over Warfarin, except in patients with moderate- severe mitral stenosis or a mechanical heart valve, and these patients are excluded from the study. Warfarin is endorsed as the first line of defense due to the fact NOACs partially rely on the kidney for elimination. (Chan et al 2016). When compared to Warfarin, NOACs were found to be noninferior, even superior in some cases when preventing stroke and systemic embolism. They also were associated with lower risk of serious bleeding. These drugs are at least as effective as warfarin, are safer, do not require routine monitoring, and are simpler to use. (Chan et al 2016). AF Patients who are unable to maintain a therapeutic INR level (International normalized Ratio) with Warfarin should use NOACs. INR is used to monitor how well blood-thinning medication is working. AF patients with CHA2DS2-VASc scores of 0 in men and 1 in women can omit anticoagulant therapy.

Another change is that moderate- severe mitral stenosis or a mechanical heart valve is now an exclusion criterion for NOACs, Warfarin is recommended instead. This is because although NOACs have a generally better profile, their efficacy on valvular AF, especially for bioprosthetic valve, remain unclear (Qiyu et al 2019). More research is needed in this area. When using Warfarin, the INR must be determined weekly, and if stable, INR must be determined at least monthly. In addition, anticoagulation therapy should be based on thromboembolism, not the AF pattern (paroxysmal, persistent, permanent). The 2019 revisions recommend, when using anticoagulants, risks factors should be discussed, and reevaluation of need should be assessed for anticoagulant therapy at

periodic intervals (assessing stroke and bleeding risk). These changes are due to the fact antithrombotic was changed to anticoagulant.

Due to Level of Evidence (LOE) update from B to B-NR, renal function and hepatic function should be evaluated before initiating NOACs treatment and should be reevaluated at least annually. LOE has three different levels A, B, C. Level A describes a wide population evaluated (multiple clinical trials) , B is a limited population evaluated (one or more clinical trial), B-NR means non randomized and level C having very little population evaluated (consensus opinions from experts and case studies), C-LD (Limited data), C-EO (expert opinion). Within these levels there are classes 1, 2a,2b, and 3. These classes explain the risk vs benefit of the different treatments. Classes 1 are the treatment recommended with the most benefit vs risk and class 3 has no benefit and possible harm. With CHA2DS2-VASc score of 2 or greater in men or 3 or greater in women and for those who have end-stage chronic kidney disease (CKD) or are on dialysis, it might be reasonable to prescribe Warfarin whereas NOACs (e.g. Dabigatran, Rivaroxaban, Edoxaban) are not recommended. This is due to LOE update from B to B-NR and NOACs not showing a benefit in these cases. These patients do not meet the inclusion criteria for the study. Dosages should be reduced for patients on NOACs with moderate - severe CKD and when CHA2DS2-VASc score is elevated. This reflects the updated exclusion criteria and approval of Edoxaban. Dabigatran should not be used when a patient has a mechanical heart valve. These patients do not meet the inclusion criteria of our study.

Guidelines for the interruption of these drugs have been updated as well. Idarucizumabis is recommended for the reversal of Dabigatran. Andexanet Alfa can be used for the reversal of Rivaroxaban and Apixaban. These reversal agents would be used in the event of any life-threatening bleeding or urgent procedures. These were updated after new evidence was published supporting LOE B-NR. For the interruption of Warfarin, for AF patients without a mechanical heart valve, risk factors like stroke and bleeding should be assessed along with the duration without anticoagulation treatment. These patients do not meet the inclusion criteria of our study.

Electrophysiology

Some main categories of ablation for the treatment of AF are Pulmonary vein isolation, AV nodal Ablation, Surgical ablation and a few alternative techniques for ablation. There are several types of ablations in these categories. First, the update to catheter ablation, also known as radiofrequency ablation (RF), will be discussed. Then the different types of ablation will be discussed. In electrophysiology treatment, catheter ablation is updated. Catheter ablation is reasonable with patients with symptomatic AF and Heart failure (HF) with reduced left ventricular (LV) ejection fraction (HFrEF), to potentially lower mortality rate and reduce hospitalization. In HfrEF also known as systolic HF, the heart muscle is not able to contract enough and, causes it to expel less oxygen-rich blood into the body. Patients with this have lower-than-normal left ventricular ejection fraction (EF). (Healio 2015). A normal LVEF ranges from 50%-75%, 36% to 49% is considered below normal, and below 35% is considered low pumping ability. This update is the result of new evidence such as improved mortality rate that has been published for AF catheter ablation. (list of publications available upon request). Ejection fraction evaluates the risk of heart failure. Another type of ablation that falls under the category of pulmonary vein isolation with catheter ablation is cryoablation. Cryoablation also uses a catheter, the difference between this type of catheter ablation is that instead of using heat to create scarring, freezing is used. Other areas outside of the pulmonary veins can be targeted, especially in patients with persistent AF. Some alternative techniques include Rotors, CFAE, and Ganglionated Plexi. Rotors are a region within the left atrium that have complex electrical activity. This technique targets this area in the left atrium, with catheter ablation. CFAE stands for Complex Fractionated Atrial Electrograms. These areas are detected by a mapping system in the use of catheter ablation. These areas are thought to be trigger areas for AF. Another alternative is Ganglionated Plexi, a region in the left atrium, rich in autonomic innervation. These nerve fibers are associated with the heart rate. RF catheter ablation can be used to target this area. (Heart and Rhythm Society).

Combination treatments with ablation are important. AV Nodal ablation is generally used as a result of failed ablations, or when surgical methods are thought to be very low. This method uses RF ablation along with a pacemaker implantation. Surgical Ablation is also used to treat AF. This is a sort of combination treatment. Mini Maze is a technique used by making a small incision and surgical tools are used to perform the isolation of the pulmonary vein. Convergent ablation is another treatment type. This method uses surgical and catheter-based ablation techniques. In this treatment catheter ablation is done and then an incision is made in order to deliver energy to the outside surface of the heart. This isolates the pulmonary vein from the outside and inside surfaces of the heart (Heart and Rhythm Society).

CONCLUSION

There are several treatment options when it comes to AF. That is why it is important to keep up with the updated information on them. These updates are key in researching the effects of pharmacological and electrophysical therapies on cognitive functioning as well as evaluating biological components. When looking at the changes between the 2014 and 2019 treatment guidelines it is important to look at treatments in these two categories that have not been changed in the guidelines in order to get a wider range of data. That is why I looked at some combination treatments in the electrophysiology category. Combination therapy is important to look at because there are many major factors to look at when selecting a treatment. AF is serious and there can be many complications and factors that can affect a patient. It is always best to find the treatment best suited for a specific patient. This analysis helps when looking at these possible treatments.

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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 caused 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. In 2016, Dr. Killebrew announced his retirement and former Provost and Vice President for Academic Affairs Kelly Quintanilla was appointed interim president. Today the University has over 12,000 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.

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