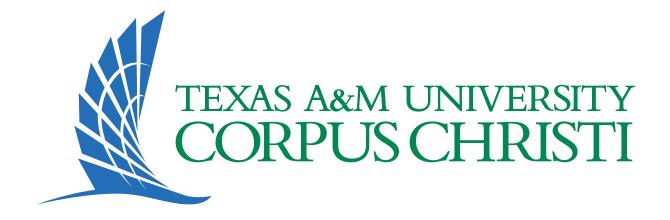


McNAIR SCHOLARS

RESEARCH JOURNAL

VOLUME IV Summer 2012





BIOGRAPHY OF DR. RONALD E. McNAIR

HE OVERCAME OBSTACLES.

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

HE ACHIEVED ACADEMIC EXCELLENCE.

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

HE BECAME A LEADER IN HIS FIELD.

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

HE WAS RESPECTED AND COMMENDED.

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



HE EXCELLED IN MANY ASPECTS OF LIFE.

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

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

Biography courtesy of the University of Nevada, Las Vegas

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PROVOST AND VICE PRESIDENT FOR ACADEMIC AFFAIRS

DR. CHRIS MARKWOOD



The U.S. Department of Education established the Ronald E. McNair Post Baccalaureate Program in 1986 in honor of one of the astronauts who perished in the 1986 Challenger explosion. The McNair Scholars Program sought to prepare a cadre of underrepresented college students to become university professors and role models for others from similar backgrounds. It is an extreme honor for Texas A&M University-Corpus Christi to host the McNair Scholars Program in the Division of Academic Affairs.

The research reported in this journal provides a testament to the hard work of the students and their faculty mentors. These studies illustrate how Texas A&M-Corpus Christi undergraduates are willing and capable of undertaking major studies and completing them in a superior manner. This research illustrates a student-centered university and a student-centered faculty at its very best.

This publication reflects not only the dedication and hard work that resulted in the research journal presented here, but also the extraordinary support and expertise offered by the faculty mentors. I congratulate the McNair Scholars, applaud all participating faculty, and extend my sincere appreciation to the entire campus community for supporting and encouraging the outstanding accomplishments of our students.

Texas A&M University-Corpus Christi

Sincerely,



ASSISTANT VICE PRESIDENT FOR STUDENT SUCCESS



DR. GERARDO MORENO

This fourth publication of the Texas A&M University-Corpus Christi McNair Scholars Research Journal is the culmination of extremely hard work by many talented and dedicated individuals. The triumphs of the McNair Scholars and the commitment of their faculty mentors are highlighted within these pages and are exemplary examples of the academic excellence at this university.

Perhaps the most important aspect of the McNair Scholars Program is that of the relationship between the faculty mentor and scholar. For the scholar, the benefit of participating in the program depends to a large extent on this relationship. The relationship is designed to encourage, motivate and prepare McNair scholars for doctoral studies. Based on the research reported in this journal, the program has been a resounding success. It provides an undeniable testament to the hard work and commitment of the students and their faculty mentors.

This program exemplifies the mission of Texas A&M University-Corpus Christi, which is to help members of a group that is traditionally underrepresented in graduate education and have demonstrated strong academic potential to attain success. We are indeed honored to have these talented students and dedicated faculty committed to excellence.

Sincerely,

Dr. Gerardo Moreno

Assistant Vice President for Student Success

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2012 McNAIR RESEARCH ARTICLES

THE QUEST TO BESTOW LIFE ON PARKS: RESIDENTS' PERCEPTIONS OF PARK USE IN CORPUS CHRISTI, TEXAS

by MELISSA BEELER



ABSTRACT

Previous literature has shown that parks can increase perceived physical activity levels of visitors, enhance residential property values, promote social inclusion, and contribute positively to visitors' quality of life. Due to the extensive list of visitor benefits, it is important to ensure parks are fairly and equitably distributed and accessible to all demographic groups. Thus, the purpose of this research was to 1) assess disparities in park distribution among residents of different minority and socioeconomic status and 2) judge whether current park amenities are meeting the needs of local neighborhood populations. A socio-spatial approach was used to evaluate public perception of park distribution and amenities in Corpus Christi, Texas. A mail-in survey was conducted of householders in the city. Data analysis was performed based on minority status, income level, and frequency of park visitation. Minorities

and lower incomes were more willing to travel longer and farther to visit a park, which may be attributed to poorer quality of parks and park amenities in lower income and minority neighborhoods. Although amenity preference among differing minority status was consistent with leisure research, non-minority and higher income residents seemed more critical of parks overall. It was determined that disparities may exist between social demographic groups in the quantity and quality of parks in their neighborhoods. Moreover, park amenities seem to not meet the needs of local residents due the consistently low scores received by the majority of respondents. The implications of these findings for future park projects in Corpus Christi are discussed.

Key words: park use, perceptions, ethnicity, income, amenities

INTRODUCTION

Parks have been found to be beneficial to their visitors and nearby city residents. Parks can increase physical activity levels for visitors (Pearce & Maddison, 2011), increase surrounding residential property values (Conway et al., 2008; Hoshino & Kuriyama, 2010), promote a sense of social inclusion and place (Martin et al., 2004), and contribute positively to visitors' quality of life (Chiesura, 2003). Due to this extensive list of visitor benefits, it is important to ensure that parks are equitably distributed and accessible to all demographic



MENTOR
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groups. However, limited resources existing both economically in local government and physically in land use can constrain the most ideal park distribution. Thus, it is imperative to study the demographic makeup of park visitors, as well as their perceptions of park spaces and park characteristics.

Although park research has been studied for decades by the leisure sciences, scientests in many fields, including geography and public health, are beginning to find park research an important topic to their disciplines. When studying park use among members of different races and ethnicities, (ethno-racially differentiated park use there appears to be two competing perspectives existing between the accepted approaches. Leisure researchers utilize a socio-demographic approach, studying aspects such as affluence, ethnic preferences, and assimilation. Geographers, however, hold that a socio-spatial technique is best when seeking to understand ethnoracially differentiated park use. Proponents of the sociospatial approach remark that leisure research overlooks the influence of race and nature ideologies of the time on the development of parks. Leisure researchers have even been accused of perpetuating stereotypes when discussing park use by various ethnicities (Byrne, 2011).

Although the socio-demographic approach may neglect to pursue spatial observations asserted by advocates of the socio-spatial approach, findings that may seem "stereotypical" from critics are still results many geographers obtain even when using their own technique. While investigating the perceptions of Corpus Christi residents towards neighborhood and city parks, I hope to uncover corroborating evidence to support or refute these findings by leisure scientists and geographers alike to assess whether or not the current research is perpetuating stereotypes. I also intend to use the more comprehensive socio-spatial approach to evaluate distribution of park space and amenities throughout Corpus Christi, Texas.

THE SOCIO-DEMOGRAPHIC APPROACH

Developed by leisure scientists, the socio-demographic approach focuses on participants' interaction with parks and nature. Leisure studies tend to study parks as spatially-fixed, unchanging entities, an approach that has been criticized by geographers (Talen, 2010; Byrne, 2011). Leisure scholars typically focus on identifying the constraints of park use, that is, "anything that inhibits people's ability to participate in leisure activities, to spend more time doing so, to take advantage of leisure services, or to achieve a desired level of satisfaction" (Jackson & Henderson, 1995).

The four main leisure theories of park participation constraints are: 1) marginality, 2) subcultural, 3) assimilation, and 4) discrimination (Byrne & Wolch, 2009). Marginality theory attributes low park participation among minorities to limited access to socioeconomic resources created by historical patterns of racial discrimination, which affords minorities little disposable income to be used for recreation (Floyd, 2001). This theory assumes minorities are equally interested in pursuing outdoor recreation as non-minorities, and if it were possible to eliminate socioeconomic hardship, equal park participation would occur among members of differing minority status. Subcultural theory suggests that unequal park participation among members of different races and ethnicities is due to differences in normalities, values, and socialization practices, which results in unique cultural preferences (Floyd, 2001). This implies that park amenities ought to be distributed to meet the needs of each racial and ethnic group. Assimilation theory refers either to the adaptation of the minority group to the culture of the majority group, or "host society", or to the social interaction of majority and minority groups in a variety of societal groups (Floyd, 2001). This theory assumes that with greater assimilation of the minority group into the host society, greater similarities will be seen between minority and majority groups. Assimilation theory has been particularly helpful in the study of immigration trends (Floyd, 2001). Lastly, discrimination theory states that minorities may experience a feeling of discrimination when visiting parks, which changes how they use parks (Byrne & Wolch, 2009), although documented evidence with this theory is limited (Floyd, 2001).

The use of these theories has assisted in evaluating participation preferences in park activities among members of various ethnicities, races, and income statuses. In order to explain why certain demographic groups are inclined to participate in certain activities,

leisure researchers to revert back to explaining the constraints of certain demographics to participate in alternative activities. In terms of race, leisure researchers have found that African-Americans have typically preferred organized recreational activities (Payne et al., 2002), and when given a choice between indoor and outdoor social activities, were more inclined to choose indoor activities such as shopping than nature activities typically found in parks (Shinew et al., 2004). In terms of race and ethnicity, African-Americans and Hispanics were more likely to engage in team sports than Caucasians and Asians (Sasidharan et al., 2005). Chavez (2001) found that Latinos preferred park development that allowed for increased social interaction.

Gobster (2002) found that minorities usually visited parks in groups, appearing to make park visits family-oriented, while Caucasians typically visited alone or in couples. This was reflected in the park activity participation expressed by the respondents (Gobster, 2002). Minorities tended to favor activities associated with relaxation and socialization such as picnicking, watching sports, and engaging in parties and festivals. Caucasians favored active individual sports, such as walking, jogging, and bicycling. Group sports games were favored by both Caucasians and minorities, but varied with sports type (basketball for African Americans, soccer for Latinos, volleyball and golf for Asians, and golf and tennis for Caucasians).

THE SOCIO-SPATIAL APPROACH

Used by geographers and researchers in public health, the socio-spatial approach to the study of park use emphasizes the need to address parks as "fluid, socio-ecological assemblages" (Jessop et al., 2008). Their interest lies in understanding how the attributes of parks are shaped by race relations and nature philosophies over time. This approach operates within an ever-changing framework termed the TPSN framework (Jessop et al., 2008). This theory focuses on four spatial dimensions: territory, place, scale, and network.

The first spatial dimension, territory, refers to the effect of boundaries on societies and place. It is implemented in situations where inside and outside divides exist bordering, parcelization, and enclosure (Jessop et al., 2008). Though not explicitly stated, this dimension can explain why special effort is needed when performing

spatial analyses near borders of a study area, even when analyzing smaller geographic extents such as cities (Dai, 2011).

Place, long-considered spatially-fixed and independent, is a spatial dimension understood by geographers as ever-changing and embedded in surrounding social relations (Jessop et al., 2008). Place is based on principles of proximity and spatial embedding, which can be seen in most ethno-differentiated park use research, particularly in studies of spatial distribution of parks and visitor perceptions (Byrne, 2011).

Scale refers to the influence that various geographic levels of social and economic relations have on a study area (Jessop et al., 2008). Scale is a dimension often used when examining a process existing in a hierarchy or exhibiting vertical differentiation from local, regional, national, or global relations. This dimension may be illustrated in park planning when studying how a locality is affected by state or national regulations or standards (Comber, Brunsdon & Green, 2008).

The final and most recently studied spatial dimension theorized by the socio-spatial approach to ethno-differentiated park use is networks, which is frequently applied using geographic information systems (GIS). Network studies focus on interconnectivity and interdependent structures, likely taking the form of nodal connectivity (Jessop et al., 2008). Geographers studying park use regularly construct various algorithms and methodologies to perform network analyses, which aid in understanding park accessibility and supply in various cities (Comber, Brunsdon & Green, 2008; Comer & Skraastad-Jurney, 2008; Dai, 2011).

The goal of socio-spatial research, according to some researchers, is to develop a multi-dimensional approach to studying socio-spatial relations (Jessop et al., 2008). This explains why findings utilizing the socio-spatial approach regarding ethno-racially differentiated park use typically provide more holistic conclusions than socio-demographic research (Byrne, 2011). Byrne and Wolch (2009) support a four part approach to studying ethno-differentiated park use: 1) socio-demographic characteristics of park users and non-users, 2) political ecology and amenities of parks, 3) historical and cultural context of park provision, and 4) individual perception of park spaces. Although geographers

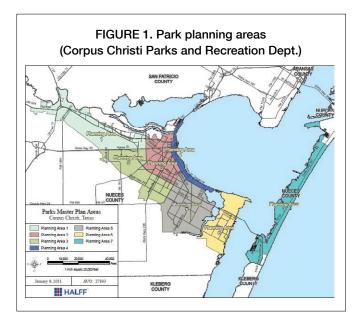
regularly criticize the socio-demographic approach as leading to stereotypical findings, researchers typically find themselves with similar results in studies of ethnic and racial comparisons of park activity participation. For example, Byrne (2011) found that many participants focused on the family-oriented activities of picnicking, barbequing, swimming, and team sports in a qualitative study of Latinos visiting four parks in Los Angeles, California, which is consistent with leisure research results.

Following Byrne and Wolch's recommendation, it would be interesting to observe the relationship between socioeconomic status and ethnicity and nearby distribution of park space and park characteristics, i.e. amenities. A study of public perception of neighborhood and city parks and their amenities would be valuable to the area and appropriate to research under the sociospatial approach. The objective of this research is to utilize the more recent and more comprehensive sociospatial approach to attempt to answer the following questions in the context of a South Texas city: 1) Is there a disparity in park distribution among residents of different socioeconomic status? Among residents of different race or ethnicity? And 2) Are park amenities meeting the needs of the local population within the neighborhood? These questions regarding park and park amenity distribution will be answered by measuring the perceptions of city residents and utilizing GIS methodology.

METHODS

In order to analyze these questions as they pertain to Corpus Christi, Texas, a mail-in survey was conducted in the core of the city. Corpus Christi's somewhat homogenous racial demographics, yet seemingly large spatial disparity in park quality make it an interesting city to evaluate ethno-racially differentiated park use and access. The parks with the newest, highest quality park amenities are mostly found along Ocean Drive, located in Planning Area 4 (Fig. 1). This street is also well-known for housing some of the wealthiest residents in the city. Planning Area 2 contains older neighborhoods, as well as the downtown area, and residents here would have more established neighborhood parks. Planning Area 3 is a more rural area of the city and is less densely populated. Lastly, Planning Area 5 contains

the quickly-growing south side of Corpus Christi, and with new residential development may come new park development. Thus residents in Planning Area 5 may or may not have adequate park access. Survey participants were selected within park planning areas 2 through 5.



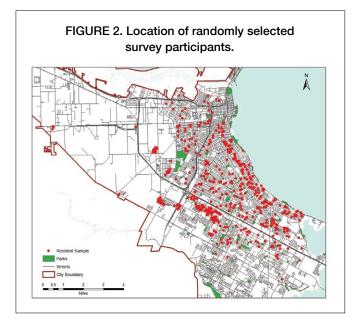
DATA SOURCES AND SELECTION OF SURVEY PARTICIPANTS

Survey participants were selected using spatial and Census data. Parcel centroids and park polygons were provided by the GIS department of the City of Corpus Christi. Street lines, block polygons, and the city boundary of Corpus Christi were obtained from Census 2010 Tiger/Line shapefiles. Land use/land cover data were provided by the United States Geological Service. Additionally, housing unit occupancy status was used from Census 2010 at a block level.

The collected spatial data were loaded into ArcGIS 10. All data were clipped to the extent of the Planning Areas 2 through 5. Housing unit occupancy status was spatially joined to the Census block polygons. Parcel centroids were selected based on their location in residential land use and whether they contained Census blocks with at least one occupied housing unit. A preliminary buffer of parks was performed to assess park availability within a ½ mile radius of the remaining parcel centroids. This, however, showed that the vast majority of the sample area had at least one park within the determined radius.

Because of this, it was determined that a resident's proximity to a park would have little influence on his or her ability to respond to the survey. Therefore, park availability to each parcel centroid was not considered in the selection of survey participants.

A random sample of 125 points was then generated within each planning area. The points were intersected with the parcel centroids to snap each randomly generated point to the nearest parcel centroid. Thus, a random sample of 500 residential addresses was created within the extent of the planning areas (Fig. 2).



SURVEY DESIGN AND DISTRIBUTION

The survey was designed and distributed based on the methods prescribed by Dillman (2007) in order to maximize response rates. The survey contained four sections, including an assessment of park use and access, perception of neighborhood and city parks, perception of park amenities, and demographic information.

An informational postcard describing the study was distributed by mail to the 500 random physical addresses. Due to the unavailability of specific residential land use data (e.g. high-density, medium-density, etc.) and the block-level occupancy status information used in selection of participants, several selected addresses were returned as vacancies. Thus, the final sample size decreased from 500 to 453. Each valid address was then sent a packet containing a letter describing the research, a consent form, the survey, and an addressed

and stamped envelope. Approximately one week later, reminder postcards were sent to those who had not yet completed the survey. The survey closed the following week.

RESULTS

The mail-in survey closed with 64 respondents, a response rate of 14.13%. The locations of respondents were relatively well-distributed among the geographic extent of the targeted area (Fig. 3). The frequency of Hispanic/Latino origin was also fairly balanced, essentially resulting in a 2:3 ratio of non-Hispanic to Hispanic respondents (Table 1). For this study, all respondents who identified as a race other than White and/or who indicated Hispanic ethnicity were grouped as one to gain statistical significance. In this configuration, race of respondents were nearly 1:1 between White non-Hispanic (53.97%) and minorities (46.03%). Survey distribution of race and ethnicity vary from demographic characteristics of Corpus Christi. Over half of Corpus Christi householders are Hispanic (52.04%), while 47.96% are not (U.S. Census, 2010). Approximately 41% of householders identify as White non-Hispanic, while minority householders comprise approximately 59%. Nevertheless, White and minority groupings were chosen to represent race in statistical analysis of the survey due to their closeness in size.

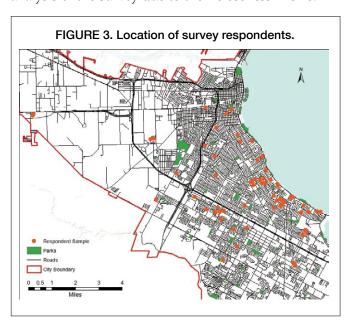


TABLE 1. Frequency of respondents' race by Hispanic/Latino origin.

		Frequency (%)
Non-Hispa	anic	39 (61.90)
	White	34 (53.97)
	Other	5 (7.94)
Hispanic		24 (38.10)
	White	16 (25.40)
	Other	5 (7.94)
	No answer	3 (4.76)

Parks most frequently visited by all races/ethnicities were Cole (17 respondents), Lamar (6 respondents), and Pope (5 respondents). Minorities most frequently visited Cole Park (10) above all other parks, while White non-Hispanics visited Cole (7), Lamar (6), and Pope (4) fairly equally. The most frequently visited parks by income level were Cole (16), Lamar (5), and Pope (5). Respondents whose annual household income was higher than \$50,000 visited Cole (9), Lamar (5), and Pope (5) most frequently, while those whose income was lower than \$50,000 visited Cole Park the most, with 7 respondents.

In terms of mode of transportation used to visit parks, approximately half (51.5%) of White non-Hispanic respondents walk or bike to parks, while 37.9% of minorities walk or bike. Respondents with income levels over \$50,000 walk or bike to parks 54.1% of the time, while those whose income are below \$50,000 walk or bike 33.3% of the time. When asked how long respondents were willing to travel to visit parks, 0.03% of White non-Hispanics were willing to travel more than half an hour compared to 28.57% of minorities. 30% of lower income respondents were willing to travel over half an hour to visit parks, compared to 5.41% of higher income respondents.

Variables significant in the minority/non-minority correlation are shown in Table 2. There was a strong correlation between income and the groups selected to test race. White non-Hispanic respondents typically had a higher annual household income than minorities. The amount of time minorities were willing to travel to visit a park was slightly higher than Whites. Whites seemed more satisfied with the abundance of parks in their

TABLE 2. Significant variables with White and minorities as independent variables.

		Mean	
Variable	Pearson Correlation	White	Minority
Income	417**	5.094	3.815
Travel time	.214*	2.182	2.643
My neighborhood has enough parks	252*	4.121	3.464
City parks positively contribute to quality of life	232*	4.000	3.414
Quality of neighborhood amenities			
Basketball	.216*	1.917	2.188
Bike path	.290*	1.615	2.438
Garden	.262*	1.111	1.462
Fitness trail	.269*	1.692	2.429
Restrooms	.331**	1.214	1.833
Quality of city amenities			
Grill	.246*	1.731	2.167
Playground	.234*	2.103	2.600
Neighborhood wants			
Grills	.224*	4.969	6.462
Shelters	347**	7.412	5.125
City wants			
Shelters	225*	8.000	6.708

*p < .05, **p < .01. *Note*. Response options for "Travel time" ranged from 1 (< 10 minutes) to 5 (< = 1 hour). "My neighborhood has enough parks" and "City parks positively contribute..." ranged from 1 ("strongly disagree") to 5 ("strongly agree"). Quality of neighborhood and city amenities responses ranged from 1 ("poor") to 4 ("excellent") and 0 ("No experience/ not applicable"). Neighborhood and city desired amenities were to be rated on a scale of 1 (least desirable) to 10 (most desirable).

neighborhoods. They also indicated a slightly higher belief that parks contribute positively to their quality of life. Interestingly, Whites consistently scored the quality of significant neighborhood and city amenities lower than minorities. Whites indicated a desire for more shelters in city and neighborhood parks, while minorities indicated a desire for more grills in their neighborhoods.

Other variables that were close to significance included respondents' perception of city parks contributing to the local economy by attracting tourists (-.201, sig. .059), with Whites averaging 3.636 and minorities averaging 3.103. Quality of neighborhood backstops, a necessary facility for some group sports, was close to significant (.190, sig. .069), with means for Whites and minorities of 2.188 and 2.368 respectively. Quality of neighborhood baseball and softball fields was also nearly significant (.209, sig. .051), with means of 2.071 and 2.1875 for Whites and minorities. Lastly, desire for neighborhood (-.216, sig. .055) and city (-.213, sig. .054) bike paths were closely significant with means of 7.580 and 6.160 for neighborhood bike paths and 7.875 and 6.577 for city bikes paths.

Respondents' answers were then correlated by income using two groups: annual mean household income less than \$50,000 and greater than \$50,000. Variables that were significant in the correlation are presented in Table 3. In the assessment of amenity quality in neighborhood and city parks, wealthier respondents consistently scored park amenities lower than less wealthy respondents, though both groups consistently scored amenity quality in the range of "poor" to "adequate." In the portion of the survey regarding desirability for various amenities, lower income respondents indicated more desire for neighborhood sports facilities and grills, while higher income respondents indicated a desire for more community gardens within their neighborhoods. Lower income respondents also indicated more desire for grills in city parks in general.

Notable variables that were close to showing significance included respondents' perception toward neighborhood parks positively contributing to home property values (Pearson Corr. 0.199, sig. 0.067). Lower income respondents averaged 3.524 on this question, while higher income respondents averaged 4.027. Respondents' feeling of safety in city parks was also almost significant (-.188, sig. 0.079), with lower incomes averaging 3.857 and higher incomes 3.459. A neighborhood desire for bike paths was also almost significant (.212, sig. .064), with means of 6.222 and 7.657 respectively for lower and higher income groups.

TABLE 3. Significant variables when independent variable is income.

Means						
Variable	Pearson Correlation	Less than \$50,000	More than \$50,000			
My neighborhoods has enough parks	.280*	3.300	4.081			
City parks are attractive and pleasing to visit	237*	3.600	3.027			
Quality of neighborhood amenities						
Backstop	356**	2.438	2.125			
Baseball/softball fields	289*	2.133	2.000			
Basketball	341**	2.286	1.923			
Community garden	239*	1.444	1.091			
Swimming pools	299*	2.222	1.333			
Quality of city amenities						
Backstop	360**	2.500	2.000			
Baseball/softball						
fields	337**	2.529	1.929			
Basketball	398**	2.556	1.963			
Fishing	.234*	2.444	2.462			
Grill	.227*	2.375	1.742			
Playground	349**	2.684	1.531			
Picnic tables	361**	2.500	1.900			
Neighborhood wants						
Backstop	340**	7.158	4.455			
Baseball/softball fields	312*	6.944	4.636			
Basketball	264*	7.222	5.469			
Community						
gardens	.272*	4.882	8.471			
Grills	310*	7.167	5.000			
City wants						
Grills	238*	7.632	6.056			

*p < .05, **p < .01. *Note*. Response options for "My neighborhood has enough parks" and "City parks are attractive..." ranged from 1 ("strongly disagree") to 5 ("strongly agree"). Quality of neighborhood and city amenities responses ranged from 1 ("poor") to 4 ("excellent") and 0 ("No experience/not applicable"). Neighborhood and city desired amenities were to be rated on a scale of 1 (least desirable) to 10 (most desirable).

Lastly, both income groups indicated a desire for city bike paths (.199, sig. .072), with means of 6.7 and 7.914 respectively.

A T-test was performed using a survey questions regarding frequency of park use within the past year (Table 4). Respondents who indicated they visited public parks "almost never" or "a few times" a year were grouped as infrequent park users (n=37), while those who visited parks "once a month" to "almost daily" were grouped as frequent park users (n=26). It may be worth noting that 57.58% White non-Hispanic were infrequent park users, compared to 62.07% of minorities. 71.43% of those whose income was less than \$50,000 were infrequent park users, while 54.05% of those above \$50,000 visited parks infrequently. Frequent park users tended to perceive neighborhood and city parks to positively contribute to their quality of life. Neighborhood swimming pools

TABLE 4. Significant variables among frequent and infrequent park users.

Means				
Variable	Sig. (2-tailed)	Infrequent (n=37)	Frequent (n=26)	
Neighborhood parks contribute positively to quality of life	.004	3.65	4.50	
City parks contribute positively to quality of life	.076	3.46	4.04	
Quality of neighborhood park amenities				
Swimming pool	.019	.68	.20	
Neighborhood wants				
Bike path	.029	6.16	8.00	
City wants				
Bike path	.032	6.59	8.28	
Swimming pool	.006	5.03	7.57	

Note. "Neighborhood/city parks positively contribute..." ranged from 1 ("strongly disagree") to 5 ("strongly agree"). Quality of neighborhood amenities responses ranged from 1 ("poor") to 4 ("excellent") and 0 ("No experience/not applicable"). Neighborhood and city desired amenities were rated on a scale of 1 (least desirable) to 10 (most desirable).

were also perceived by frequent park users to be of poorer quality than infrequent park users' perception of the neighborhood amenity. Frequent users also indicate a stronger desire for neighborhood and city bike paths and city swimming pools than infrequent users.

A one-way ANOVA was performed to analyze the significance of variables between the race/ethnicity groups (White/Non-Hispanic, Minority) and income groups (<\$50,000, >\$50,000). A two-way ANOVA was then performed for variables found to be significant by the one-way ANOVA test in order to determine group means. Neighborhood abundance of parks was nearly significant, with lower income minorities agreeing less than any other group. The perceptions of lower income minorities and higher income Whites in regards to activity and healthiness in parks was significantly lower than lower income Whites and higher income minorities. Quality of baseball and softball-related amenities were perceived to be of higher quality by lower income minorities and lowest quality by higher income minorities. It is important to acknowledge that the groups used in the analysis are not large enough

TABLE 5. Significant variables among income and minority status.

	a		Mea	ns	
Variable	Sig. (2-way ANOVA)	2-way White Non-		Minority	
		<\$50,000 (n=6)	>\$50,000 (n=26)	<\$50,000 (n=16)	>\$50,000 (n=11)
Neighborhood has enough parks When visiting neighborhood parks, I feel	.069	4.400	4.077	2.933	4.091
active and healthy Quality of city park amenities	.005	4.600	3.769	3.667	4.727
Backstops	.014	1.600	1.720	2.643	1.182
Baseball/ softball field	.039	1.800	1.720	2.429	1.000

Note. "Neighborhood/city parks positively contribute..." ranged from 1 ("strongly disagree") to 5 ("strongly agree"). Quality of neighborhood amenities responses ranged from 1 ("poor") to 4 ("excellent") and 0 ("No experience/not applicable"). Neighborhood and city desired amenities were rated on a scale of 1 (least desirable) to 10 (most desirable).

to constitute statistical significance. This analysis was performed simply to fulfill curiosity. Further research and analyses would require a larger sample size to reach statistical significance.

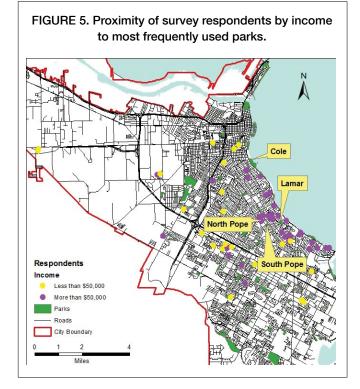
DISCUSSION

According to data on frequency of park visitation, there is less diversity in the parks minorities choose to visit. Minority and low income responses of frequency in park visitation was clustered around Cole Park more than any other park, unlike White non-Hispanic and higher income respondents, who indicated more variety in parks most visited. This suggests that Cole Park, the park with the most and best amenities, is attracting minorities and lower incomes from around the city more than the neighborhood parks more closely located to these residents. This is consistent with the increased likelihood of minorities and lower income respondents to travel by car and the higher likelihood to travel longer. This may be attributed to poorer perceived quality of nearby parks or fewer desired park amenities in their neighborhoods. This finding raises the question of whether the city ought to build and maintain attractive parks with little attention to the proximity of those parks to minorities and lower incomes, since these groups are willing to travel farther and longer than others. On the other hand, perhaps due to this method of park planning, minorities and lower incomes have been conditioned to travel farther and longer, thereby uncovering a need for the city to maintain a larger quantity of attractive, interesting parks near these groups of residents to provide more equitable park access.

This issue of lower satisfaction of neighborhood parks perceived by minorities and lower income residents is reinforced by the relatively higher satisfaction expressed by White non-Hispanics with the amount of parks in their neighborhoods. Since White non-Hispanics are satisfied with the amount of parks near their homes, they are more willing to travel by foot or bike and less willing to travel more time to reach their destination, which is consistent with other data collected. Because they are likely more engaged in their neighborhood parks, it is understandable that White non-Hispanics would feel their parks contribute positively to their

Respondents
Minority Status
White Non-Hispanic
Minority
Parks
Roads
City Boundary

O 1 2 4
Miles



quality of life than minorities who seem to be less engaged in their neighborhood parks.

Although White non-Hispanics seem more engaged in their nearby parks, they also consistently scored the quality of neighborhood and city amenities lower than minorities. This may mean that White non-Hispanics are somewhat more critical of their surroundings. This group may have access to private fitness and leisure facilities such as golf courses and gyms, resulting in less need for public, city-maintained facilities. The same low scores in amenity quality were found in higher income status, thus strengthening the inference of less need for public, city-maintained facilities.

Higher income respondents indicated a strong desire for community gardens. Most community garden literature demonstrate that users of community gardens are most commonly motivated by the social benefits of participating in the gardens, such as increasing community resilience or social interaction (Guitart et al., 2012). The second most common benefit demonstrated by users was the promotion of environmental sustainability by utilizing less attractive land for the purpose of gardening. Although a wide array of economic statuses and cultural backgrounds were found to participate in community gardening, it may be the case that higher incomes have the flexibility to care about these common gardening benefits, thereby increasing their desire to participate in community gardening. Using a larger sample size and more varied statistical groupings for income and race/ethnicity could analyze this concept more thoroughly in Corpus Christi.

White non-Hispanics desired shelters in cities and public parks, while minorities desired grills. A desire for shelters could indicate a desire to pursue more leisurely, social activities. This may be contrary to literature by leisure researchers that suggest Whites tend to prefer solitary activities (Gobster, 2002; Sasidharan et al., 2005). Since this specific amenity is discussed in neither leisure nor geographic literature, it may be worth examining in the context of Corpus Christi. Testing multiple definitions of shelter among a larger sample size may also be helpful.

Minorities' desire for grills was consistent with leisure research, as minorities have typically used parks for more social activities. The indication by lower income respondents for more team sports facilities and grills are also consistent with the literature, since these amenities are associated with outdoor social activities. Again,

since minority status and income status were highly correlated, it would be expected that lower income and minority desires would be similar. The same should be true for non-minorities and higher incomes.

CONCLUSION

Returning to the original questions, do disparities in park distribution exist among residents of differing socioeconomic status or minority status? Are current park amenities meeting the needs of the local residents? According to the perceptions of this group of residents, it seems there exists somewhat of a disparity between minority/low-income and non-minority/higher income neighborhoods in terms of quality and quantity of neighborhood parks. Minorities and lower income residents tend to drive farther and travel longer to parks and have a lower frequency of park attendance. This may be attributed to insufficient park space or park amenities available in their neighborhoods. This finding could initiate more research into the specific constraints that seem to be put on the minority group in Corpus Christi.

In terms of park amenities meeting the needs of local residents, it seems unlikely. Certainly each group has amenities they would like to see in their neighborhood parks, but it is clear when examining the vast infrequency of park attendance within each group (over half of all groups are infrequent park users) coupled with the feeling that their neighborhoods have enough parks that residents are not benefiting from parks as much as they could. More work needs to be done to understand which parks need to be revitalized for each neighborhood and how the city could meet more needs of its residents. Further research into the influence of ideologies of nature historically within the city would also be interesting. This would help us understand how the development of Corpus Christi's green space has changed over the years and may even lead to predictions for future park development based on current ideals held by various stakeholders in park planning.

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WHAT DO THEY WANT TO BE WHEN THEY GROW UP AND WHY?

by SABRINA DEL MORAL



ABSTRACT

Aspirational prestige within occupations has been seen as gender divided throughout past generations. But with the stabilization of gender norms and with females going into previously male-dominated occupations, the prestige levels of males and females jobs goes into question. This study looks at how gender is related to prestige levels in aspired occupations of college students. In addition to that, racial-ethnic backgrounds are looked at comparing how Non-Hispanic Whites and Hispanics differ in aspirational occupation prestige levels. The findings concluded that males and females in the study were aspiring for occupations with similar or equal prestige levels. Even when controlling for gender and race, the researchers found the same results. While this study does show that males and females were aspiring for occupations with similar or equal prestige scores, it does raise the question if males and females were aspiring



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for different jobs, but with similar prestige levels. Therefore, this study continued to look at if males and females were choosing occupations that were gender segregated. The researchers found that even though prestige scores among the genders were similar or equal, men were choosing more gender segregated occupations while women were more gender integrated with their occupational aspirations.

STATEMENT OF PROBLEM

Throughout past generations in the United States we have seen a shifting of gender roles that is reflected in career aspirations. During the 1950s and 1960s, traditional gender roles continued throughout the nation. The housewife was a cultural icon, while men continued to be seen as breadwinners (Jones et al. 2011). After major social movements and conflicts (Jones et al. 2011), new gender norms stabilized, welcoming the ideas of women working and of more flexibility within occupational choices. (Jacobs 1995).

Current generations are now being raised by parents who grew up during this stabilization. Now, women and men can pursue basically any occupation they choose. With that in mind, the question arises, is the current generation more open to the idea of careers outside their gender scripts in different prestige levels? This research uses information from the millennial generation, whereas previous research on gender and

career aspiration tends to come from data sets from the 1980s and 1990s. In addition, with a growing Hispanic population, and little research on this group, this study pays particular attention to this group. Overall, this research examines how gender and racial-ethnic background relates to aspirational occupation prestige.

LITERATURE REVIEW

Post World War II

With the end of World War II in 1945, millions of men in uniform returned home and back to their lives (Jones et al. 2011). The men coming home also meant that the millions of American women who entered the labor force during the war were now feeling intense pressure to leave it and return to their homes as mothers and wives (Jones et al. 2011). Now that the war was over and men were back in the labor force, traditional gender roles were brought back to America. The push toward "traditional" gender norms stayed consistent as suburban areas became popular across the nation. Life in suburbia helped reinforce a sharpening of gender role in families; men stayed head of the household, and women continued to fulfill responsibilities with the house and children (Jones et al. 2011).

Society had the impression that the postwar American dream consisted of "successful breadwinners supporting attractive homemakers in well-appointed, comfortable homes" as an American journalist stated (Jones et al. 2011). The "American dream" then, made gender roles stronger within families, pushing for more traditional ways of life, which was a clear conflict for career woman. Career women and women in college were considered "contradictions" to what society saw as the traditional woman, i.e. housewives, and were even labeled "deviants for violating sex-role norms" (Simpson and Simpson 1961).

While many women accepted the housewife role, others didn't feel the same (Jones et al. 2011). One-third of American women decided to continue working after the war (Jones et al 2011). As time went on the number of full-time homemakers started to decrease, more women entered the workforce; many escaping what Betty Friedan called the "problem that has no name", which was a feeling of dissatisfaction among housewives that made them feel unhappy and disappointed with their

lives. In addition, many women continued to work even after the war due to the satisfaction they obtained from earning their own income (Jones et al. 2011). Men's jobs usually stayed safe during this increase of female workers since many of the higher-earning and higher skilled jobs were reserved for the men (Jones et al. 2011).

Gendered Career Aspirations

Throughout this time some mothers and wives started to work part-time while their children where at school and made use of their homemaking talents for pay. It's important to note that this was done with the expectation that they were homemakers before they were workers (Jones et al. 2011). But along with these part-time working moms and wives came women who wanted to work full-time after the war. The number of married full-time working women started to rise during World War II and continued to increase even after the war (Jones et al. 2011). As more and more women started to enter the workforce, modified gender scripts followed along with them. Women started working in jobs that matched their traditional gender roles. Almost half of women who did earn a Bachelor's degree in the 1960s did so in teaching. Other major career decisions were focused around English, fine arts, history, home economics, and nursing. Those five college majors and teaching account for 75% of degrees earned by women in the 1960s (Jacobs 1995). Even though women started to become part of the workforce, the choices were very limited. Other occupations that favored women during this time were clerical workers, sales workers, hairdressers, and cosmetologists, all jobs that are predominantly stereotyped for women (Oppenheimer 1968).

Compared to women, men had more occupations to choose from in the 1960s. Although women's occupational choices were limited to a small number of categories, there was not one occupation or specialty that was filled by more than 20% of the male population in the 1960's, leading to the conclusion that men' jobs were more widespread than women's. (Jacobs 1995). However, many occupations and fields did come with the stereotype of being filled only by males, such as engineering, physical sciences, or those occupations requiring physical strength on a daily basis (Jacobs 1995;

Oppenheimer 1968). Thus both men and women were going into occupations in that fit their gender scripts.

Significant Factors

Socialization among genders dictated for more traditional occupational choices among both men and women during the 1960's and 1970's. Females' family size and education attainment of parents' was also reflected in career decisions made by females (Rosen and Aneshensel 1978). However, socioeconomic status was the main influence on female's occupational decisions (Rosen and Aneshensel 1978). Women of lower socioeconomic status found it even harder to pursue high prestige careers, especially when they didn't have the support from their families do to so (Danziger 1983). Furthermore, traditionally socialized girls were taught at an early age to value skills and characteristics like "interpersonal skills, attractiveness and popularity" while boys were taught to value "competitiveness and personal achievements" (Rosen and Aneshensel 1978). Consequently, obstacles for women and men to act against the sex-role norms started up long before they even entered the workforce as adults (Rosen and Aneshensel 1978).

Factors that influenced male's career aspirations included features that concentrated performance, such as academic achievements, mental abilities, and self-assessments (Rosen and Aneshensel 1978). The more males believed they were capable of the mental challenges they would face in higher prestige occupations the more likely they pursed them. Academic achievements and self-assessments also showed males that they had reason to believe they could handle the occupation they aspired for. Achievements show talents, so the more they achieved, the more they felt prepared for the high prestige occupations. While female's influences typically included outside factors, male's mostly consisted of personal traits (Rose and Aneshensel 1978). Males were more likely to choose higher status jobs than females because women were more likely to focus on their family than their career (Bielby 1978).

Societal Shift: Stabilization of Gender Roles

Starting in the 1960's, many social reforms and conflicts arise about gender occupations/ work, education, and

pay. With these concerns came many changes that affected how gender was viewed. The Equal Pay Act of 1963 meant to help even out the salaries for men and women doing similar work (Jones et al. 2011). In 1966, the National Organization for Women (NOW) was founded and fought against sexual discrimination in wages, education, and employment. NOW's fight then led to the women's movement, dedicated to increasing women's opportunities and to alter gender relations in America (Jones et al. 2011). In the 1970s, more women began going college, thus expecting to create a career out of them. Many single-sex colleges became coeducational, and male and female dorms moved closer together (Jones et al. 2011).

In 1972, Title IX required that schools spend equal amounts on men's and women's sport programs. This crucial step helped shape women's image in American culture. They didn't just participate in cheerleading, but in other sports that males were predominantly seen in (Jones et al. 2011). While in the 1950s over 70% of American families consisted of a stay-at-home mother and a working father, only 15% of American families were constructed that way in 1980 (Jones et al. 2011). The result of all of the conflicts and debates was a stabilization of new gender norms. The level of segregation in the workforce decreased from the 1950s to the 1990s, after remaining mostly unchanged for the first part of the century (Fullerton 1999). In the 1980's we also saw a stabilization of gender norms among college majors and careers (Jacobs 1995).

Gendered Aspiration

After this stabilization of new gender norms, more women enter jobs that were previously male-dominated (Jacobs 1995). In the early 1990s these women were called "pioneers", standing for women who were going into unknown territory (Sandberg, Ehrhardt, Ince, and Meyer-Bahlburg 1991). The number of occupations women participated in increased. For example, in 1990, 46.7% of bachelor's degrees in business were earned by women. From 1980 to 1990, law degrees earned by women increased more than 20%. Life science, physical sciences, and engineering all increased for women as well, but by very little (Jacob 1995). Overall, more and more women started entering high prestige, male-dominated career, though they are entering at low

rates. But there are still a number of women focusing on "pink-collar jobs" such as secretarial, child care, nursing, and teaching (Macionis 2010). While some women continue to become "pioneers", others would prefer to stick to the gender norms of society. In all actuality, the majority of women are still focusing on highly female-dominated occupations (Macionis 2010).

Men, however, have yet to make much growth in female-dominated job (Jacobs 1995). Men have been shown to concentrate on areas that require critical thinking, such as math, science and technology (Lips 2004; Schulenberg et al. 1991). In recent years, men have been shown to make up the majority of police officers, engineers, physicians, surgeons, and corporate managers (Macionis 2010). While women have made a significant increase in male typical occupations, the number of men in female-dominated jobs has not shown a parallel. They instead continue to concentrate on high prestige, male-dominated careers.

Factors That Lead to Gendered Aspirations

Women's occupational choices expanded during the past few decades, yet women have mostly continued traditional gender role occupations (even though there has been more equality in recent years). This may be so because women are faced with pressure from family and work, which pushes them toward occupations that are female-dominated and believed to be more flexible. Women tend to choose jobs that help them with their family lives, so that way they can still be a part of their children lives (Correll 2004). In addition, as women come closer and closer to entering the workforce, their level of job commitment declines and their occupational choices become more traditional. This could be interpreted to mean that as women start to feel the pressure of work and family life they try to find ways to control both by as choosing a career that allows them to have time for both the roles (Schoon and Polek 2011). Furthermore, socialization of gender norms from past generations are alive throughout subsequent generation and still effect men and women's occupation choices and college majors, which affects their aspirational occupation prestige level (Jacobs 1995).

Men's occupational aspirations remained stable throughout these social changes and have been consistent with male gender norms and the prestige that comes with them. As to why this is, Tinklin et al. (2005) asserts that men mostly reject female-dominated jobs because of the low pay. So much of the reason why men remain with their traditional gender roles within career choices is due to the responsibilities that come along with their gender. Men traditionally are expected to make more money than women and support the family. So while changes have taken place among gender occupational decisions, there are still gender scripts that keep occupations stereotyped (Macionis 2010).

Growing Hispanic population

Along with looking at gender and career aspiration, this research looked at how the Hispanic culture is involved with occupational and educational outcomes. This study was conducted in a Hispanic serving institution, where 40% of the undergraduate student population is Hispanic (College Portrait of Undergraduate Education 2008). Hispanics accounted for over half the national population growth between the years 2000 and 2010 (Schaefer 2012). With an increasing population in the nation and so little research concentrating on Hispanics, the research focusing on this population is needed. Since Mexican Americans make up 63% of the United States Hispanic population (Pew Research Center 2011), research conducted on Mexican Americans can be considered related or similar to the research on Hispanic population. Furthermore, Texas A&M University is a regional university, fairly close to Mexico. It can be assume that many of the Hispanic students that attend the university are Mexican American.

With that being said research on Mexican Americans shows that they are viewed as holding lower standards of education and are stereotyped as being the non-active student who doesn't care about schooling. Unfortunately, this stereotype helps keep Mexican American students in lower prestige occupations. Thus, many Mexican Americans stay out of colleges in general and out of the running for high prestige occupations (Bettie 2003). In actuality, 44% of Mexican origin students do not make it past high school in the United States. Only 15% earn some kind of degree, including Associate, Bachelor's, Master's, Professional degree, or Doctorate (Covarrubias 2011). Consequently, this data shows that Mexican Americans prestige levels are low since only 15% of Mexican origin individuals earn some kind of degree,

leaving 85% with a high school diploma or lower (Covarrubias 2011). Moreover, Mexican American culture adheres to traditional gender roles that continue into their occupational choices (Wells, 2005).

Research concentrating on the Hispanic population with regard to their aspirational occupation prestige is limited and needs to be examined. This research focused on how gender relates to careers aspirations, specifically the prestige level of those aspirations, along with a cultural perspective on Hispanics' occupational aspirations. In addition, since this research is being conducted in a Hispanic serving institution, it will continue to expand the little research that has been done in such institutions. This research also aims to continue research on gender roles in career aspiration, but within in a different era than the research cited here, much of which was conducted in the 1970's.

METHODS

Sample

This study used data collected from a convenient sample of undergraduate Texas A&M University-Corpus Christi students. All participants were enrolled in an introductory Human Societies course during either the fall 2011 or spring 2012 semester and were at least 18 years of age. One the first and second day of the semester the professor asked students to complete surveys in order to aid class discussions about sociological concepts. During the fall, 167 participants completed the survey, while 74 surveys were gathered during the spring, bringing the total surveys to 241. Of the total, 108 (44.8%) were males and 133 (55.2%) were females. Out of the original sample of 241 respondents, 106 were identified as Hispanic and 101 were identified as Non-Hispanic White.

Everyone was not utilized in the study. All other respondents who answered to neither Non-Hispanic White nor Hispanic were coded as other and eliminated from the sample. In addition, all those who didn't answer questions about their career aspirations were excluded. The final sample size was 148. The table below provides an overview of the sample.

TABLE 1. Breakdown of Sample by Gender and Race (n = 148).

	Males	Females	Total (Race)
Non-Hispanic Whites			
Hispanic	30 (20.2%)	45 (30.4%)	75 (50.7%)
Total (Gender)	65 (43.9%)	83 (56.1%)	148 (100%)

Out of Non-Hispanic whites there were 35 males and 38 females. The Hispanics sample consisted of 30 males and 45 females.

Measures

Dependent Variable

Aspirational Occupation Prestige. Students were asked the open-ended question "What do you hope to be when you are done with your education?" The participants' career aspirations were then matched with a prestige score. These scores were created by Carl Frederick (2010), who created prestige levels for the 2000 census occupational codes using past research that did the same for previous census occupational codes. The prestige score is an interval scale that increases as the prestige level increases. The students' scores ranged from 33.39 to 86.01. From there the occupational codes were coordinated with the corresponding prestige score.

Independent Variables

Gender. Gender is a dichotomous nominal variable. If the respondent was male they received a 0; if they were female they received a 1.

Race. Race was also a nominal and dichotomous variable. In the survey respondents were asked to answer "yes" or "no" to the questions, "Are you white?", "Are you Hispanic?", "Are you Black?", "Are you Asian?", and "Are you Native American?". From the questions, students answering yes to White, but no to all other questions were deemed non-Hispanic White and coded 0. If the respondent answered yes to the question "Are you Hispanic", they were identified as Hispanic and coded 1. All others were coded as other and excluded from the study.

Test of Significance

T-Test

Because our independent variable was considered nominal while our dependent variable was interval, the appropriate test of significance is a T-Test. T-Tests were used to compare the prestige levels by genders and race. The T-test used the hypothesis that males and females would have equal or similar prestige levels, with the alternative hypothesis of them not being equal. When conducting a T-Test a t-value is calculated along with a corresponding alpha. If the alpha is less than .05 then the differences observed are determined to be real. If the alpha is more than .05 then the differences are considered due to chance or non-existent.

RESULTS

Table two shows the mean prestige scores for the total sample of males and females.

TABLE 2. T-Test Comparing Means of Prestige Level for Males and Females (n = 172).

		Males (n = 74))	Females (n = 98)	5		
	Mean	SD	Mean	SD	t	р	
Total	Sample	61.63	8.7	62.39	8.5	58	_ .57

Males mean score was 61.63 while females mean score was 62.39. Because t equals -.58, p equals .57, the mean prestige scores are not significantly different. Males and females in the total sample are actually aspiring for jobs with equal or similar prestige levels.

While the total sample did not show any significant difference among career aspirations for males and females, gender may still influence the aspirations among the participants within similar racial-ethnic backgrounds. Tables three and four control for ethnicity when comparing mean scores of prestige level for gender. Table three compares the means scores of prestige level for Non-Hispanic White males and females.

TABLE 3. T-Test Comparing Means of Prestige Level for Non-Hispanic White Males and Females (n = 73).

		Males (n = 35))	Females (n = 38)	3		
	Mean	SD	Mean	SD	t	р	
Non- White	Hispanic es	61.63	8.5	62.51	7.12	29	.77

Males' aspirational occupation prestige mean score was 61.63. Females mean score was 62.51. Because t equals -.29 and p equals .77, the t-test indicate there is no significant difference between the mean prestige scores. Like the total sample, the mean of males and females occupational prestige aspirations did not differ within the Non-Hispanic Whites sample.

Table four also compares means prestige scores by gender, but focuses on those who self-identified as Hispanic. The findings are presented below.

TABLE 4. T-Test Comparing Means of Prestige Level for Hispanic Males and Females (n = 75).

		Males (n = 30)		Females (n = 45)			
	Mean	SD	Mean	SD	t	р	
Hispa	anics	60.58	9.73	61.86	8.37	61	.55

Males mean score for prestige was 60.58, while females mean score was 61.86. Since t equals -.61 and p equals .5, the t-test indicates that the mean prestige scores are not significantly different. The Hispanic males and females did not differ within their mean prestige scores.

Literature focusing on Latinos discusses the disadvantages and hardships they have to face when attempting to get an education and the fact that many of them don't make it through or past high school (Bettie 2003; Covarrubias 2011). Therefore, they are not expected to have high prestigious aspirations. Given this information, one may anticipate differences between people of the same gender, but within different racial ethnic identities. Thus, t-test compared the mean prestige scores of Non-Hispanic Whites and Hispanics. Tables five and six control for gender. While the previous tables compared gender within the same races, these tables are comparing the races within one gender

at a time. Table five compares the mean prestige level for Non-Hispanic Whites and Hispanic males.

TABLE 5. T-Test Comparing Means of Prestige Level for Non-Hispanic White and Hispanic Males (n = 65).

	Non-Hispanic Whites (n = 35)		Hispanics (n = 30)			
Mean	SD	Mean	SD	t	р	
Males	61.98	8.53	60.58	9.73	.62	.54

Non-Hispanic Whites males mean prestige score was 61.98, while Hispanics males mean was 1.4 points lower. Because t equals .62 and p equals .54, the mean prestige scores are not significantly different. So Non-Hispanic Whites and Hispanic males' prestige scores also do not differ and actually seemed to aspire to occupations with similar prestige.

The Table six compares the prestige level for Non-Hispanic Whites and Hispanic females.

TABLE 6. T-Test Comparing Means of Prestige Level for Non-Hispanic White and Hispanic Females (n = 83).

	Non-Hispanic Whites (n = 38)		Hispanics (n = 45)			
Mean	SD	Mean	SD	t	р	
Females	emales 62.51 7.12		61.86	8.37	.38	.71

Non-Hispanic Whites mean score was 62.51, while Hispanic means score was 61.86. Because t equals .38 and p equals .71, the mean prestige scores are not significantly different. Comparatively, Non-Hispanic Whites and Hispanics females are also aspiring for occupations with similar or equal prestige.

Among all the comparisons between race and gender, there were no significant differences among prestige level. The data suggest that Non-Hispanic Whites and Hispanic males and females hope to achieve occupations with a similar prestige levels. However, these findings raise the question "Are the aspired occupations were still gendered even though the occupations have similar or equal prestige levels?" To test this, the researchers

conducted additional T-Tests comparing the average percent of males in the occupations. Since the percentage in the occupations should be close to 50 percent for the occupations to be considered gendered equal the percent of men in the occupations were used to see if the occupations the participants aspired were jobs that was considered gender segregated or gender integrated. The following tables show the results.

Table seven shows the average percentage of men in the aspirational occupations of men and women in the total sample.

TABLE 7. T-Test Comparing Means of Percent of Men in Aspired Occupations Among Males and Females (n = 172).

		Males (n = 74)		Females (n = 98)			
	Mean	SD	Mean	SD	t	p	
Total	Sample	65.81	20.23	50.10	22.35	4.752	.000

Male respondents identified aspirational occupations that had an average of 65.81% men in that job, while females' aspirational occupations were on average 50.1% male. A t-score of 4.752 and p-value of < .000 indicates that the occupations to which men and women aspire have a significantly different amount of men in those occupations and the results shown are not due to chance. Males are more likely to choose an occupation that is gender segregated and females are more likely to choose jobs that are gender integrated.

After looking at the total sample gender differences were examined for Non-Hispanic Whites and Hispanics. The following tables compare Non-Hispanic White males and females. Table eight has the results for non-Hispanic Whites.

TABLE 8. T-Test Comparing Means of Percent of Men in Aspired Occupations Among Non-Hispanic White Males and Females (n = 73).

		l		Females (n = 38)	5		
	Mean	SD	Mean	SD	t	р	
Non- White	Hispanic es	64.29	18.60	45.70	20.32	4.066	.000

The results for Non-Hispanic Whites follow the same pattern that the total sample. The mean for males was 64.29 and 45.70 for females. Since t equals 4.066 and p < .0001 the results are considered significantly different. For males, the jobs to which they aspired were nearly two-thirds male, while females were more likely to go into gender integrated occupations. Women aspired to jobs that were on average 45.7% male. Even here, women's aspirational jobs had more women in them.

Table nine also compares the means of percent of men in aspirational occupations among Hispanic males and females. The findings are presented below.

TABLE 9. T-Test Comparing Means of Percent of Men in Aspired Occupations Among Hispanic Males and Females (n = 75).

		1		Females (n = 45)			
•	Mean	SD Mean		SD	t	р	
Hisp	anics	66.82	21.42	52.14	23.60	2.737	.008

Hispanic males had a mean of 66.82 and Hispanic females had a mean of 52.14. Because *t* equals 2.737, *p* equals .008 the results shown are consisted significantly different and not due to chance. Following the pervious patterns again, males are more likely to aspire for gender segregated occupations and female gender integrated. Among Hispanic men, they want to be in occupations that are mostly occupied by men, while Hispanic women want jobs that are on average 52.14% male.

Table nine suggests that Hispanic men want more gender segregated jobs than white men and non-Hispanic women want more gender segregated jobs than their Hispanic counterparts. Tables ten and eleven put that suggestion to the test. Table ten shows the results for males.

Non-Hispanic Whites males' mean was 64.29 and Hispanic males mean was 66.82. The t-value was .509 and p-value equaled .612; therefore, the mean percentages are not significantly different. The results show that both groups of males were aspiring for occupations with similar male percentages.

TABLE 10. T-Test Comparing Means of Percent of Men in Aspired Occupations Among Non-Hispanic White and Hispanic Males (n = 65).

	Non-Hispanic Whites (n = 35)		Hispanics (n = 30)			
Mean	SD	Mean	SD	t	р	
Males	64.29	18.60	66.82 21.42		509	.612

The last table compares the percent of men in aspired occupations of Non-Hispanic White and Hispanic females. The results are shown below.

TABLE 11. T-Test Comparing Means of Percent of Men in Aspired Occupations Among Non-Hispanic White and Hispanic Females (n = 83).

	Non-Hispanic Whites (n = 38)		Hispanics (n = 45)			
Mean	SD Mean		SD	t	р	
Females	45.70	20.32	52.14 23.60		-1.319	.191

Non-Hispanic Whites females had a mean percentage of 45.70 while Hispanic females had a mean of 52.14. That means on average non-Hispanic Whites females want jobs that are on average 45.7% male, while Hispanic females aimed for jobs that are on average 52.14% male. Since t equals -1.319 and p equals 191 the results are not considered significantly different and are actually shown to be close to 50 percent which means they are aspiring for more gendered integrated occupations.

DISCUSSION

The main focus of this study was to compare males' and females' occupational aspirations. The overall findings did not support the hypothesis that male and females would hold different aspirational occupation prestige levels. All tests demonstrated that males and females in the study actually had similar aspirational occupation prestige scores. Even when controlling for racial-ethnic identity of male and female respondents, scores still had equal or similar prestige scores.

However, further investigation demonstrated that males were more likely to aspire for gender segregated occupations while females were more likely to aspire for gender integrated occupations.

Previous literature suggested that even though there was an increase in women entering male-dominated occupations after the stabilization of gender norms around the 1980's (Jacobs 1995), women continued to be focused in "pink-collar" jobs or female-dominated jobs (Macionis 2010). Much of the research proposed that there were lingering gender divisions that kept women in female-dominated work spaces and men in male-dominated work spaces (Gabriel and Schmitz 2007). Because of these divisions, the aspirational prestige among the occupations can be perceived as different as well, since male-dominated jobs have been thought of as higher prestige occupations than female-dominated jobs. While, we did find the gender segregation within the male sample as suggested by the literature, the female sample didn't show the same thing, additionally the prestige scores didn't vary as it was predicted.

The initial findings suggested that males and females were going for similar occupations since the prestige scores were so similar; however, the latter results showed that males were choosing occupations that were more male-dominated and therefore corresponded with their gender script. The males had more drive to continue on with male-dominated occupations than females did with female-dominated occupations, even though the prestige score means among the two were similar or equal to each other. This shows that males were determined to stay with those occupations that came with their gender script, even though they held with similar prestige scores as the female's occupational choices. The women's results showed differently. The women in the study were more gender integrating with their occupational aspirations.

Several factors may account for the prestige score results presented in the study, such as the fact that the sample consisted of all college-goers. Many of the participants are going to college because they hope to achieve a better occupation than they currently have. Thus, the fact that their aspirational occupation prestige scores are equal may be because they share similar values and are all going to college to elevate their current prestige scores. This actually is a limitation to the study as well. While research does show that women and men are still divided in occupational prestige, other research shows that the expectations of women are starting to look

more and more like expectations of men (Collins 2011). Instead of going to college to find future husbands, women are now trying to get into the best universities and have high earning careers as well. Parents expect all their children to go to college now and push them to aspire for high prestige occupations (Collins 2011). Furthermore, in reaction to high divorce rates, women are using their careers as a backup or "Plan B" in the case they needed to provide for themselves and their future children (Gerson 2011). Therefore, their occupational aspirations and willingness to be gender integrated may reflect an awareness that they may have to play "breadwinner". These reasons could explain why we saw equal or similar prestige scores in our findings.

LIMITATIONS

This study had a number of limitations that could be improved upon in the future. The study was not conducted with a representative sample, including only college-goers. Making the sample more sociodemographically diverse might produce more valid results, making them more generalizable to other populations. The sample size for each race and gender sample was small and could be improved by increasing the number of participants. Other factors which have been shown to influence could have been included. such as education attainment of parents and gender distribution of various occupations. Such questions were not included in the questionnaire and could not be included in the analysis. Also, this investigation was limited to bivariate analyses. Advance models where multiple factors can be taken into consideration simultaneously may improve the study.

DIRECTIONS FOR FUTURE RESEARCH

The limitations of the study can also serve as directions for future research as they could alter this project's findings and improve the study's reliability and validity.

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THE PAST DECADE OF PSPB: A COMPARISON TO PREVIOUS CONTENT CHARACTERISTICS

by ROMAN VINCENT GONZALES



ABSTRACT

In this investigation, assessments were made on current article characteristics of the Personality and Social Psychology Bulletin (PSPB). Articles published during 2001, 2006, and 2011 were compared to articles that were published between the years of 1976-1996. It was found that articles have become lengthier, included more authors, and more studies. In addition, a wide array of statistical measures were utilized in comparison to past research. This could be due to a shift towards a more stable display of findings that will hold under scrutiny. Inferences are made about the effects of these changes and possibilities about future growth within this publication.



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THE PAST DECADE OF *PSPB*: A COMPARISON TO PREVIOUS CONTENT CHARACTERISTICS

The Personality and Social Psychology Bulletin (PSPB) has been a major leader in research for the field of social psychology. It has been ranked as high as fourth in terms of its impact on the psychology community in comparison to similar publications (Fisch & Daniel, 1982). With its publication of research in areas such as affect, judgments, and social cognitions, the PSPB has become a pinnacle of change and modernization towards a more reliable, concise guide to major theories in social psychology. This holds significant weight as the field has been described and consistently viewed as being broader in comparison to other subfields of psychology and more complex to examine (Fisch & Daniel, 1982).

The documentation of growth within a publication helps to foster and confirm the idea of ever-changing trends in methodology, along with other characteristics (Elliot, Fischer, & Rennie, 1999). Through time, the means of conducting research have evolved. Since the early 1970's, research seemed to lack an empirical basis and seemed to focus on other factors that relied heavily on more qualitative experiments, rather than being backed by scientific, experimental means (Fisch & Daniel, 1982). Cumming et al. (2007) looked at several

different journals in the field and showed an increase in the inclusion of more analyses. This coincided with the trend of more quantitative studies as it offered a more stable ground due to researchers' statistical practices improving over the years (Cumming et al., 2007; Elliot, Fischer & Rennie, 1999). The ability to distinguish prominent techniques gave the scientific community some headway in truly being more concise, relied heavily on statistical methodology, and aided in using visual representations (Cumming et al., 2007; Dearing & Hamilton, 2006; Rushby, 2011). Current studies all have this universal theme of solid, scientific support to guide prominent theories and hypotheses. This is not to say that previous research is void of any reason under the circumstance of not being as in depth with their methodology. Intrinsic value is placed upon building on classical foundations which allow investigators to gain a better understanding of how to effectively report findings (Dearing & Hamilton, 2006; Petty, Flemming, & Fabrigar, 1999; Swann & Seyle, 2005). In fact, learning about what has been done can set the stage for progression through time.

Many benefits have risen from this development and progression of time. For instance, research done by Kruglanski (1992), suggests that looking into existing research delineates patterns of knowledge and contemporary trends could shed light on inevitable change. There still remains an outstanding search for more modifications and stronger support. There seems to also be a demand for the interpretation of development and future areas of focus (Rushby, 2011). Research by Graham & Ismail (2011) sought what is so useful about looking at past studies and compiling characteristics of them. They found that identifying data analyses helps make research more resistant to scrutiny. This is salient findings for future researchers seeking publication. Studying these conventional approaches can give rise to innovation (Martin, Lounsbury, & Davidson, 2004; Swann & Seyle, 2005).

In the current investigation, examinations of trends within the *Personality and Social Psychology Bulletin* were assessed. Adhering to research done by Sherman et al. (1999), this comparison to his findings allowed for a more updated visual as to what is being done in terms of methodology and general publication trends. This allows insight into some specific changes that have

accrued as comparative studies help to explain and promote important new practices and methodologies (Eaton & Sleigh, 2002; Schruijer & Stephenson, 2012).

We compared articles of the PSPB in a ten year interval starting in 2001, centering on 2006, and ending in 2011. This ten year spread would allow us to make very close comparisons to the research of Sherman et al. (1999) in which they covered PSPB articles from 1976 to 1996. Doing so also allows for the documentation of change and the catalyzing of progress (Blancher, Buboltz, & Soper, 2010; Helwig & Schmidt, 2011). Specifically, it was decided that the main focus of the current research should center on doing the same things as the previous research in which the aim was to look into characteristics such as article length, number or authors, funding, statistical methodologies, and statistical analyses performed. Ambiguity arose when it came to uncovering what is currently being done. This was due to the research of this kind being relatively outdated for the PSPB (Kashy, Donnellan, Ackerman, & Russel, 2009). To fix this problem, the current research was set to uncover trends, article characteristics, and statistical methodology. We were interested in seeing if new research, in comparison to older studies, made use of more statistical methodology, if length, number of studies, and authors experienced an increase, and where the most research was stemming from.

METHOD

A total of 398 *PSPB* articles, which include those published in 2001 (n=140), 2006 (n=129), and 2011 (n=129) were examined. Data reported from Sherman et al. (1999) was also included to aid in a comparative analysis of the current findings.

The characteristics that were chosen as the primary focus were all ones that stemmed from research from Sherman et al. (1999). The structural qualities (number of authors, pages, and studies), as well as the methodological qualities (design, statistical methods, and funding), were chosen to highlight the major features of each article. To stay consistent with the research that was previously done on the *PSPB*, it was decided that the same features would be the focus for the more recent decade that was analyzed.

As each article was surveyed, certain characteristics were pulled from each and then recorded for later coding. The first items that were collected were much easier to pick out. The authors and page numbers were calculated. Page numbers were a calculated by how many pages the article used, excluding any introductory pages. The setting of the research was also documented. It was grouped in either U.S., International (outside the U.S.), or Joint (research conducted in and outside of the U.S.). Funding was then sought after. If the research was partially or fully funded, then it was tabulated as funded. Next, was finding out how many studies were carried out within each article. The last characteristics that were pulled were the statistical methodology that was used as well as the design that was implemented.

RESULTS

Structural Characteristics

Table 1 presents data that is representative of the article's characteristics: the number of authors, studies, and pages within each publication. Also included was the descriptive statistics on funding support per year.

TABLE 1. Personality and Social Psychology Bulletin (PSPB) Article Characteristics

Variable	1976	1986	1996	2001	2006	2011
Number of authors (M)	1.63	2.14	2.64	2.69	2.88	3.12
Number of pages (M)	3.45	5.71	11.36	11.79	12.82	12.98
Number of studies (M)	1.1	1.16	1.73	1.92	2.27	2.45
Funding support (%)	20	33	61	87	74	71
N	82	51	104	140	129	129

SOURCE: *PSPB* data for 1976, 1986, and 1996 are from Sherman et al. (1999).

Although the number of authors did not change between 2001 and 2006, the number of authors experienced an increase in 2011, F(2,395) = 4.085, p = .018. The number of pages presented in the articles increased from 2001 to 2006 and was maintained in 2011, F(2,395) = 13.81, p < .001. Finally, the number of studies conducted in each article increased from 2001 to 2006 and was maintained in 2011, F(2,395) = 7.69, p = .001.

The proportion of studies that were funded stayed fairly consistent from 2001 to 2011, decreasing by minimal amounts.

Table 2 presents the number of studies identified as U.S., International, or Joint (US & International). The research settings were found to change from 2001 to 2011, $\chi^2(4) = 12.03$, p = .017. The percentage of studies conducted in the U.S. that were published in PSPB steadily decreased from 2001 to 2011 while the number of international and especially joint studies increased.

TABLE 2. Percentages of *Personality and Social Psychology Bulletin (PSPB)* Research Setting

Setting	2001	2006	2011
United States (%)	62.14	51.16	45.74
International (%)	27.86	36.43	32.56
Joint (%)	10.00	12.4	21.70

Design and Statistical Methodology

The percentages of studies using each category of design from 2001 to 2011 are presented in Table 3. The most prominent used study seemed to have been the true experiment as it represents almost half of the articles in each year. Quasi-Experiments were utilized more as you can see the trend in numbers growing over time. The Cross-Sectional design was utilized often. There is a general consistency that seems to run through the data set, as each year seemed to be very uniform with the other additional years.

TABLE 3. Percentage of *Personality and Social Psychology Bulletin (PSPB)* Articles and the Research Designs Used.

Design	1976	1986	1996	2001	2006	2011
Meta Analysis (%)	7	12	4	1	0	2
Cross-Sectional (%)	24	32	36	19	17	22
Longitudinal (%)	0	6	5	2	7	5
Quasi-Experiment (%)	14	4	9	26	27	30
True Experiment (%)	43	32	36	52	49	41
N	42	51	104	141	130	130

SOURCE: *PSPB* statistics for 1976, 1986, and 1996 are from Sherman et al. (1999).

NOTE: Experimental and Other designs were excluded as a topic from the current tabulations.

The percentages of studies using each statistical method from 2001 to 2011 are presented in Table 4. There were subtle but detectable differences across the years in terms of which method was employed to analyze the data. ANOVA seems to be the most used statistical method; this trend is consistent across the span of years, although it has experienced a decline in usage in comparison to previous years. Correlation remained pretty consistent within the new data set, but when compared to the previous set, you can detect a decline in use. Also, for other statistical methods used, you can see an increase over time. The articles that used a different statistical method were categorized under other, which has also experienced an incline.

TABLE 4. Percentage of *Personality and Social Psychology Bulletin (PSPB)* Articles and the Statistical Methods Used.

Method	1976	1986	1996	2001	2006	2011
ANOVA (%)	78	69	79	44	45	36
MANOVA (%)	5	7	16	8	4	1
Correlation (%)	22	47	76	20	16	22
Multiple Regression (%)	5	20	28	6	6	14
Factor Analysis (%)	3	9	13	0	0	0
Path Analysis (%)	0	2	12	3	1	0
Nonparametric Methods (%)	7	18	16	3	0	0
Multivariate (%)	0	0	0	2	0	1
Other (%)	15	2	11	16	27	24
n	41	45	102	200	180	207

SOURCE: PSPB statistics for 1976, 1986, and 1996 are from Sherman et al. (1999).

DISCUSSION

The main purpose of this research was to update previous data regarding structural and methodological procedures published in the *PSPB*. Specifically, there was a need to compare the data that was compiled over a decade ago, with articles that were published within the last 11 years. This would help us discover any shifts of trends in terms of publishing. An increase in statistical methodology, longer articles, and the incorporation of more joint effort based research were all among the findings that were hypothesized.

Consistent with past trends, a steady increase in the number of authors, number of studies, article length,

and number of authors was found. The article length since 1976 has quadrupled, making it the biggest increase in that data set. This could be due to more in depth studies and more statistical methodologies used to conduct these studies. Funding also took an exponential growth climbing up more than 3 times what it was in 1976. This could be due to a greater emphasis on the importance of such research under the status quo, in comparison to what it was 36 years ago. The number of studies within an article also experienced a small but steady increase. With the everexpanding nature of the PSPB, more research topics are readily available to investigate. More ideas have become prominent, foundations onto which other philosophies have sprung from. This could help to explain why several areas were investigated within one article.

Exploring the research settings was a new addition to the research. Sherman et al. (1999) did not investigate this particular characteristic so it is interesting to see where most of the research was coming from. International and joint effort research took an increase across the years. Inversely, research stemming solely from the United States took a plunge across the span of years. Perhaps this is because there was more emphasis on joint effort research with the United States and a country outside of the U.S. This could have taken some power behind the numbers for research conducted in the U.S. However, the numbers do show that nearly half of the research conducted in 2011 comes exclusively from the U.S.

In the present study, a consistent trend was found regarding the types of research designs utilized for the sampled articles. Consistent with past data, true experiments, quasi-experiments, and cross sectional experiments were used more than other methodologies. These are more solid styles of designs and yield the best results. Consistent with this, our analysis of statistical techniques used in each article found that ANOVA was the most frequent statistical method used among the 35 year span.

Some of the limitations to the present study should be noted. First there were discrepancies between the way Sherman et al. (1999) conducted portions of his data collection and the way it was collected here. Length of the article was determined by word count and pages. The present study strictly dealt with how many pages were written. There was also control for reliability. The authors would often analyze articles more than once and record the percentage to which they agreed with each other. Another problem was ambiguity when

it came to deciphering what statistical methods were utilized in the experiments. In the present study, the category of "other" was utilized more often than in the past. Along with this, coding for statistical techniques was based on the major statistic utilized in study. Past research made use of every statistical technique utilized in a study. Also, past research (Shcerman et al., 1999) categorized the use of ANCOVA as using ANOVA. A separate category was used in the present investigation. Finally, due to time restraints, the topics to which each article described was not examined. In the original research done by Sherman et al. (1999), one of their tables pertained to content categories. These categories were to cover a wide array of possible research topics that each article investigated.

In conclusion, this research helped to bridge the gap between past and present data. It shed light upon what is being done now, and trends that it worked off from. I believe it will also spark new, widespread and prevalent areas of focus, statistical improvements, and methodological shifts toward harnessing a way to be more concise in terms of experimental values and norms. With this newfound information the future of research can have an updated basis from which to learn and grow from.

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VISUAL SKILLS OF ATHLETES VERSUS NON-ATHLETES

by RENAE HUDAK



ABSTRACT

With the growing popularity of institutionalized sports there has been an increased interest in examining visual skills and athletics participation. However, little research has been conducted on the visual skills of athletes and non-athletes. PURPOSE: The purpose of this study was to investigate the visual skills of athletes vs. non-athletes. METHODS: The research was conducted on NCAA Division I athletes consisting of baseball, softball and, volleyball players (n=72), and non-athletes (n=30). All subjects were between the ages of 18-25. Visual skills were assessed by the Vizual Edge Performance Trainer (VEPT) software program and included tests for visual alignment, depth perception, visual flexibility, visual recognition, and visual tracking, which resulted in a composite VEPT score. DATA ANALYSIS: A t-test for independent samples was utilized to analyze the mean VEPT scores of the two samples with an alpha level of



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.05. The results indicated a significant difference in the two examined groups with a P value at 0.0393. CONCLUSIONS: Statistical analysis indicated that NCAA Division I athletes possess superior visual skills when compared to non-athletes.

Keywords: visual skills, visual analysis, VEPT, NCAA Division I, athletes, athletics, Vizual Edge

INTRODUCTION

In recent years, there has been a growing interest in visual skills and sports performance (Spaniol, 2011). However, visual skills are often overlooked from a training point of view. There is some evidence to suggest that the need to incorporate visual skills into a training regimen for athletes is just as necessary as employing strength and conditioning programs (Grasso, 2011). Empirical evidence suggests that athletic performance suffers as visual skills decrease (Hawks, 1984). Traditionally, visual skills have often been excluded as a measureable factor when evaluating and training athletes. However, Grasso suggests that visual skills are an actual trained commodity (Grasso, 2011).

One of the reasons visual skills training has been slow to evolve is due to the lack of valid and reliable assessment instruments. Fortunately, the advent of new technology has provided researchers and sport scientists with a quantifiable instrument to evaluate visual skills.

Vizual Edge, a computer based 3-D visual performance assessment system, is a commercial software program that assesses and trains visual skills. The system utilizes 3D glasses to assess visual alignment, depth perception, visual flexibility, visual recognition, and visual tracking. The Vizual Edge system computes the results of each subtest to develop a comprehensive Vizual Edge Performance Trainer (VEPT) score for each subject (VizualEdge, 2012).

Statement of the Problem

The purpose of this study was to investigate the visual skills of athletes and non-athletes at an NCAA Division I University. Visual skills included visual alignment, depth perception, visual flexibility, visual recognition, and visual tracking and were measured by the Vizual Edge Performance Trainer (VEPT). Athletes were defined as eligible players participating in the NCAA Division I Athletics Program of Texas A&M University-Corpus Christi. Non-athletes were selected from undergraduate majors in the Department of Kinesiology at Texas A&M University-Corpus Christi.

Significance of the Study

It is often assumed that athletes possess significantly greater physical skills than non- athletes (Bonnette, Spaniol, Seiller, Puchalski, and Neville, 2007). The results of this study will provide athletes, coaches, and administrators with quantifiable data to determine if there is a significant difference between the visual skills of athletes and non-athletes.

Limitations

The two major limitations of this study were sample size and lack of simple random sampling. A larger sample size of both groups of participants (athletes and non-athletes) could possibly generate more valid and reliable results. Also, since it was impossible to employ simple random sampling, purposive sampling was utilized for the selection of subjects for both samples.

Definition of Terms

Convergence is the inward movement of both of the eyes toward each other at the same time; this is in effort to maintain single "binocular vision" when viewing an object (Calder, 1998).

Depth perception is the ability to perceive spatial relationships; this includes distances between objects in three dimensions (Meir, 2005).

Divergence is the outward movement of both eyes away from each other at the same time; this is in effort to maintain single "binocular vision" when viewing an object (Calder, 1998).

Visual reactions are defined as motor output that is developed by experiences and exposure to external stimuli (Leonard, 1998).

Visual skills are referred to as visual and perceptual abilities as they relate to vision (Kluka et al., 1996).

Visual tracking is the ability of the eyes to track an object from one point to another (Meir, 2005).

REVIEW OF LITERATURE

Visual Skills of Athletes versus Non-Athletes. Athletes require superior visual abilities to succeed in their sporting activity (Bonnette, et al., 2011; Spaniol, et al., 2011; Stein, 1982). Christension and Winklestein (1988) used a clinical battery of vision tests to compare the visual performances of athletes to non-athletes. Athletes were found to have a substantially better visual performance in peripheral awareness, near point of convergence, and visual reaction time as athletes compared to non-athletes.

Color Blindness. Color blindness is defined as a visual defect resulting in the inability to distinguish colors. According to VEPT, if a participant is colorblind, he or she may not be able to participate in all of the activities provided for testing one's visual skills. The CRS - Pediatric Advisor, a journal that includes over 900 topics on newborn care and child illnesses. The journal explains the cause of colorblindness as when a person has difficulty differentiating between colors. This is because the retina is located at the back of the eye which has special cells that are called cones. There are three different types of cones that mix the colors together to create all of the colors that people can see. In a color blind person, these cones will have trouble distinguishing between colors and background shapes, which can lead to less than superior performance when doing the visual flexibility portion of the test (Mamalis, 2012). Du Toit and colleagues stress in their article that

"vision is one of the most important special senses and is the primary source of external information" (p. 429).

Subsequently, due to the effect of color blindness on visual skills assessment, color blind subjects were not included in this study.

Vizual Edge. Vizual Edge claims to improve an athlete's performance by training the individual's visual skills through a 3D computer based program. The Vizual Edge website explains how the program has been a great visual training investment for many professional athletes (VizualEdge, 2012). There have been several studies examining Vizual Edge's claims; many of which come from Drs. Frank Spaniol, Randy Bonnette, Liette Ocker, and Don Melrose of Texas A&M University-Corpus Christi. In one particular study, Spaniol and colleagues used the Vizual Edge Performance program to assess the batting performance of NCAA Division I baseball players. The results showed that baseball players who received visual training produced superior batted-ball velocities compared to the Division I baseball players who did not receive visual training (Spaniol et al., 2008). In another study, this cohort investigated the attitudes and perceptions of professional baseball players who participated in Vizual Edge Performance Training. The results of the study indicated that while 100% of the participants agreed that visual skills are an important part of baseball performance, 67% of the baseball players were convinced that the VEPT enhanced their visual skills (Bonnette et al., 2007). Finally, in a separate study on visual training and skills, Du Toit et al. (2011) conducted a study to determine if sports vision training could improve visual skills, thereby enhancing motor and cognitive performance (p. 429). The research indicated that enhanced training focusing on sports vision can enhance specific visual skills, which can lead to the improvement of motor and cognitive learning performance in sport (Du Toit et al., 2011).

Null Hypothesis

There will be no significant difference between the visual skills of athletes and non-athletes.

METHODS

Subjects and Sampling

Purposive sampling was used to select a total of 102 subjects that were divided into two groups for this study. Group I consisted of athletes (n=72), specifically NCAA Division I male baseball players (n=41), female softball players (n=12), and female volleyball players (n=19) from Texas A&M University-Corpus Christi. All subjects were between the ages of 18-25 years. Group II included non-athletes (n=30), consisting of male and female volunteer subjects from kinesiology classes at Texas A&M University-Corpus Christi with an age range of 18-25 years.

Instruments

The instrument used for this study was the Vizual Edge Performance Trainer (VEPT) software. VEPT is a web-based application that utilizes a computer, keyboard or game controller, and three-dimensional glasses. VEPT was used to assess the following visual skills of each subject: visual alignment, visual depth perception, visual flexibility (convergence and divergence), visual recognition, and the visual tracking. The results of each subtest are used to compute a comprehensive VEPT score for each subject. All subjects were tested in a controlled environment on computers located in the Department of Kinesiology Biomechanics Lab at Texas A&M University-Corpus Christi.

Research Design and Statistics

A causal-comparative research design was used for this investigation. A t-test for independent samples was utilized to analyze the mean VEPT scores of the two samples with an alpha level of .05. The study also determined the average VEPT scores for each group of subjects (athletes and non-athlete students).

Procedures

Before beginning the study, approval from the Texas A&M University-Corpus Christi Institution Review Board (IRB) was acquired. Prior to obtaining the IRB, a CITI training course was completed. Following IRB approval, the gathering of test subjects and data collection began. Prior to testing, subjects were informed on the study topic and were given instructions on how the testing would be conducted. Students were instructed to wear any corrective lenses or contacts that had been

prescribed to them. This was to make sure the data remained as valid and reliable as possible.

On the day of testing, researchers used the Vizual Edge Performance Trainer software to evaluate the visual skills of each subject. Three-dimensional glasses were used for the first four of the six total visual skill tests. The tests included: visual alignment, visual depth perception, and visual convergence and divergence. The final two visual skills tests that did not require three-dimensional glasses included visual recognition and visual tracking. For each of the six exercises, step-by-step instructions were given to each subject prior to starting each task. If the subjects had any confusion, test administrators were present to explain the instructions until subjects had a full understanding of the goal of each test.

Once the subjects completed all six visual skills tests a comprehensive VEPT score was calculated for each subject. A t-test for independent samples was then used to determine if there was a statistically significant difference between the mean VEPT scores of the two samples, athletes and non-athletes. An alpha level 0.05 was utilized for the t-test.

RESUITS

The mean VEPT score for athletes was 74.04 and non-athletes 70.47, as represented in Table 1. Table 1 represents the VEPT scores for the athletes and their specific sport, along with the non-athletes. The averages of each subgroup are as follows: baseball (M=74.16), softball (M=69.93), volleyball (M=76.38), and non-students (M=70.47) as represented in Table 2. The number of players who participated in the study were: baseball players (n=41); softball (n=12); volleyball (n=19); and non-athletes (n=30). The results of the t-test for independent samples indicated a significant difference (p=0.0393) between the VEPT scores of athletes and non-athletes. Subsequently, the null hypothesis was not accepted.

CONCLUSION

Results of this study indicate that NCAA Division I athletes possess superior visual skills when compared to non-athletes. For future research, it is recommended that studies be conducted that examine the effect of visual skills training on both athletes and non-athletes.

Finally, research can be conducted that examines the effect of visual skills training on athletic and academic performance.

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THE RESISTANCE CHARACTERISTICS OF THE TRX SUSPENSION TRAINING SYSTEM AT DIFFERENT ANGLES AND DISTANCES FROM THE HANGING POINT



by TRACEY HUDAK

ABSTRACT

PURPOSE: The purpose of this investigation was to evaluate the effects of body angle and distance from the hanging point on the percentage of body weight resistance experienced by users of the TRX suspension training system. METHODS: Eighteen male and female college students were used for this investigation. The TRX system was connected to a force meter and hung from a power rack. From the supine position, subjects held the TRX handles and leaned back at 60, 45, 30 and 15 degrees with their feet directly under the hanging point and progressively greater 30.48 cm (1 foot) intervals from the hanging point. Force data were visually collected from the force meter in kg at each angle and interval. Descriptive data (means \pm sd, percentages, and prediction equations) were calculated with all data. RESULTS: As the angle decreased from 60 to 15 degrees, the resistance encountered by subjects increased; 34.09% of body weight at 60°, 48.69% at 45°, 67.18% at 30°, and 80.19%



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at 15°. As a result of increasing the interval away from the hanging point of the TRX to the furthest increment, there were relatively small changes in resistance (range: -2.06 to 4.17%). CONCLUSION: A decreased angle resulted in an increased resistance during use. Interval changes produced small variations in resistance at each angle.

INTRODUCTION

The TRX is a suspension resistance-training system. The abbreviation "TRX" stands for "Total-body Resistance eXercise". The system is currently used by the military, athletes at all levels, personal trainers and fitness enthusiasts. Its simplistic design lends to its versatility, economical nature and apparent safety. Two adjustable straps, connected at a common point to a metal ring, have padded handles and foot-straps on the free ends. The system is suspended from an overhead support such as a power rack, installed horizontal bar, or door-way. The system was first developed by a group of Navy Seals as a means to stay fit on location (6). Because it uses varying degrees of body-weight resistance, it can be used by people of varying fitness-levels and ages (6). This system can provide a total body workout without the need for expensive equipment. Because of the simplicity of the TRX system, workouts can be easily modified to minimize the risk for an injury. A major benefit of suspension training is that it allows for a full range of motion, maximizing the workout (4).

Although the TRX system is currently used in a multitude of settings ranging from athletic conditioning, to general fitness, to pre- and rehabilitative purposes, there is little supporting research to adequately explain the breadth of applications for which it is being used. One of the primary missing factors is an accurate assessment of its resistance characteristics. In all instances, the loads used are percentages of the user's body weight. The degree of resistance (load) is the cornerstone of proper exercise prescription. In most instances, load determines the number of repetitions that can be performed and is generally reflective of the overall volume of the training session (1). It would be virtually impossible to determine the resistance characteristics of all possible exercises using the TRX system. Consequently, the approach to this investigation was more general. In this study two key elements of this system were tested: the effect of angle and distance from the hanging point on the resistance characteristics. We hypothesized that decreasing the angle in which the exercise is performed would result in an increase in body weight resistance. We further hypothesized that increasing the distance away from the hanging point of the TRX would result in negligible changes in body mass resistance.

METHODS

Subjects

The subject pool for this investigation was selected via word of mouth at Texas A&M University - Corpus Christi (TAMUCC). Eighteen subjects (n = 18) were used in this investigation. To be included in this study, subjects could be either female or male, 18 years of age, and of a reasonable fitness level. All subjects signed an informed consent form that was approved by the Institutional Review Board at TAMUCC. Additionally, all subjects were required to complete a Physical Activity Readiness Questionnaire (PAR-Q) prior to participating. Students who met the inclusion criteria were then scheduled to use the apparatus. Upon arriving at the lab and prior to any data collection, each participant was briefed on the protocol and was allowed to ask any questions at any time during the data collection period.

Subject Demographic Information

Subject demographic information was collected to determine the age and physical characteristics of the

testing population. Demographic data included: gender, age, height, weight, body composition, and body mass index (BMI). Subject height (cm) was measured with the shoes off using the stadiometer function of a Health-O-Meter height-weight scale. Weight (kg) was measured using the same apparatus. Prior to use, the weight measuring apparatus of this device was calibrated for accuracy using known weights. Body mass index (kg/m²) was calculated from the height and weight measurements using an online calculator. Body composition was measured using a calibrated Lange Skinfold Caliper. The chest, thigh and abdomen skinfold sites were measured for males and the tricep, supraillium and thigh skinfold sites were measured for females. These measurements were entered into a computer system that calculated percent body fat, lean mass (kg), and fat mass (kg). Table 1 displays the demographic information for the subjects tested as a part of this investigation.

TABLE 1. Subject Demographic Information (means ±sd)				
Subjects	n = 18			
Gender	5 females, 13 males			
Age (yrs.)	24.06 ± 6.69			
Height (cm)	172.53 ± 6.36			
Weight (kg)	79.00 ± 17.55			
BMI (kg/m2)	26.59± 5.27			
Body Fat (%)	15.09 ± 9.84			
Lean Body Mass (kg)	66.60 ± 13.72			
Fat Mass (kg)	24.06 ± 6.69			

Equipment

To accommodate the testing parameters of this study, a Takei Analog Dynamometer was suspended from the center support bar of a power-rack. The TRX suspension training system was hung from the base of the dynamometer. Within the horizontal floor supports of the power-rack, a proprietary, wooden floor-frame was installed. The rectangular frame extended along the floor horizontally from the hanging point of the TRX. The frame was approximately 2.44 m (8 feet) long and 1.22 m (4 feet) wide. Within the frame were notches to accommodate a removable cross-bar that was to be placed between the long sides of the frame. The notches were equally placed on each side of the

frame at 30.48 cm (1 foot) increments. Five notches were placed on each side. This allowed testing at five increments away from the hanging point, a total of six positions. To accurately measure body angle during all testing, a proprietary, hinged, wooden goniometer was designed to help obtain appropriate body angle alignment during data collection. This goniometer was approximately 1.83 m (6 feet) long and was capable of 180° range of motion. Supports between the long axes of the goniometer allowed it to be set and maintained at the angles used in this investigation: 60°, 45°, 30°, and 15°. The goniometer was placed perpendicularly to the floor frame during testing.

Testing Protocol

Prior to collecting resistance data, the primary researcher demonstrated the data collection technique to all subjects. All testing began at a 60 degree angle at the TRX hanging point, facing the power rack. The subject placed his or her feet on the cross-support of the floor frame. With the arms fully extended and holding the handles of the TRX system, the subject leaned back to 60 degrees as determined by the goniometer. A research assistant visually aligned the goniometer between the subject's ankle and shoulder joints. Any necessary changes to body posture were also made at this time. Subjects were encouraged to maintain body alignment and rigid posture during the trial. Adjustments to the TRX strap length were also made as needed to ensure the most accurate body angles during the trial. Within 5 to 10 seconds of achieving the proper body placement, the amount of pull on the TRX was visually collected from the force meter. All force meter readings were collected by the primary researcher. leaning back at 60°, measurements were repeated at each 30.48 cm increment away from the center hanging point until the TRX system was fully lengthened. This process was repeated at 45, 30 and 15 degree angles respectively. As the distance away from the hanging point increased and the angles progressed from 60 to 15 degrees, the ultimate length limits of the TRX system were reached. To that end, it was not possible to collect the same number of observations at each angle and position. At 60 degrees, six increment measurements were made. At 45 degrees, five measurements were made. At 30 degrees there were four measurements, while 15 degrees allowed only three measurements. At

minimum, each angle was measured at three different increments, the hanging point and the next two 30.48 cm increments away from the hanging point.

Statistical Analysis

The statistical model for this investigation was descriptive and intended to characterize and predict the loads experienced at different angles of the TRX. All data collected were entered into a Microsoft Excel file. Means and standard deviations were calculated for all demographic information. Means and standard deviations were also calculated for all force meter readings at each angle and subsequent foot position interval. In addition, the percentages of resistance encountered by subjects in comparison to average body weight were calculated for each angle and foot position interval. A prediction formula was calculated for each angle.

RESULTS

Effect of Angle on Resistance

Analysis clearly indicated that as the degree of angle decreased from 60 to 15 degrees, the amount of the body-mass resistance increases. At 60 degrees, the average body mass resistance was 29.2 kg, or approximately 34.09% of the person's body weight. At 45 degrees, the average body mass resistance was 41 kg, or approximately 48.69% of the person's body weight. At 30 degrees, the average body mass resistance was 54.01 kg, or approximately 67.18 % of the person's body weight. At 15 degrees, the average body mass resistance was 63.09 kg, or approximately 80.19% of the person' body weight. Table 2 shows the values from this analysis.

Effect of Interval on Resistance

In general, body mass resistance was not greatly affected by moving farther away from the TRX hanging point at the pre-determined intervals. However, there was a notable trend in resistance as the foot positions progressed further from the hanging point of the TRX. As mentioned, across all angles, resistance was measured in at least three different increments: the hanging point and the next two increments away from the hanging point. When comparing the hanging point values to those of the second increment from the hanging point,

TABLE 2. Average resistance and percent weight supported at specific measured angles.

Degrees	Average Resistance (kg)	% Weight Individual Supports
15	63.09 ± 1.78	80.19 ± 2.26
30	54.01 ± 1.84	67.18 ± 2.34
45	41.00 ± 0.83	48.69 ± 1.05
60	29.20 ± 0.81	34.09 ± 1.11

the difference in resistance was -1.72% at 60 degrees (30.78 kg vs. 29.06 kg). At 45 degrees the difference was 0.06% (40.94 kg vs. 41.00 kg). At 30 degrees, the difference between the two increments was 2.28% (52.22 kg vs. 54.5 kg). At 15 degrees, the difference was 3.56% (61.22 kg vs. 64.78 kg). The differences in resistance between the hanging point and the furthest increment possible for each angle were -2.06% at 60 degrees, 0.84% at 45 degrees, 4.17% at 30 degrees and 3.56% at 15 degrees for each angle respectively. Table 3 shows the values for each at the different angles for each increment.

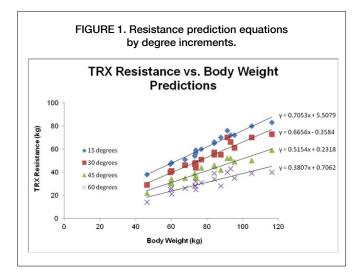
Prediction Formulas

A basic prediction equation was calculated for each angle based off of body mass and the resistance at each angle at the hanging point. These equations can be used to calculate the expected weight resistance experienced by the user at a specific angle. Figure 1 graphically shows the relationship between body mass and the resistance in addition to the individual formulas. At 60 degrees, the formula is y = 0.7053x + 5.5079. At 30 degrees, the formula is y = 0.6656x - 0.3584. At 45 degrees, the formula is y = 0.5154x + 0.2318. At 30 degrees, the formula is y = 0.3807 + 0.7062. The "y" value would

reflect the resistance encountered at that angle and the "x" in each formula would be the individuals' body mass in kg.

DISCUSSION

The purpose of the present study was to determine the effects of body angle and distance from the hanging point on the amount and percentage of resistance experienced by users of the TRX suspension training system users during exercise. In addition, it was our purpose to formulate prediction equations capable of accurately determining the average resistance the user will encounter at the angles researched in this investigation. It was our hypothesis that as the angle increased, users would support a progressively greater percentage of their own body mass during exercise.



This hypothesis was supported, as was evidenced by progressively greater loads encountered as the angle decreased. It was our hypothesis that distance away from

TABLE 3. Changes in body weight resistance by 30.48 cm increments.

Degrees	TRX Hanging Point Resistance (kg)	First Increment Resistance (kg)	Second Increment Resistance (kg)	Third Increment Resistance (kg)	Forth Increment Resistance (kg)	Fifth Increment Resistance (kg)	Average Resistance Per Angle (kg)
15	61.22	63.28	64.78	-	-	-	63.09 ± 1.78
30	52.22	52.94	54.50	56.39	-	-	54.01 ± 1.84
45	40.94	39.67	41.00	41.61	41.78	-	41.00 ± 0.83
60	30.78	29.33	29.06	28.78	28.56	28.72	29.20 ± 0.81

(-) denotes a lack of data at this increment and angle due to length limitations of the TRX

the hanging point would have an inconsequential effect on resistance. This hypothesis was also supported. At the angles of 60 and 45 degrees only small fluctuations in the resistance were realized as the subject moved progressively further from the hanging point. Although not large changes, subjects encountered slightly greater differences while holding the apparatus at 30 and 15 degrees as they supported their body mass at progressively further intervals from the hanging point. Overall, the results of this investigation are likely best understood with respect to the effect of gravity.

Effect of Angle on Resistance

Although there are no studies at this time that expound the effect of body angle and its relationship to resistance encountered while using the TRX suspension training apparatus or any other similar equipment, the association between body angle and the effect of gravity was anticipated by the researchers. However, the unknown factor was the actual amount of body mass resistance the subject would have to support at each target angle. At each of the different angles, users supported the same average relative percentage of their own body mass. For instance, at 60 degrees, subjects supported an average of 34.09% of their body mass, at 45 degrees they experienced 48.69%, at 30 degrees they experienced 67.18%, and at 15 degrees, users experienced 80.19% of their own body mass. Simply, the further back the subject leaned while holding onto the TRX grips, the greater the percentage of their body mass they supported due to gravity. In theory, such changes in resistance would enable the user to manipulate training loads by changing the angles used during exercise.

While there is little support to help explain the extent of variation at each angle, the effects of changing body position and angles on resistance encountered during exercise are not unfounded. Furthermore, changes in resistance and even muscular activation patterns as a result of changing the form of the exercise are not unprecedented (2,3,5). In an investigation of the effect of position on the percentage of body mass supported during different varieties of push-ups (traditional and modified), Suprak et al. found that subjects performing the traditional push-up supported 69.16% of their body mass in the up-position and 75.04% in the down-

position. During the modified (knees-down) position subjects experienced 53.56% of their body mass in the up-position and 61.80% in the down-position. In this instance, the greatest range in percentage of body mass supported occurred during the modified version of the push-up (5). Gouvali and Boudolos took this concept a step further when they measured muscular activation patterns using EMG (electromyography) as well as loads encountered during different push-up variants. They found significantly greater muscular activity in the pectoralis major and triceps with the hands placed posterior to the shoulder, as compared to the standard push-up in which the hands are placed directly under the shoulder (2). McCaw and Melrose (1999) demonstrated a similar type of finding with respect to the lower body musculature during the parallel squat exercise. Greater muscular activation was seen in certain muscles during the ascent phase of the lift as opposed to the decent. Although no significant change in quadriceps activation was detected due to stance or load, greater adductor and gluteal activation was noted when squat-stance width was increased as compared to a normal parallel squat stance (3).

Effect of Interval on Resistance

Changes in body mass resistance were not greatly affected by moving farther away from the TRX hanging point at the pre-determined intervals. The variation in the intervals became progressively greater as the angle went from 60 to 15 degrees, albeit in very small increments. The variations in resistance at the different intervals were greater at the angles of 15 and 30 degrees as compared to 45 and 60 degrees. At 15 and 30 degrees the greatest increases in resistance were encountered as the subjects moved farther from the hanging point. Although there doesn't appear to be any standard interval for this effect, it is most likely that the subjects' center of gravity was altered by the very low angles in conjunction with the greater distances from the hanging point. At these low angles and greater intervals from the hanging point of the TRX, the subjects' body was very close to the floor and the head at its furthest distance from the hanging point. This combination of factors likely shifted the subjects' center of gravity toward the head thereby resulting in these slightly greater increases in body mass resistance transferred to the subject. This effect did not appear to be as noticeable in all subjects

tested, but was markedly apparent in many of the subjects. Differences in distribution between subjects could be due to differences in body mass distribution between subjects.

Prediction Formulas

The prediction formulas calculated from the TRX data allow the calculation of predictable body mass resistance at the different angles measured in this investigation. The idea is that the individual's body mass resistance can be easily predicted and potentially used for more accurate progression of an exercise prescription. For example, the prediction formula at the hanging point of the TRX at 45 degrees is: y = 0.5154x + 0.2318. The "x" value is the subject's body mass. If the body mass of the subject is 75 kg, the calculated y value equals 38.88 kg or 51.85% of their body mass at this angle. Group data indicate that the average person at 45 degrees will support 41.00 \pm 0.83 kg which is 48.69 \pm 1.05% of their body mass. This difference in this estimate is approximately 2.11%.

CONCLUSION

The TRX system has many benefits. It is versatile, economical, and safe. With a suspension training apparatus such as this, changes in angle increase or decrease the resistance transferred to the user. These changes in resistance are now known and can be predicted with relative accuracy. This study showed that increasing the distance away from the hanging point of the TRX had little effect on the amount of body weight percent supported by the user. A prediction formula can calculate the expected percent of body weight resistance a person will experience when using TRX at a given angle. Knowing the amount of resistance that will be experienced by the user can be used to better modify a training plan to fit the needs of the individual.

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NON-THERMAL PLASMA INDUCTION OF APOPTOSIS ON MONOCYTIC LEUKEMIA CELLS IN A DOSE DEPENDENT MANNER



by MEGAN L NORFOLK

ABSTRACT

Plasma is a state of matter similar to gas in which a certain portion of the particles are ionized which can be a thermal or non-thermal form. Ionized plasma is already being seen used in the medical field such as for sterilization, tissue removal, and cauterization of blood vessels to stop bleeding which leads to the possibility of using non-thermal ionized plasma to help in the fight against cancer in a non-inflammatory process. In this work, we were interested in the type of morphological cell death that occurs in monocytic leukemia cells (THP-1). Phenotypes of interest were cells demonstrating apoptosis (preprogrammed cell death) or necrosis. We proposed that utilizing varying dosage parameters of non-thermal plasma on cancer cells will



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induce into the preferred route of apoptosis. By varying time of exposure, we were able to demonstrate a preference for apoptosis in THP-1 cells. Cells were identified as apoptotic utilizing a fluorescent dye conjugated with FITC followed by identification of the cells through fluorescent microscopy. The results obtained from these experiments suggest that further investigation on the effects of non-thermal plasma on cancer cell lines is required to allow for future use of this technology as an inexpensive and effective tool for treatment of skin cancer and cancerous lesions.

INTRODUCTION

In physics and chemistry, plasma is a state of matter similar to gas in which a certain portion of the particles are ionized which can be a thermal or non-thermal form. Ionized plasma has many applications, such as for sterilization, tissue removal, and cauterization of blood vessels to stop bleeding. Ionized plasma is already being seen used in the medical field which leads to the possibility of using non-thermal ionized plasma to help in the fight against cancer. Cancer which is defined as uncontrolled growth of abnormal cells in the body will lead to 15 million new cases and 10 million deaths alone in 2020 (1). Current treatments of cancer are

the process of inducing toxins into the patient's bodies to fight against cancer. These current methods can be harmful and induce damaging inflammation into the patient however new treatments are now being focused to help fight against cancer in a non-inflammatory process.

Inflammation has been linked to induce begin tumors or cells to be transformed into cancerous. Cancer lacks the appropriate cell regulations as normal cells. Such normal cell regulations include programmed cell death and necrosis. Apoptosis is a form of cell death in which a programmed sequence of events leads to the elimination of cells without releasing harmful substances into the surrounding area in a non-inflammatory process. It is characterized by phenotypic observations of cell shrinkage, chromatin condensation, nuclear collapse, and cellular fragmentation into apoptotic bodies [2]. Necrosis is an inflammatory cell death resulting from cell damage or injury. Apoptosis and necrosis can be currently detected using reagents in conjunction with fluorescents. Annexin V binds to phosphatidylserine (PS) which is normally located on the inner leaflet of a cell membrane which will translocate during apoptosis to the outer leaflet allowing the binding of Annexin V (3). This in turn will be detected with the conjunction of a fluorescent FITC when analyzing the sample. Necrosis is determined by the use of propidium iodide(PI) that will bind every 4-5 nucleotides to nonsequence specific dsDNA, ssDNA, and RNA (4).

This research focuses on the use of a non-thermal resistive barrier discharge (RDB) plasma machine which uses a novel atmospheric pressure non-thermal plasma micro-jet (NTPMJ). A resistive barrier discharge is a modification of a conventional machine of the dielectric barrier discharge that has been adapted. The main feature of the RDB is that it can function in both DC and AC modes, and rather than a dielectric which is a wetted high resistivity material used (Fridman). Our hypothesis is that non-thermal RDB plasma machine with a NTPMJ will induce apoptosis in acute monocytic leukemia cells in a dose dependent manner.

METHODS

Cell Culture

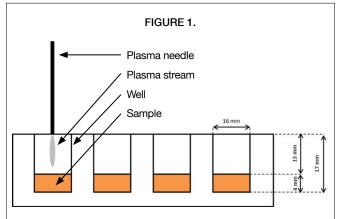
THP-1 cells were grown in RPMI media supplemented with 10% FBS and 1% antibiotic at 37°C with 5% CO₂. The cells were passed every 3-4 days when reaching full confluency. For all experiments, cells were used at a concentration of 2×10^6 cells/ml. Cell concentrations and viability were determined by hemacytometer counts of cells diluted in erythrosin B in a 1:1 ratio. Cells that stained with erythrosin B were considered nonviable.

Cell Viability Assay

The treatment of the cell viability assay was done in a sterile environment under a vent hood expect for the cell counts with the hemacytometer. Cells at a concentration of 2x106 cells/ml were taken from stock cells. Note the concentration was achieved by spinning down/re-suspending the cells as necessary. 500 µL of cells were placed in each well of a 24 well plate as needed. The plasma needle was mounted on a ring stand so that the tip was just above flush with the mouth of the well (Figure 1). After all the cells were treated, the contents of the well were then transferred to a 1.7mL microcentrifuge tube and spun for 6 minutes at 300g. Then the cell pellets were re-suspend in 1mL of pre-warmed complete RPMI media and returned to the original well in which they were treated. To ensure that the wells of the plate were mixed homogeneously, a 10µL sample from each were pipetted individually into a 0.5mL microcentrifuge tube with a 1:1 ratio of erythrosin B to sample. Counts were taken of both the live and dead cells for each sample with a hemocytometer. Post treatment counts were performed additional at 24, 48 and 72 hours post incubation depending on the assay.

Fluorescent Microscopy

Cells at a concentration of $2x10^6$ cells/ml were taken from stock cells with the same technique described above. 500 μ L of cells were placed in each well of a 24 well plate as needed. For the plasma treatment three 24 well microplates were prepared with five 500 μ L samples in each. Each well was treated according to the same plasma treatment set up as described in the cell viability assay however at the time points of 0s, 40s, 45s, 50s, and 60s with the post treatment time points



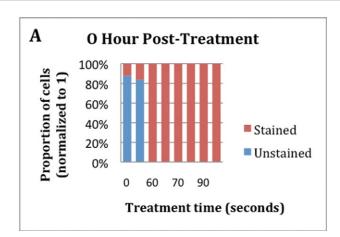
Side view of schematic of the experimental setup plasma treatment technique. As shown, the tip of the plasma needle will be maintained at the threshold of the well, creating a needle to sample gap of 1.3 centimeters (13 mm).

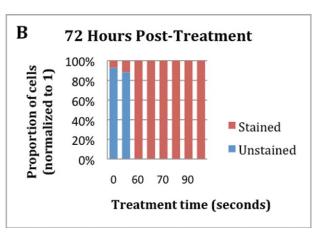
of 0, 2, and 24 hours. For the control sample along with the positive control at variable concentrations one well plate was prepared with nine 500 µL samples. The plate contained concentrations of 0, 0.5+, and 0.75+ ug/ul of staurosporine (Sigma, St. Louis, MO) which is a known apoptosis inducer for the post treatment times of 0, 2, and 24 hours. The samples were then spun down in a 1.7ml microcentrifuge tube at 300xG for 5 minutes. Each sample pellets were re-suspended with 1ml of fresh pre-warmed RPMI media. Post treatment samples were collected at 0, 2, and 24 hours. Cells counts as according to prior protocol were taken to ensure an even consistency of cells at 0 hours post treatment of samples at additional at 2 and 24 hours collection. Each sample was washed twice with 1xPBS by spinning the cells at

300xG for 6 minutes and re-suspending the pellet in 1 mL of 1xPBS. The cells were then stained based on Invitrogen Annexin V FITC Apoptosis Detection Kit. Then 500 ul of the sample was removed and spun down and re-suspended in 100ul 1x binding buffer. Each sample was dyed with 5 ul of FITC along with 1ul of propidium iodide(PI) and incubated for 15 minutes. After staining, the cells were spun down 300xG for 7 minutes resuspend in 100 µL of 1xPBS. L-lysine coverslips were placed inside wells of a new 24 well plate with all of the 100ul of the final suspension dispensed individually directly on the each coverslip. The samples inside the well plate were spun at 300xg for 6min. The cover slips were removed and mounted cell side down on a glass slide with ProLong® Gold Antifade Reagent with DAPI (4',6-diamidino-2-phenylindole). The slides were kept in the dark at room temperature overnight and then stored in 4°C which allows for up to three months of use for fluorescent microscopy. Images were taken using a Nikon DS-Qi1Mc camera attached to an AZ100 microscope. The images taken of each sample was of bright field, PI only, FITC only, DAPI only and then combined overlay.

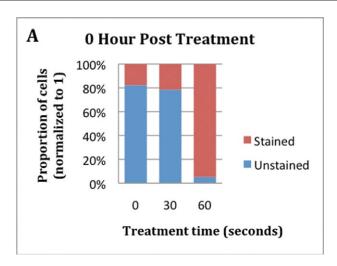
RESULTS

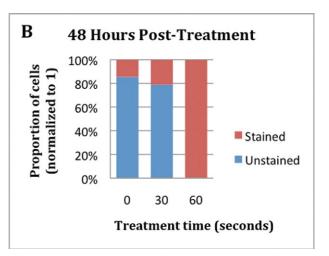
The cells were grown according to the procedure of cell culture. The cells were then treated and counted according to the cell viability assay. The tables of Graph 1 shows the initial plasma treatment was done with varying time points ranging from 0 to 120 seconds at 0 and 72 hour post treatment for the cell viability testing





Graph 1 A and B: Cell viability assay treatment with non-thermal plasma with treatment times of 0 to 120 seconds at 0 (A) and 72 hour (B) post treatment normalized triplicate cell counts.

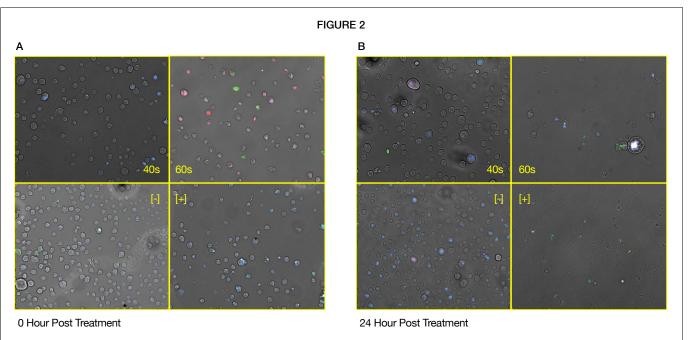




Graph 2 A and B: Cell viability assay treatment with non-thermal plasma with treatment times of 0, 30, and 60 seconds at 0 (A) and 48 hour (B) post treatment of normalized triplicate cell counts for three experiments totaling nine samples.

to determine an area of focus of treatment thereafter. Due to the response of the cells being at 100 percent cell death at 60 seconds and beyond, the following experiments used 60 seconds as the maximum time point and 48 post treatment maximum. In Graph 2, cell viability results are combined averages of 3 experiments each containing triplicate samples.

Following the cell viability testing, the cells were then tested using microscopy fluorescents according to the procedure. Due to the noticeable difference of cell death between 30 seconds and 60 seconds, the microscopy fluorescents assay included the time points of 0, 40, 45, 50, and 60 seconds to better understand the cell morphology after nonthermal plasma treatment. The images were taken and then analyzed to determine the dominate cell morphology after plasma treatment



THP-1 cells stained with PI(red), FITC (green) and DAPI (blue). Samples shown are of negative, positive control along with the 40 and 60 second samples. Samples shown are of (A) O hour post treatment and (B) 24 hour post treatment. Pictures shown are of one sample set however a total of 3 experiments were ran with consistent results.

		TABLE 1				
Samples	Morphology	Size	Sample Conc.	Debris	FITC	PI
0Hr (-) Control	Regular	Average	++	-	+	+
0Hr (+)Control 0.5 ug/ul	Regular	Average	++	-	+	+
0Hr (+)Control 0.75 ug/ul	Regular	Average	++	-	+	+
0Hr 40 sec plasma	Regular	Average	++	-	+	+
0Hr 45 sec plasma	Regular	Larger	++	-	+	++
0Hr 50 sec plasma	Irregular	Smaller	++	-	+	++
0Hr 60 sec plasma	Irregular	Smaller	++	-	+	+++
2Hr (-) Control	Regular	Average	++	-	+	+
2Hr (+)Control 0.5 ug/ul	Few Irregular	Smaller	+	+	++	+
2Hr (+)Control 0.75 ug/ul	Few Irregular	Smaller	+	+	+++	+
2Hr 40 sec plasma	Regular	Average	++	-	+	+
2Hr 45 sec plasma	Irregular	Average	++	-	++	++
2Hr 50 sec plasma	Irregular	Smaller	++	-	++	++
2Hr 60 sec plasma	Irregular	Smaller	++	-	++	++
24Hr (-) Control	Regular	Average	+++	-	+	+
24Hr (+)Control 0.5 ug/ul	Irregular	Smaller	+	++	++	+
24Hr (+)Control 0.75 ug/ul	Irregular	Smaller	+	++	+++	+
24Hr 40 sec plasma	Regular	Average	++	-	+	+
24Hr 45 sec plasma*	N/A	N/A	N/A	N/A	N/A	N/A
24Hr 50 sec plasma	Irregular	Smaller	+	+	++	++
24Hr 60 sec plasma	Irregular	Smaller	+	+	++	+

Qualitative summary of microscopy fluorescents images.* Sample 24Hr 45 sec plasma treatment images were inconclusive to determine.

exposure time points along with positive and negative controls at 0, 2, and 24 hour post treatment for all samples. The images of the plasma treatment samples were compared to the positive control staurosporine to determine if there was common cell morphology.

Figure 2A and 2B displays the 0 and 24 hour post treatment respectively of the samples consisting of the negative, positive, 40 second, and 60 second samples. The images shown are of the overlay of individual pictures taken of the bright field along with the PI, FITC, and DAPI fluorescents. Due to the high volume of sample microscopy pictures, a summary table of the qualitative analyze of all samples is represented in in Table 1.

DISCUSSION

In the beginning, the area of focus for treatment time needed to be determined. The cell viability tests stained the cells with erythrosin B stain which will only be present in the cells if there is damage to the plasma membrane. This particular damage is rendered as non-viable cells and thus cell death. The initial cell viability test ranged from 0 seconds to 120 seconds in triplicate sets with post treatment of 0, 24, 48 and up to 72 hour post treatment times. The initial cell viability assay represented in Table 1 shows some response of cell death at 30 seconds and almost complete death after 60 seconds and beyond up to 72 hour post treatment. Table 2 is a compiled average of three experiments each containing triplicate samples of normalized cell counts to confirm 100% cell death at 60 seconds and 24 hour post treatment. Interestingly the cell counts of nonviable cells increased over time which could lead to apoptosis as a mode of death.

The microscopy fluorescent pictures were taken and certain cell morphology was noticed throughout the time points of samples. For the negative controls they were consistency of some natural occurring apoptosis show with FITC stain and necrosis shown with PI stain seen at low levels. Also the confluency of cells increased at the 24 hour post treatment correlating with the cell growth. For the positive control, at Ohr post treatment the cells seemed smaller in size relative to the negative control. As the time progressed, by 24 hour post treatment the cells are of small apoptotic bodies, increase amount of debris and little PI and FITC staining in the samples consistent with the ending process of apoptosis. The sample of 45 seconds post treatment 24 hours was inconclusive to determine however the remaining samples of 40 and 45 seconds were comparable to the negative control samples at all time points. The samples of 50 and 60 seconds at 24 hour post treatment were shown to be more closely related to the positive control samples of 0.5 ug/ul.

After the cell viability assays and the microscopy fluorescents images, the analyzed data shows that the cell death is occurring in correlation to increasing dosages of plasma. Due to the increasing FITC staining in the samples, the initial findings are supportive of apoptosis as a possible mode of cell death. At this point in the research, we must fail to reject hypothesis due the increase amount of Annexin V FITC staining in correlation to dosage of non-thermal plasma. As the research continues the future work needs to include flow cytometry for quantitative results along with RT-PCR to further investigate apoptosis as a mode of cell death

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THE ICONOGRAPHY IN THE ART OF SALVADOR DALÍ TO BE VIEWED AS POSSIBLE INDICATIONS OF CHILDHOOD SEXUAL ABUSE AND REPRESSED HOMOSEXUALITY



by SARAH PONS

ABSTRACT

Salvador Dalí was born in Figures, Spain on May 11, 1904. He is considered to be the most influential of the Surrealists and one of the most iconic figures in modern art. In the course of this research, ten of Dalí's works were analyzed based on their iconography. The chosen iconography was examined for consistency and established symbolism. Out of the ten creations selected for this project, nine are from Dalí's Surrealism period and one is from his religious period. Altogether, nine paintings and one movie are discussed. Symbolism is a major part of Dalí's art; I selected works that overflow with symbolism, but I also wanted to tackle certain creations that have limited but profound iconography. It is common knowledge in the world of art history that Dalí based his symbolism on psychoanalysis, particularly the

work of Sigmund Freud. Certain Dalían symbols have stable definitions based on psychoanalytical theory, and I merely desired to take it a step further and decipher his more puzzling symbols. In the course of this project, I turned to the framework of Sigmund Freud, Carl Jung and Sándor Ferenczi. I wished to study both the confirmed and possible meanings behind the selected Dalían iconography and align them with mysterious aspects of Dalí's life. The core of this research is to uncover the secrets of the very private life of Salvador Dalí. Dalí's ambiguous sexuality has always been called into question. Throughout the majority of his life, Dalí was rather reluctant to discuss the nature of his friendship with poet Federico García Lorca. The childhood of Salvador Dalí has forever been ambiguous due to his refusal to offer any insight into his past. Dalí's mannerisms, however, exhibited signs of trauma such as his terrible fear of sex, the reluctance to discuss his childhood, his dark imagination, and the large memory gaps surrounding his early life. In this research, his iconography is analyzed in accordance with the topics of sexual trauma and homosexuality. The purpose of this study is to approach the iconography of Salvador Dalí's art as an unofficial autobiography.



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LITERATURE REVIEW

Thesis

Salvador Dalí's art is a popular and somewhat dreaded subject in the world of art history, mainly due to the ambiguity of his iconography. Other than his much publicized relationship with his wife Gala Diakonova, the true nature of Dalí's personal life manages to fall below the radar. Through the theoretical framework of psychoanalysis, I would like to approach the topics of childhood sexual abuse and repressed homosexuality and connect the two scenarios to the iconography in Salvador Dalí's art.

Insects

The subject of insects is a plentiful and rich aspect of Dalí's art. Over the years, there has been debate over the proper symbolism of said insects, and many have an established status; several of Dalí's bugs even have multiple meanings. There is a hypothesis that visual symbols have at least two meanings – an obvious one and a hidden one (Enckell, "Reflection in Psychoanalysis: On Symbols and Metaphors"). The two insects I would like to focus on are the ant and the grasshopper; both of these creatures make numerous appearances in Dalí's art.

Ants

In *The Enigma of Desire*, a cluster of ants are seen crawling on an amoeba. In *The Great Masturbator*, an army of ants are swarming a grasshopper and some trickle onto yet another amoeba. In *The Metamorphosis of Narcissus*, a number of large ants are seen moving about on a faceless, gray figure. In *Un Chien Andalou*, ants are seen coming out of a hand. The Dalían ants have two primary meanings. The ants presented in Dalís works are universally attributed to sexual sensation and decay (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"), both of which are specifically seen as Dalían symbolism.

Grasshopper

In *The Great Masturbator*, a grasshopper is kissing an amoeba while carrying a swarm of ants. In *The First Days of Spring*, a grasshopper is kissing a firmer version of the amoeba. The grasshopper in Dalí's paintings has been identified as a Dalían symbol of fear because he had a terrible phobia of grasshoppers (Descharnes

and Neret 37); the grasshopper is also linked to the concept of the vagina dentata which is an image that symbolizes female sexual aggression (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

Animals

Freudian symbolism has a special place in not only Dalí's art but in all Surrealist art (Arnason and Mansfield 318). Freudian imagery brings the inevitable use of phallic symbols, and Dalí's paintings are overflowing with such visions. The use of animals can be extended to both the Freudian phallus and ancient mythology.

Fish

A fish makes an appearance or two in Dalí's art. In *The Enigma of Desire*, a fish is seen kissing a grasshopper. In *The First Days of Spring*, a fish is seen floating in mid–air above a set of stairs. The fish is universally presented as a Freudian phallic symbol (Lubar 55). In the world of art, however, the fish has been repeatedly connected with religious overtones, symbolizing Christ himself.

Lion

The lion is a curious and frequent character in Dalí's works. In *The Enigma of Desire*, a lion is connected to the strange structure that is also attached to an amoeba; in the same painting, there is a second lion paralleling a skeletal female face. In *The Great Masturbator*, a lion is fused onto the amoeba and located directly under a promiscuous woman who is also linked with the amoeba. The lion has been accepted as a more violent manifestation of the vagina dentata (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"); the representation of female sexual aggression is a common theme in Dalí's art.

Standard cat

A cat is present in *The Invention of the Monster*, and it is lying next to a small, winged figure. In *Shirley Temple*, the title character's head is attached to a red, sinister, cat-like body. The common cat has been previously linked to the vagina dentata (Otero, "'Fearing Our Mothers:' An Overview of the Psychoanalytic Theories Concerning the Vagina Dentata Motif") just the same as the lion.

Birds

The bird can be viewed multiple times in *The First Days of Spring*. It can be seen on the building blocks used to help form a skeletal female face which has been previously identified as a Dalían Medusa (Lubar 59). The general symbolism of a bird can be connected to feelings of abandonment (Nuckolls, "The Case for Sound Symbolism"); birds do not have a definitive Dalían explanation.

Bat

The bat is seen in Dalí's *Shirley Temple* piece; a motionless bat is hovering above Shirley's head.

The bat does not have a concrete meaning for it was not a regular icon in Dalí's art. There is one recorded bat-related incident Dalí experienced as a child. He found a dead bat swarming with ants and then took a bite out of it in a fit of rage (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

Horse

The horse is a common character in Dalí's work and it often appears distorted. In *The Invention of the Monster*, a creature with a horse's head and a woman's body is one of the central characters. In the same painting, a group of horse/woman hybrids can be spotted in the background. The horse is a rather ambiguous figure, meaning it has the ability to represent a number of varying scenarios. In traditional art history iconography, the horse has been used as a physical manifestation of war and power. In some ancient romantic literature, the horse is found to be in the company of that infamous femme fatal, Medusa (Dexter, "The Ferocious and the Erotic").

Donkey

The donkey makes an appearance in *Un Chien Andalou*, Dalí's most acclaimed film. There are two dead donkeys that each lay in a piano, covered in ants. The dead donkey is quite strange because Dalí does not make it a habit to include such an image in his art. The dead donkey is scarce so there is no established symbolism surrounding the deceased animal.

Inanimate Objects

A significant amount of Dalían iconography includes objects of absolute stillness and their meanings are

ambiguous at best. Many of Dalí's iconographical symbols are distinctly Freudian, such as the numerous phallic symbols. Some of the presented material objects hold specific meanings, some of which are found within traditional art history definition. There are those few signs, however, that possess no established meaning and are open for interpretation.

Mask

The mask is seen in *The Invention of the Monster*; the winged boy is wearing a mask while in the company of the woman/horse hybrid. In ancient Greece, masks are associated with the comedy/tragedy plays; the mask represents a character, one that is not the same as the actor. It was a common practice in ancient Mycenae and Greece for people to receive a funerary mask upon their death.

Amphora

In *The Invention of the Monster*, a broken amphora is placed directly in front the horse/woman hybrid and the winged boy. One can tell it is specifically an amphora due to the curved, double handles. Amphorae were used primarily for storage but were also used as grave—markers in ancient cultures.

Piano

The piano is one of Dalí's more common subjects. In *Atmospheric Skull Sodomizing a Grand Piano*, a piano is engaging in sexual relations with a distorted skull. In *Un Chien Andalou*, the rotting donkeys are placed inside pianos. The piano is a Dalían symbol of female genitalia (Descharnes and Neret 51). The piano has also been interpreted as a reference to Federico García Lorca; the piano is conceived to represent a part of Lorca's nature that is repressed by the skull. The theory goes on to suggest that the skull is also a reference to Lorca (Rojas 175). *Atmospheric Skull Sodomizing a Grand Piano* is thought to convey the idea that Lorca is denying himself of his true nature.

Feathers

In Dalí's paintings, feathers always seem to be connected to the amoeba. In *The Enigma of Desire*, *The Great Masturbator* and *The First Days of Spring* a cluster of colorful feathers are placed next to the amoeba's closed eye. The feathers do not have a concrete meaning in Dalían iconography.

Flowers

In *The Metamorphosis of Narcissus*, a narcissus flower is implanted in the head of Dalí's gray figure. In *The Great Masturbator*, a lily is placed in between the seductive woman and the ferocious lion. Two flowers that are universally associated with death are the lily and the narcissus.

Knife

The knife is a recurring character in Dalí's art. It makes an appearance in *The Enigma of Desire* when a faceless stone figure is seen holding a knife to the back of a much smaller stone figure. In *Un Chien Andalou*, a knife plays a significant role in the very first scene; a man sharpens a knife and then proceeds to cut a woman's eye with the very same weapon. The knife is a dastardly symbol that has been immortalized by Freud because if one goes by the typical rules of Freudian psychoanalysis, they will find that the knife is a phallic symbol. It is elongated and meant to cut or penetrate a surface (Hall, "A Cognitive Theory of Dream Symbols").

Boat

The boat makes an appearance in *Atmospheric Skull Sodomizing a Grand Piano*. It is spotted washed up on the shore where the grinning skull and piano consummate their physical relationship. In *Shirley Temple*, a boat can be spotted behind the title character. According to Freud, anything elongated with rounded edges can be seen as a phallic symbol and the presented boat fits this criteria ("A Cognitive Theory of Dream Symbols").

Skull

In the chosen pieces, one will find a skull in three of the chosen pieces. In *Atmospheric Skull Sodomizing a Grand Piano* a life–sized, stylized skull is the sexual partner of the piano. In *Meditation on the Harp*, a skull is attached to a faceless figure and is resting on a crutch. In *Shirley Temple*, a skull is sitting in between the outstretched arms of the malicious feline. In traditional art history iconography, a skull is known as a memento mori, which is a symbol of time running out (Arnason and Mansfield 641). The memento mori was a particularly popular concept in the Renaissance and Baroque periods. In *Atmospheric Skull Sodomizing a Grand Piano*, the skull has been interpreted by Santos Torroella as a representation of Federico García Lorca (Rojas 175).

Stairs

A set of stairs is in the center of the scene in *The First Days of Spring*. The only things that are placed on the stairs are a real, pasted photograph of Dalí as a small child (Lubar 55) and a fish. Stairs have been suggested to be a Freudian symbol of sexual relations as is anything that can be associated with the physical act of climbing (Spector, "On the Limits of Understanding in Modern Art: Klee, Miró, Freud").

Figures and Anatomy

The human figure is at the core of many Dalí paintings. They are very animated and often produce different moods and scenarios. When it comes to the human figure, Dalí knows no bounds; he portrays them as realistic and unrealistic, full of features and faceless, metaphorical and literal, the list goes on.

Human figures

There are ambiguous human figures in three of the chosen works by Dalí. In First Days of Spring a lone human male sits with his back to the audience. In Meditation of the Harp a looming set of human figures are seen standing over a smaller, shadowed figure. In *Atmospheric Skull Sodomizing a Grand Piano* a set of human figures are seen sitting on a wall with their backs turned from the skull and the piano. The positions of the human figures offer some insight that may be significant to the dynamisms of the pieces. According to art historians, if a person in a painting has their back to the viewer then it is usually an indication of isolation. If a painted figure is significantly larger than their scene partner then it is said the larger figure is meant to be seen as a threatening being.

Finger

The finger makes an appearance in *Meditation on the Harp* and in *The Metamorphosis of Narcissus*. In *Meditation on the Harp* a small figure is holding out a single finger in a gesture of pointing. In *The Metamorphosis of Narcissus*, a finger is one of the legs of the fragmented, gray figure. The pointed finger is a universal symbol of accusation, hence the term 'finger-pointing.'

Narcissus

The general persona of Narcissus is the leading character in Dalí's painting *The Metamorphosis of*

Narcissus. Narcissus is a popular figure in contemporary psychoanalysis, especially within Freudian study. According to Freud, Narcissism is divided into three psychological segments - the Ego, the Superego and the Id (Fancher 394, 395 and 396). The Ego is the immediate conscious and represents how one is in reality. The Superego develops directly from the Ego and is commonly known as the ideal self. The Superego is a manifestation of how one wants to be and sets standards for one's self in accordance to high morality and social convention. The Id rests deep within the subconscious and recognizes primal want and impulses which are monitored by the Ego (Fancher 395). Freud claims that a Narcissistic person takes the characteristics of his or her own Superego and uses them as a guide to finding a suitable mate; he goes onto say that if one tries to find their ideal self in their ideal partner then all love is, on some level, homoerotic (Greven, "Rereading Narcissism: Freud's Theory of Male Homosexuality and Hawthorne's 'Gentle Boy'").

Carl Jung concentrates more on Narcissus' reflection; he believes the reflection symbolizes the ideal mate and its elusiveness (Javanbakht, "Was the Myth of Narcissus Misinterpreted by Freud? Narcissus, a Model for Schizoid-Historic, Not Narcissistic, Personality Disorder"). Jung claims that a Narcissistic person subconsciously looks for the opposite gender versions of himself or herself as the perfect partner. The female version is called an anima and the male version is called the animus ("Was the Myth of Narcissus Misinterpreted by Freud? Narcissus, a Model for Schizoid-Historic, Not Narcissistic, Personality Disorder").

Christ

Christ makes an appearance in Dalí's painting *Assumpta Corpuscularia Lapislazulina*. Christ is seen nailed to his cross in the center of the portrait. Christ has remained a fairly literal figure in traditional art history symbolism, but such cannot be said for Surrealism. In Surrealist paintings, Christ on the cross represents male -oriented father issues, as does the figural representation of Zeus (Ades and Bradley 20).

METHODS

Why I chose to research Salvador Dalí:

I decided to research Salvador Dalí because of the mystery surrounding the man. He never really discussed what the paintings were meant to represent. Many points of interpretation have been developed, and yet few are universally accepted as probable. Documentation regarding his personal life has always been ambiguous. My goal is to research his art and develop further insight into his personal life. I desire to treat his works as an unofficial autobiography.

Psychoanalysis:

I wanted to use the psychoanalytical theory as a research method because such a branch of psychology has been linked to Surrealism -- the style of art in which Dalí was involved. I also wanted to approach his iconography with reference to transference theory. The process of transference is when feelings that initially surround a person are projected onto a relatable place or an inanimate object. For example, if one is beaten in a bedroom they will transfer their fear from the person who beat them to the general setting of a bedroom. This mindset allows the person to act as if nothing had ever happened. This state of mind is considered to be a type of coping mechanism that falls under dissociation. I wanted to connect Dalían iconography to various levels of transference (the use of transference has a tendency to develop out of personal trauma) and I strongly believe that Dalí's symbolism offers some horrific insight into his personal life.

There are several masters of psychoanalytical psychology, including Sigmund Freud, Carl Jung and Sándor Ferenczi. The average Surrealist piece, however, has been primarily analyzed in a Freudian manner because Freud was the only psychoanalyst to whom the Surrealists gave any staunch recognition. While Dalí was a major fan of Freud, limiting his iconography to Freudian symbolism is a little too confining for one as versatile as he. I wanted to look for references to other psychoanalysts because I believe it unrealistic to think that Dalí limited himself to one path or theoretical framework.

Traditional art history iconography:

I wanted to exhaust the possibility of Dalí staying true to traditional art history symbolism because he was quite fond of classical art and expressed great admiration for Baroque works and the revered Dutch painters of the Romanticism period. The Surrealist clique encouraged its followers to break ties with traditional art, but Dalí never formally abandoned the old masters; this greatly annoyed his fellow Surrealists, particularly the leader André Breton. Dalí was always a bit of a rebel when it came to the Surrealist status quo, and paying homage to classical art would be the perfect form of rebellion against the narrow-minded Surrealists.

Topics of Discussion:

There are two arguments on which I would like to focus. I wish to consider the possibility that Dalí was sexually abused by his mother as a child; such a concept is not new. Published author, artist, and Spanish professor Carlos Rojas, Ph.D., has published the novel Salvador Dalí: the Art of Spitting on My Mother's Portrait in which he discusses the theory that Dalí was molested by his mother. Unfortunately, his theory never really became mainstream. One book review tore his findings to shreds on the premise that Dalí actually adored his mother. It is not at all uncommon for traumatized children to 'love' their abuser; doing so is considered to be a form of survival and, therefore, almost expected. In the given time I had to conduct my research, I was unable to find another credited source who believed that sexual abuse occurred in Dalí's childhood so I decided to tackle this topic in a different fashion. I studied the statistics and behavior surrounding Childhood Sexual Abuse victims and compared them to Dalí's own, personal mannerisms; the results are quite staggering. I wanted to relate his terrifying iconography to a scale of transference and develop the possible CSA scenarios accordingly. Dalí himself claimed that his fear of intercourse was a result of his father teaching him the horrors of sexually transmitted diseases at an early age; I wanted to debunk this statement because conditioning is only a temporary reaction; I firmly believe that Dalí's unique level of sexual terror stems from trauma.

The second point I would like to present in the research revolves around the notion that Dalí may have been homosexual. The rumor of Dalí preferring

men to women is a little better known, but it is not considered to be a fact, despite the numerous sources who vehemently declared that Dalí was attracted to men. The only angle that keeps said concept from being common knowledge is Dalí's union with Gala, a woman to whom he was married for forty-eight years. I do think that they loved each other, but it was questionable to those closest to Dalí that he was in love with Gala or she with him. In approaching Dalí's sexual preferences, I wanted to pay particular attention to his very private relationship with the poet Federico García Lorca and how references to said relationship can be found in his art. Some sources say the two were only friends, while others say Dalí and Lorca's relationship was romantic. I turned to original documentation at this point in the research. I read several corresponding letters between Lorca and Dalí, and such proved to be highly beneficial in uncovering the complex nature of their connection.

The chosen pieces:

Nine out of the ten pieces I chose are from the peak of Dalí's Surrealism career and the tenth comes from his religious period. They include a massive amount of iconography, much of which the pieces share, and include references to sexual terror and homoeroticism. I believe these pieces are appropriate in supporting the topics of maternal sexual trauma and repressed homosexuality.

I decided to study *The Metamorphosis of Narcissus* because I believe it offers some insight into Dalí's sexual preferences and his issues surrounding self-esteem. Dalí's story arc for this painting parallels Freud's narcissism theory; Freud specifies narcissism in three segments just as Dalí offers three points of interest in his image. In comparing Dalí's scenery to Freudian narcissism, I have found some perceptions that concern his relationships with Gala and Federico García Lorca. In addition to Freudian theory, I wanted to tackle a Jungian outlook on this piece as well because Jung's concept of narcissism pays special attention to the role of Narcissus' reflection; Dalí clearly uses the reflection as a point of emphasis in the piece.

The Enigma of Desire is chosen because the symbolism found in the piece gives some insight into Dalí's relationship with his mother, an Oedipus complex fixation and the possible Childhood Sexual Abuse. The

amount of iconography is startling; much of it relates to both phallic representation and the vagina dentata, which are primarily Freudian concepts.

The Great Masturbator is examined for the same reasons as The Enigma of Desire. It contains a long list of Dalían symbolism that is quite disturbing in both its established and potential definitions. I also believe that, as in the previously discussed piece, *The Great Masturbator* offers some clues to the topic of CSA.

The First Days of Spring was approached because there are some clues in relation to Dalí's feelings of isolation, his identity crisis concerning his deceased brother, and the complex relationship he had with his parents. The format of the piece is a cause for interest; it contains both symbolic scenes and individual representations.

Meditation on the Harp was picked because of the simplicity of the scene. It does not contain a hallucinogenic display of symbols but instead represents a fairly plain image of three figures. The positions and physical features of the figures are what captured my attention. The nature surrounding this image is rather unsettling and it requires some acknowledgement of not only Dalí's mother-oriented thoughts but also the anger he felt toward his father.

Atmospheric Skull Sodomizing a Grand Piano was selected for a number of reasons. For starters, it is not an overly well-known Dalí painting. The use of limited iconography leads me to believe that the meaning behind the piece is a little more straightforward than usual, relatable to not only Dalí's interesting coupling with Gala but also his complicated connection with Lorca.

The Invention of the Monster is interesting because of its references to Greek culture. In linking this painting's scenery with traditional Greek art and Greek society, there is more evidence indicating that Dalí's childhood was less than ideal.

Shirley Temple was explored because of the limited iconography and the possible references to Greek Mythology. In what little iconography Dalí uses in this piece, there seems to be a profound use of transference in relation to CSA.

Assumpta Corpuscularia Lapislazulina was tackled because of the sheer irony behind his religious pieces; Dalí created many paintings revolving around Christianity even though he was raised an atheist. He claimed to have converted to Christianity, but those closest to him declare that such a statement is insincere. There is almost no iconography in this piece but there are figural representations. I propose that the figures Dalí uses in this piece still prove to be useful in dissecting his issues concerning his parents.

The reason this research attempted to analyze Dalí's movie *Un Chien Andalou* was because nobody has officially been able to crack the code of Dalí's complex use of iconography in this work. Many of those who attempt an analytical discussion of the movie approach it with the notion that there Pons12

is a continuous story arc; I do not think such is the case with *Un Chien Andalou*; I believe that the plot goes frame by frame and each scene contains its own story. In the interest of time, I've chosen to evaluate only the more climactic scenes, for I believe they can be connected to Dalí's personal views surrounding sexual relations, the struggle between his Ego and Superego and his severed (by the time of production) relationship with Lorca. It is no secret that Lorca believed the movie to be a personal attack on him.

Limitations:

Because of my limited time frame, I was not able to conduct all the research I would have liked. I had to abandon much of the iconography in the paintings and movie because of my constricted window of opportunity. I would love to delve deeper into Dalí's Surrealist art and tackle the iconography I was not able to study.

Another limitation involved my scarce background in psychology. I wanted to look at these paintings from a psychological aspect so that I could gain some insight into Dalí's mind, but psychology is neither my major nor my minor. My perception surrounding psychology is limited at best and I wish to develop a more in-depth understanding of the field. Also, I would like to apply various branches of psychology to Dalían art, such as behaviorism. I think Dalí's works offer infinite potential

in terms of cognitive theory, as well, and I wish to explore such a thought process.

Beneficial to art history:

Iconography is subjective. Every artist, style and culture has its own train of thought and its own methods of application. Creating a painting, sculpture, or print is a very intimate process for an artist and they will – either consciously or not – personalize their imagery. The story arc of an art piece has been related to the protocols of the style and the social customs of the culture; the topics developed out of such focus have proved to be insightful; I believe that if there is a deeper understanding of the artist as a person with issues, demons, and insecurities (because everybody has them), then their art will be more relatable to the general public. People today cannot connect with Rome's political hierarchy or the Baroque period's preference for black backgrounds; they can, however, connect with feelings of isolation and histories of abuse. If art historians look at art and describe art from the artist's point of view, then there is no telling what can be uncovered. If your average art enthusiast can find similarities between their lives and the lives of a master artist using their iconography as a connector, then art will truly be timeless.

INTERPRETATIONS

Ants

There is no reason to believe that the ants mean anything other than the representations stated above: I wholeheartedly agree with my sources. Dalí did hold a borderline unhealthy fascination with death (Arnason and Mansfield 330-331) which would explain the connection to decay. Dalí would even fantasize about his own death (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). The idea of the ants symbolizing sexual sensation molds into Dalí's repeated pattern of sex; his high level of shame and fear involving sexual relations has never been kept a secret ("The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). I believe that Dalí fits the criteria of a type of panic disorder commonly known as sexual aversion disorder (SAD) which is essentially an extreme fear of sex (Brotto, "The DSM Diagnostic Criteria for Sexual Aversion Disorder"). A 2007 study

shows that the leading cause of SAD is sexual trauma which is one of the topics this paper will discuss.

In The Enigma of Desire, the ants are seen swarming the amoeba which has been identified as a Dalían self-portrait (Martinez-Herrera, Alcantara, and Garcia-Fernandez, "Dalí (1904 - 1989): Psychoanalysis and Pictorial Surrealism"). The meaning of the presented ants may revolve around death. In this scenario, I think the theory of decay supports another one of Dalí's many fantasies involving his own death. The amoeba is painted with its eyes closed and this detail can be seen as suggesting eternal sleep. There could be a second, more malicious meaning behind the placement of Dalí's ants. The amoeba is always portrayed as boneless, limbless, and lying on its side, which may construe total defenselessness. The symbolism of the closed eyes may go deeper than simply an indication of death; closed eyes may represent a refusal to accept reality or an attempt to block out traumatic imagery. This is where the sexual sensation theory appears. Dalí's fear of sex was persistent and downright damaging to his personal life (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). If the ants (sexual sensation) are crawling on the amoeba (self-portrait) then Dalí is obviously linking himself with some sort of sexual arousal, but the amoeba is blocking it out but has no limbs with which to defend itself. I believe such features serve as implications of an unwanted sexual encounter. I think the nonconsensual event is related to Dalí's mother. Dalí himself states that he gets flashes of his mother performing fellatio on him as a child ("The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

In *The Enigma of Desire*, there is a structure surrounding the amoeba that repeatedly says "my mother," and the structure is attached to the back of the amoeba's head, perhaps implying a memory. Dalí did admit to having memory fragmentation when it concerned his mother ("The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). I think that the structure is exactly that — a memory track. There are gaping holes in the structure which may represent the lost memories; one of the gaping holes parallels a faceless, nude, female body. An image displaying an unwanted sexual event (ants on the amoeba) accompanied by memory fragmentation surrounding Dalí's mother (the structure) supports the

belief of maternal sexual abuse; memory fragmentation – otherwise known as dissociation – is linked to sexual trauma (Frankel, "Ferenczi's Trauma Theory"). I would like to suggest that the ants represent both decay and sexual sensation and that memories of the mother inflicting such feelings are terrorizing the defenseless amoeba.

In *The Metamorphosis of Narcissus*, the ants swarm a gray figure. I think that the established theories of the ants apply to the image. The gray being is hiding his face, indicating guilt and shame; such emotions are connected to Dalí's mindset surrounding masturbation (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"), and masturbation connects to the sexual sensation theory. The notion of decay is relevant to my belief that the gray figure is Dalí's Ego, which is one of the levels of Freud's narcissism theory. According to Freud, the Ego (real self) suffers a sort of metaphorical death at the hands of the Superego (ideal self) which strives to be the perfect human being (Merkur, "Interpreting the Sense of Badness"). I think the ants may represent the death of Dalí's own Ego.

In *Un Chien Andalou*, the two meanings of the ants apply to the scene simultaneously; they are seen crawling out of a hand and the hand is actually a direct symbol of masturbation (Thiher, "Surrealism's Ending Bite: *Un Chien Andalou*"). Masturbation is linked to arousal, and Dalí connected decay with any sort of sexual sensation (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

The ants in *The Great Masturbator* could serve both theories of decay and sexual sensation. In this painting, the ants swarm both an amoeba and a grasshopper. The grasshopper represents the vagina dentata which is a visual aid of female sexual aggression (Martinez-Herrera, Alcantara, and Garcia-Fernandez, "Dalí (1904 – 1989): Psychoanalysis and Pictorial Surrealism"); grasshoppers also act as a particular source of fear on Dalí's part ("Dalí (1904 – 1989): Psychoanalysis and Pictorial Surrealism"). The grasshopper is seen kissing the defenseless amoeba implying what I think is an unwanted sexual encounter. The ants are crawling from the grasshopper to the amoeba, indicating that the grasshopper (the female) is the instigator in this sexual event. By comparison, there are many more ants on the

grasshopper than on the amoeba. I think this symbolizes the female instigator achieving a high level of sexual satisfaction while Dalí achieves merely a biological response and receives no enjoyment whatsoever. This notion is further supported by the fact that the amoeba's eyes are closed, thus blocking out the event. The decay theory surrounding the ants fits perfectly into this entire paradigm; during this unwanted sexual rendezvous, Dalí may have been achieving what is known as the 'psychic death,' a term used for victims of childhood sexual abuse (CSA) when they mentally "checkout" so they do not have to face the reality of being molested (Paláez, "Trauma Theory in Sándor Ferenczi's Writings of 1931 and 1932"). This would certainly explain Dalí's fragmented childhood memories (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). I would like to claim that the ants in this particular scenario symbolize the 'psychic death' Dalí experiences during his possible sexual trauma. The mass of ants on the grasshopper also has a place in the hypothesis of decay; the decomposition of the grasshopper serves as support for Dalí's directly linking sex to death ("The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). Reverting back to the molestation theory, Dalí's mother died of uterine cancer when Dalí himself was just sixteen. The ants swarm the bottom of the grasshopper's belly and if such an image is compared to a woman's body, the ants would be crawling on the womb; the womb and the uterus are the same thing. The ants on the grasshopper's belly could be a direct reference to the cancer, itself, thus connecting sexual aggression, sexual sensation, fear, and decay to his mother ("The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

Grasshoppers

In *The Great Masturbator*, the grasshopper plays a rather significant role. In the front of the scene, there is a grasshopper kissing an amoeba. The grasshopper is seen primarily as a vagina dentata object or a representation of female sexual aggression (Martinez-Herrera, Alcantara, and Garcia-Fernandez, "Dalí (1904 – 1989): Psychoanalysis and Pictorial Surrealism"). Its second role is a Dalían symbol of fear which directly coincides with the vagina dentata. The significance of the grasshopper intensifies when one attempts to combine the frame works-- Dalí had a phobia of sexually

aggressive women. Take note that the artist associates his fear of sex exclusively with women (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"); Dalí appeared to have had a tough time separating sex, guilt, and fear, which is a classic sign of CSA (Romano and De Luca, "Evaluation of a Treatment Program for Sexually Abused Adult Males").

In *The First Days of Spring*, the grasshopper is seen kissing a slightly more structured version of the amoeba, and probably represents the same historical event as in *The Great Masturbator*: Dalí was at one point subjected to an unwanted sexual encounter by an aggressive female.

Fish

In The Enigma of Desire, the grasshopper is seen kissing what appears to be a fish. Once again, I believe there are two meanings behind the iconography. The obvious meaning revolves around the accepted theory that a fish is a symbol of male genitalia (Lubar 55) which would fall under the protocols of Freudian imagery. If a symbol pertaining to male sexuality is caught in a passionate lip-lock with a symbol of female sexuality (grasshopper) then I believe it is safe to assume that this little scene represents an intimate encounter of a heterosexual nature. I think the fish does contain a religious definition, though not necessarily a traditional one. Fish have been linked to the story of Noah's Arc; they were the forgotten creatures who were left alone in a time of chaos but they survived (Clapp, "The Biggest Fish Story"). Perhaps this fish represents survival. It may specifically symbolize the survivor of a vicious sexual encounter, which would explain the use of the vagina dentata (grasshopper). I would also like to point out that the traditional representation of the fish is not totally out of the question. In your average classical painting, the fish is a direct symbol of Christ. Dalí was raised an atheist but due to academic problems in public school, his parents enrolled him in a Catholic school called the Hispano-French School of the Immaculate Conception (Tate Publishing 8). He was exposed to biblical stories and their symbolism. Furthermore, religious iconography is nothing new to Surrealism; the Christ figure as well as the Zeus figure is believed to represent male-oriented resentment toward the father (Ades and Bradley 20). If the fish is a manifestation of Christ, this scene could be connecting Dalí's father to the sexual encounter involving the aggressive female.

In *The First Days of Spring*, a fish is placed in the front of the scene, suspended in mid–air; anyone who has encountered a Surrealism painting can attest to the group's fascination with floatation. Many surrealists attempted to visualize psychedelic dreams in their paintings (Arnason and Mansfield 209), and perhaps floatation means exactly that. The fish is a lone figure so I deduce that it is meant to have its own personal meaning. I believe that any of the previously stated definitions are plausible; it could represent Christ, survival, or a phallic symbol.

Lion

In The Enigma of Desire, the lion is seen attached to a fragmented structure which has been continuously littered with the phrase 'my mother;' fear of aggressive female sexuality has been connected to Dalí's mother by the artist himself (Ades and Bradley 24). Dalí contributes this mindset to a memory and/or hallucination of his mother performing oral sex on him (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"); Dalí cannot be sure if this memory is real or not. This leads back to my previously stated belief that the strange 'mother' structure symbolizes a memory track. Fragmented memories, otherwise known as dissociation, can be linked to CSA (Frankel, "Ferenczi's Trauma Theory"). One should pay particular attention to the fact that this vagina dentata symbol has teeth; the toothed vagina dentata is meant to symbolize a loss of male identity and the constant use of such imagery has been specifically connected to male victims of childhood sexual trauma (Blazina, "Part Objects, Infantile Fantasies and Intrapsychic Boundaries: An Object Relations Perspective on Male Difficulties with Intimacy"). I think it is possible that Dalí was molested by his mother and that his memory of sexual abuse was

In the same painting, we can view a second lion which is parallel to a skeletal female face. The symbolism of the lion is female sexual aggression (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational") and Dalí parallels it to a face which has been previously identified as Medusa in another Dalí painting called The Font (Lubar 59). Through sheer observation, I have found that the Dalían lion shares some striking resemblances to the monstrous Medusa, such as the lolling tongue and the stringy, snake-like

hair (Dexter, "The Ferocious and the Erotic"). I believe that the buried significance of the lion revolves around Medusa; this idea is supported by the fact that the same motif includes stone figures which are an essential plot device in the myth of Medusa. According to Freud, Medusa acts as a source of sexual fear (Eastman, "Freud, the Oedipus Complex and Greece or the Silence of Athena"), and this theory directly coincides with the vagina dentata theory. Jung specifically links Medusa to motherhood gone wrong (Dexter, "The Ferocious and the Erotic"). My belief that the lion symbolizes Medusa supports the scenario of Dalí linking his mother to the vagina dentata; this leads us back to the possibility of CSA.

In The Great Masturbator a lion can be seen attached to the amoeba and simultaneously placed directly under a woman who has been theorized to represent Dalí's mother in the alleged act of mother/son fellatio (Rojas 121). I assert that the lion represents both the vagina dentata and Medusa. The role of Medusa is emphasized by the accompaniment of the stone figures that stand below. I will reiterate that the lion symbolizing the vagina dentata is commonly agreed upon amongst those familiar with Dalí's art. The placement of the lion is quite interesting. Medusa has been portrayed as a symbol of sexual danger particularly strongly by Freud (Eastman, "Freud, the Oedipus Complex and Greece or the Silence of Athena"), but in mythology she was not always a monster. In The Iliad and The Odyssey, Homer depicts Medusa as a beautiful woman (Dexter, "The Ferocious and the Erotic") and a beautiful woman is exactly what parallels the lion in *The Great Masturbator*. Perhaps the artist is conveying the notion that sexual appeal and sexual aggression can be found within the same source. The source in his case has been speculated to be his mother.

Standard cat

In *The Invention of the Monster*, the cat is in a crouched position and placed beside a frail figure. The cat represents the vagina dentata (Otero, "Fearing Our Mothers:' An Overview of the Psychoanalytic Theories Concerning the Vagina Dentata Motif"), but its position indicates dormant female sexual aggression that will eventually rise to the surface.

In Shirley Temple, a cat's body is attached to a female human head and this is the exact appearance of the Sphinx. In the myth of Oedipus, the Sphinx acts as a guardian, and the use of such a being may be relatable to Dalí's parents. This again suggests that Dalí's fear of female sexuality is directly related to his mother (Ades and Bradley 24). In this painting, fear is represented by a cat and both the cat and the lone set of wings that hover above Shirley's head echo the figure of a Sphinx. Another distinct cat-like feature is the set of claws on the red cat. The cat is scraping its nails against the ground, and the sound of scraping nails is perceived by modern psychology as auditory transference (trigger) which is accepted by psychologists as a direct result of CSA (Chopra, "Delusional Themes of Penetration and Loss of Boundaries and Their Relation to Early Sexual Trauma in Psychotic Disorder"). The transference process is practiced by many trauma victims and is done to make the reality of sexual abuse more bearable (Maldonado, "Vicissitudes in Adult Life Resulting from Traumatic Experiences in Adolescence"). Since the painting centers around a cat scraping its nails (Otero, "Fearing Our Mothers:' An Overview of the Psychoanalytic Theories Concerning the Vagina Dentata Motif"), I believe the piece symbolically narrates the scenario of Dalí being victimized by a sexually aggressive female.

Birds

It is interesting that a bird -a symbol of abandonment- is interwoven with Medusa, someone who Jung summed up to represent failed motherhood (Dexter, "The Ferocious and the Erotic"). I think this may indicate a feeling of abandonment Dalí had experience at the hands of his mother. Dalí felt overshadowed by the memory of his older brother who had died less than a year before he was born (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). Dalí felt anger toward his parents, despite the fact that his mother had a tendency to overindulge him ("The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

Interestingly enough, a bird–like, Neolithic god would later be morphed into the character of Medusa (Dexter, "The Ferocious and the Erotic"). Perhaps the winged creature is a direct representation of Medusa. This would further explain why the bird blocks are used to build the face of the same mythological female (Lubar 59).

Bats

It has been noted that when Dalí bit into the bat he was suffering from an episode of rage to which he was prone as a child (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). Perhaps the bat represents not just general rage but the specific rage he felt toward female sexuality. The bat is placed directly above a cat which has been named a vagina dentata (Otero, "Fearing Our Mothers:' An Overview of the Psychoanalytic Theories Concerning the Vagina Dentata Motif"). I find it interesting that the bat is above the cat. I think this may represent the possibility that Dalí's rage is even greater than his fear, thus giving the artist a much needed sense of power. Dalí had been very isolated and shy as a boy and a young man (Stainton, "From Lorca: A Dream of Life."); some say that a submissive nature is a result of CSA (Frankel, "Ferenczi's Trauma Theory"). This particular arrangement of a bat hovering above a vagina dentata may represent the metaphorical process of overcoming trauma and feeling empowered as a result.

Horse

Dalí has a tendency to dehumanize women, putting emphasis on their bodies and totally erasing their faces. This common occurrence is perhaps due to the fact that Dalí finds women to be threatening monsters (Ades and Bradley 20). According to Freud, the mythological creature of Medusa is the ultimate vagina dentata (Eastman, "Freud, the Oedipus Complex and Greece or the Silence of Athena") and such a being holds the key to male subjugation, sexual appeal, and power. In The Invention of the Monster, the audience is visually assaulted by the horse/woman hybrid's ample bust - a much sexualized sign of femininity; as stated previously, the common horse has been linked to Medusa in Greek and Roman romantic literature (Dexter, "The Ferocious and the Erotic"). I believe that the half horse/half woman is Medusa. To further support this concept, the hybrid is clutching its neck while staring at a young, male figure. According to mythology, Medusa is actually the mother of Pegasus who was birthed from her neck ("The Ferocious and the Erotic"). The young male figure possesses a small set of blue wings which suggest that the hybrid's scene partner is Pegasus, Medusa's son. I believe that this possible incarnation of Medusa

represents Dalí's mother and Pegasus represents Dalí himself.

I think the explanation for the group of horses is simple. They appear to be in the middle of a metamorphosis from horses to women or vice versa. The women are over-sexualized and suffer from a loss of identity due to the lack of facial representation. I think that Dalí is linking horses with female sexuality. Remember, the horse is a traditional symbol of power, and I think the horse may be an original, Dalían symbol of the vagina dentata.

Donkey

From 1925–1928 Dalí corresponded by letter with Federico García Lorca. In at least one letter from Dalí to Lorca, Dalí specifically referrers to himself as a rotting donkey (Maurer 92). I think the explanation behind the decaying donkeys is simple; I believe the donkey is a Dalían self-portrait. It is no surprise that Dalí associates himself with such a morbid picture; he often associated himself with death (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

Mask

Due to the mask's connection with plays, I think the mask represents a sort of second persona concerning Dalí. Many people have described him in different ways; throughout the course of his career, some have called him shameless (Brenson, "Review/Art; Surrealism's Roots in Its Time"), while in his earlier years, friends and acquaintances have described him as painfully shy (Stainton, "From Lorca: A Dream of Life"). Multiple sources confirm the shy personality, declaring that he was rather insecure throughout his childhood (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). I believe that the mask worn by the winged figure in *The Invention of the Monster* is symbolic of the metaphorical mask many believe Dalí wore to hide his true self from the world (Murphy, "The Link Between Artistic Creativity and Psychopathology: Salvador Dalí").

I believe the young male figure in *The Invention of the Monster* may represent Dalí. The figure is offering his hand to the horse/woman hybrid and I think this is Medusa who is the ultimate vagina dentata (Eastman, "Freud, the Oedipus Complex and Greece or the Silence

of Athena"); the vagina dentata is always depicted as the perpetrator of a sex-related death (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). If the figure is Medusa, I suggest that the mask the little boy is wearing could very well be a Greek funerary mask. This serves as a haunting metaphor for his future demise at the hands of the vagina dentata. The Greek funerary mask was generally referred to as the mask of Agamemnon (Harrington, "Behind the Mask of Agamemnon"); the character of Agamemnon – ironically enough – gained a reputation for sacrificing children. I believe the boy is sacrificing himself while wearing the appropriate, ritualistic gear- the mask of Agamemnon.

Amphora

The ancient cultures such as Egypt, Minoa, Mycenae, and Greece used amphorae for storage and as gravemarkers. I believe that, just the same as most Dalían iconography, this amphora has two meanings; I do think that the storage aspect comes into play. I think the storage jar is symbolically connected to Dalí's family life. Dalí has been reported to have had a very secretive family (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"), and the same branch of extreme secrecy has been connected to abusive homes (Freshwater, Leach, and Aldridge, "Personal Constructs, Childhood Sexual Abuse and Revictimization"). The fact that amphorae are also linked to death is relatable to Dalí's own fascination with the grim subject (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

Piano

I would like to talk about the role of the piano in *Atmospheric Skull Sodomizing a Grand Piano*; I do think that the piano symbolizes female genitalia (Descharnes and Neret 51), because such is already a key theme in his work. On a more symbolic note, I believe that the scene in this painting sums up a masturbatory fantasy of a homosexual nature. The activity of self-satisfaction was the primary source of sexual release for Dalí (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). Reportedly, he and his wife Gala engaged in sexual relations only once in their forty-eight year marriage because Dalí preferred masturbation to the act of sex ("The Enigma of Desire: Salvador Dalí

and the Conquest of the Irrational"). I do believe that the obvious meaning of the painting is heterosexual attraction and even more specifically reenacts Dalí and Gala's only time to engage in intercourse. I also think that there is a hidden meaning behind the instrument. One of the most important figures in Dalí's life was the poet Federico García Lorca, and it is reported that the two had a very complicated and somewhat private friendship. The exact paradigm of their friendship remains ambiguous but many speculate that their interaction was more romantic than platonic. Luis Buñuel, a mutual friend of Dalí and Lorca, has reportedly referred to Dalí as Lorca's boyfriend (Brandon 312). Carlos Lozano, a close friend of Dalí, was positive the artist was homosexual (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). Dalí had even sent a letter to Lorca describing his own fantasy involving the poet masturbating (Maurer 103). I would like to suggest that the hidden meaning behind the painting involves a sexual fantasy revolving around Lorca. It is not a new concept to connect this painting to Dalí and Lorca's possible romantic love for each other; there is a hypothesis that the skull is Lorca and the piano is Dalí (Rojas 175). It has also been suggested that both the skull and piano are portraits of Lorca and that the presented act of sodomy symbolizes his struggle with his sexual preferences (Rojas 175). Lorca has been connected to the piano because Lorca himself was a classical pianist (Rojas 175). I must disagree with both of these theories and dare to say that the imagery contains a much more simplistic explanation. I think that Dalí is the skull, Lorca is the piano and the entire scene is Dalí's fantasy of himself taking the initiative and consummating his and Lorca's love. In the accumulated evidence supporting the notion that a sexual act did occur between the two, Lorca has always been described as the instigator. I believe that this painting visualizes Dalí's fantasy of letting go of his inhibitions and taking what he had wanted all along.

In *Un Chien Andalou*, the piano makes a very ambiguous appearance. In one scene, there are two pianos and each contains a rotting donkey. It is interesting that the donkey is placed inside of the piano but even more so, I find it peculiar that Dalí himself is in the same scene; he is dressed as a priest and tied to one of the pianos. It is reported that at one point during their relationship,

Lorca sketched an image of Dalí dressed in a priest's uniform; Dalí kept that sketch for decades (Stainton, "From Lorca: A Dream of Life"). I believe that the pianos in Dalí's movie refer to Lorca and that the donkeys represent Dalí; it is no secret that Lorca believed the movie to be a direct attack on him (Morse, "Portrait of the Poet as an Andalusian Dog"). Dr. Carey Rote speculates that the dragging of the pianos symbolizes Dalí dragging his emotional baggage. I do agree with this notion, but I believe that the act of dragging the pianos specifically relates to the baggage of Dalí and Lorca's relationship.

Feathers

I think the feathers are a reference to homosexuality. Dalí often pictured Saint Sebastian, an icon of the gay community since the 1800's, with colorful feathers and suggested the association in a letter to none other than Federico García Lorca (Maurer 78). Dalí and Lorca often spoke of Saint Sebastian and even referred to each other as such (Maurer 67). When he was a teenager, Dalí experienced a near sexual encounter with one of his few, alleged girlfriends. It was after failing to consummate with his lady friend that Dalí first verbally associated himself with Saint Sebastian (Maurer 21). I believe that this scenario supports the hypothesis that Dalí was homosexual.

Flowers

In The Metamorphosis of Narcissus, the narcissus flower is seen sprouting from the head of the gray figure. This painting was meant to portray the Freudian theory of Narcissus. Freud had seen Dalí's piece in person and was impressed at the artist's interpretation of his work (Martinez-Herrera, Alcantara, and Garcia-Fernandez, "Dalí (1904 – 1989): Psychoanalysis and Pictorial Surrealism"). Freud's framework of Narcissism includes the Ego, Superego and Id (Fancher 392). I believe the gray figure is Dalí's own Ego which he has personalized in a heartbreaking manner; it is flawed and rife with Dalían iconography. The Ego is a manifestation of how one is in reality (392); human beings are imperfect and the Superego or ideal self is developed to battle these flaws (Fancher 395). According to Dan Merkur, the Superego places impossibly high standards onto the Ego and as a result of the pressure to be "perfect", the Ego suffers a psychological death because it cannot live

with the reality of its imperfection ("Interpreting the Sense of Badness"). In the myth, Narcissus turns into a flower of the same name after his death (Figueira et al., "Sexual Dysfunction: A Neglected Complication of Panic Disorder and Social Phobia"). Since the narcissus flower is seen springing from the gray being's head, I believe it symbolizes the psychological death of Dalí's Ego.

In *The Great Masturbator*, the lily is placed directly in between the seductive woman and the ferocious lion, the painting's two primary representations of the femme fatale. I believe that the lily is meant to symbolize its universal meaning of death. It directly coincides with the vagina dentata and can further attest to Dalí's greatest fear; he was convinced that sex leads to death (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

Knife

I believe that the knife has two possible meanings. I think it is possible that Dalí uses the knife in the context of the Freudian phallic symbolization, for it is elongated and penetrates a surface (Hall, "A Cognitive Theory of Dream Symbols"). To further support this idea, the scene of the knife cutting the eye is merged with a shot of a cloud moving across the moon. Luis Buñuel, the co-creator of the film Un Chien Andalou, uses the very same image of a cloud passing a moon in place of a rape scene that starts one of his later movies. The knife in the eye and the cloud on the moon could both represent heterosexual relations. The knife is a phallic symbol and the moon is a sign of femininity. The slicing of the eye could also be a reference to the myth of Oedipus. When Oedipus realizes the horror of his incestuous situation, he blames his eyes for being blind to the truth (Hartocollis, "Origins and Evolution of the Oedipus Complex as Conceptualized by Freud") and gouges them from their sockets as a form of punishment. The actual slicing of the eye has been connected to the social stir modern art had created (López, "Film, Freud and Paranoia: Dalí and the Representation of Male Desire in an Andalusian Dog"); supposedly, this movie's primary purpose was to offend the soulless bourgeois circle (Thiher, "Surrealism's Ending Bite: Un Chien Andalou"). Personally, I do not think that this movie was simply weird for the sake of being weird, because it contains too much symbolism. Due to Dalí's modus operandi,

I believe that either the concept of intercourse or an Oedipus reference would best fit the movie's opening scene.

In the painting *The Enigma of Desire*, there are two stone figures of different heights locked in an embrace, and the larger one is seen holding a knife to the smaller one's back; I think the variation in height may represent an age difference between the two figures. I believe the larger stone being is offering a false sense of security but is about to stab the smaller one in the back. In numerous Dalí paintings, the knife is usually held by William Tell, a fictional character who Dalí associates with the castration complex (Taylor, "'A Shine on the Nose:' Sexual Metaphors in Surrealism"). The castration complex falls within Freudian framework and is used to describe a subconscious rivalry between a father and son for the mother's affection (Hartocollis, "Origins and Evolution of the Oedipus Complex as Conceptualized by Freud"). The symbolism of the knife may be connected to Dalí's father. It interesting that the large figure is holding it at the base of the smaller one's back and not in the genital area as a castration scenario would dictate. I believe these stone people represent Dalí and his father. The small figure clings to the larger figure while the larger figure holds a knife to the other's back. I believe the use of the knife indicates betrayal (hence the term 'stabbed in the back'). This scene symbolizes a paradigm where Dalí seeks the protection of his father but does not receive it and thus, Dalí is implying that his father betrayed him.

Boat

In Atmospheric Skull Sodomizing a Grand Piano, I believe the boat fits the criteria of a phallic symbol due to its elongated shape (Hall, "A Cognitive Theory of Dream Symbols"). If such is Dalí's intention, it would fit in perfectly with the scenario of heterosexual relations. A phallic symbol is placed directly in front of a Dalían sign of female genitalia (piano) (Descharnes and Neret 51) while said object is being penetrated. These interwoven meanings further emphasize the theory that this painting is a visual montage of sexual arousal. On another note, the boat has been named as a reference to Cadaqués, Spain where Dalí's family had a summer home. I think this explanation is more likely because it is personal. From 1925–1928, Dalí often took Federico García Lorca to Cadaqués with him to spend

the summers away from R.A.F.A. (Royal Academy of Fine Arts) and they would often wander the beaches together (Stainton, "From Lorca: A Dream of Life"). The landscape in this painting has been linked to the Cadaqués shore (Rojas 174). I agree with the theory that the scenery is a reference to the Cadaqués beaches and that the boat emphasizes such a notion. Associating this painting with a landmark significant to Dalí and Lorca's relationship supports the notion that this painting revolves around homoeroticism.

In Shirley Temple, the boat is made of bones which are elongated and have rounded edges; due to the shape, the boat may represent your typical Freudian phallic symbol (Hall, "A Cognitive Theory of Dream Symbols"). A boat is used in the Oedipus myth and it leads the title character to the Sphinx; I believe this image depicts a scene from the story of Oedipus, but I also think that it represents the horror of an oedipal scenario. According to Freud, the Oedipus complex festers and grows during the phallic stage of development (ages three-six) (Hartocollis, "Origins and Evolution of the Oedipus Complex as Conceptualized by Freud"). I believe this painting uses two symbols to represent one, general idea; the Sphinx represents the myth of Oedipus while the boat represents the phallic stage of development and thus the two symbols create a reference to the Oedipus complex. Such a concept is nothing out of the ordinary in terms of Freudian theory, but I think Dalí takes contemporary psychoanalysis a step further. The cat's nails scraping against the surface can possibly be seen as auditory transference (trigger) which is related to CSA (Chopra, "Delusional Themes of Penetration and Loss of Boundaries and Their Relation to Early Sexual Trauma in Psychotic Disorder"). According to Freud's protégé, Sándor Ferenczi, an Oedipus complex fixation (a case where the complex bleeds into adulthood) only occurs if the boy's innocent claims of being "in love" with his mother are indulged and reciprocated (Paláez, "Trauma Theory in Sándor Ferenczi's Writings of 1931 and 1932"); I agree with such a theory. After considering the iconography of Shirley Temple, I think this painting contains strong – albeit circumstantial -evidence of maternal sexual abuse. I believe that during Dalí's phallic stage of development, he approached his mother with declarations of love. The concept of love to a child differs dramatically from that of an adult's. I

think Dalí's mother, an overly indulgent woman when it came to her son (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"), took his declarations literally and gave into Dalí's oedipal tendencies; this turn of events resulted in the very unwanted reality of sexual abuse, and thus an Oedipus complex fixation was executed. Dalí fits the criteria of an Oedipus complex fixation; such a disorder includes impotence, compulsive masturbation, and memory fragmentation (Frankel, "Ferenczi's Trauma Theory"). Even Dalí associated himself with the Oedipus complex which would imply that he had a subconscious, sexual yearn for his mother but -- in the same breath--- he declares that his mother performed oral sex on him when he was a child (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"); he clearly has trouble recognizing the difference between consensual sex and rape.

Skull

I am not disagreeing with the memento mori symbolism, but I do not think that such an explanation belongs to Dalí's paintings. The memento mori suggests a passage of time or simply a person who is getting older. Such an explanation seems too out of place compared to the rest of Dalí's iconography; the traditional use of the skull is just not modus operandi. I think that the representation of the skull is a little bit more personal. Dalí was obsessed with death (Arnason and Mansfield 330) and often fantasized about his own death (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"); due to this macabre mindset, I believe Dalí's skull is actually a symbol of himself.

If the skull represents Dalí's fixation with his own death, then it can connect beautifully with the rest of the iconography in *Shirley Temple*; the cat can be seen as a vagina dentata (Otero, "Fearing Our Mothers:' An Overview of the Psychoanalytic Theories Concerning the Vagina Dentata Motif") and the feline has a skull placed in between her claws.

In Meditation of the Harp, the skull is resting on a crutch which is suspected to be a symbol of impotence (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). Dalí has been associated with such a diagnosis, and many believe that it resulted from his fear of sex ("The Enigma of Desire: Salvador Dalí

and the Conquest of the Irrational"). Such a connection emphasizes the possibility that the skull is a Dalían selfportrait. It has been theorized that the skull is a sign of metamorphosis and the crutch represents resurrection (Rojas 51). Such explanations for this painting have been connected to Dalí's fascination with Jean-Francois Millet's The Angelus, which the artist believed to portray a couple's grief for their lost son; Dalí's mother and father never quite recovered from the loss of their first-born son (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). I believe that this hypothesis may be one explanation behind the imagery, but I do not think it is the only one; even if Dalí is trying to represent his interpretation of Millet's The Angelus, it would not explain the blatant sexual overtones. I believe that the crutch symbolizes impotence as well as resurrection and that the skull is a Dalían self-portrait.

It is speculated by Santos Torroella that the skull in *Atmospheric Skull Sodomizing a Grand Piano* is a manifestation of Lorca due to the fact that he was nearly anticipatory of his own demise (Rojas 177). I maintain my previously stated belief that the skull in this painting is not a portrait of Lorca but a self-portrait of Dalí; such a concept is supported by the fact that Dalí was fascinated by his own death (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

Stairs

Stairs have been described as a Freudian symbol of intercourse (Spector, "On the Limits of Understanding in Modern Art: Klee, Miró, Freud") and a staircase plays a role in The First Days of Spring piece; Dalí includes multiple points of iconography in this painting and most of them either directly state or imply a sexual nature (Lubar 55). The objects on the stairs are the fish and a real, pasted photo of Dalí. As stated previously, the fish has been linked to survival (Clapp, "The Biggest Fish Story"), and a connection with the stairs supports my belief that the Dalían fish represents survival of a sexual encounter. The photo of Dalí raises further questions; Dalí appears to be between the ages of three and six, which fits the criteria of the phallic stage of development. If Dalí links his phallic-stage self to the same motif as sex (stairs) and survival (fish) then something unwanted and sexual very well could have happened to Dalí when he was between the ages of three and six. The Oedipus

complex occurs during the phallic stage and Ferenczi claims that an Oedipus complex fixation is the direct result of the oedipal tendencies being reciprocated, in other words, being molested by the mother (Paláez, "Trauma Theory in Sándor Ferenczi's Writings of 1931 and 1932"). This point directly coincides with Dalí's almost compulsive use of the vagina dentata, which also makes numerous appearances in *The First Days of Spring*. As stated previously, those who have a fixation with such imagery are linked to sexual trauma instigated by females (Blazina, "Part Objects, Infantile Fantasies and Intrapsychic Boundaries: An Object Relations Perspective on Male Difficulties with Intimacy").

Human Figures

I think the traditional art history symbolism of the presented human positions have relevance to all of these paintings. In *Atmospheric Skull Sodomizing a Grand Piano* and in *The First Days of Spring* the figures have their backs turned and their faces are hidden; this could offer further emphasis to Dalí's own introverted behavior (Stainton, "From Lorca: A Dream of Life").

The looming figures in Meditation on the Harp offer a constructive role in the unsettling nature of the piece. The large humans are a male and a female and they are significantly larger than the smaller figure that is kneeling before them. The small, shadowed figure is hiding its face from the viewer, which may support the idea of separation. Since the dark figure shows no obvious signs of a specific gender, I believe that the figure may be a child who has not yet reached puberty, while the specified genders of the larger people may indicate that these figures are grown adults. The small being has already been speculated to be Dalí, and the set of large figures are believed to be Dalí's parents (Rojas 50), and I agree with this speculation. An already established idea describes the scene as Dalí kneeling down and begging his parents for forgiveness for living while his brother died (50). I believe there is a second meaning behind this image due to the sexual overtones. The large woman in the piece is faceless (as are almost all of Dalí's females) and has her hand placed on top of the smaller figure's head, suggesting intimacy. The looming man is offering a hat to the smaller figure (in traditional art history iconography, a hat is a symbol of female genitalia) and I think that the man (Dalí's father) is symbolically offering sex to the smaller figure, thus implying that the larger figure played a primary part- whether intentional or not - in a sexual encounter between the nude woman (Dalí's mother) and the smaller figure (Dalí).

Fingers

In The Meditation on the Harp, the shadowed being is pointing a finger at the man, perhaps as a sign of accusation. This parallels the belief that the man in question is symbolically offering a female to the small figure via hat, which is a symbol of female anatomy in art history; perhaps the smaller figure blames the man for the sexual encounter that may have occurred between the promiscuous female and the submissive, smaller figure. Again, the lack of gender on the smaller figure may indicate that said figure is a prepubescent child. Let me reiterate my speculation that the small figure is Dalí and the larger set of figures are his parents (50), which I believe to be the case in this scenario. A sexual encounter involving an adult and a child is rape because children are neither mentally nor physically mature enough to make decisions involving sex. In cases of CSA, children (especially males) will blame the nonaggressive parent for the abuse because they did not stop it (Romano and De Luca, "Evaluation of a Treatment Program for Sexually Abused Adult Males"). This fits into the established accusatory symbolism of the finger. If Dalí blames his father for the implied sexual encounter, then the aggressive parent in this possible CSA scenario could be Dalí's mother.

In The Metamorphosis of Narcissus, a finger acts as a leg to the gray figure. I believe the gray figure in this painting represents the Ego which is a foundation stone of the Freudian theory of Narcissism (Fancher 394). I think the notion of accusation applies to this scenario but in a different context. Since the finger is pointed up and toward the hidden face of the gray being, I think the finger symbolizes a sense of shame; shame also applies to the bowed head of the gray figure and the sexual sensations represented by the ants (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). Dalí automatically associated shame with sex (Martinez-Herrera, Alcantara, and Garcia-Fernandez, "Dalí (1904 – 1989): Psychoanalysis and Pictorial Surrealism"). I think a hidden meaning behind the finger is present and very specific. Dalí and his companion Federico García Lorca have often been

suspected to have engaged in a romantic relationship (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). Upon hearing of Dalí's marriage to Gala, Federico expressed confusion; he claimed that the only non-masturbatory way for Dalí to achieve an erection was by anal stimulation via finger ("The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). I think the finger may be reminiscent of his secret encounters with Lorca. The Ego is dominated by the Superego who embodies the ideal self, a person who heeds social convention and high morality in order to gain the love of those surrounding them (Fancher 394). The Superego often points out the moral and social shortcomings of the Ego, resulting in a feeling of shame and an eventual mental death (Merkur, "Interpreting the Sense of Badness"). I believe that the finger symbolizes Dalí's repressed homosexuality but is also used by his Superego to mock him for such a reality; the fact that the finger is an actually a part of the Ego implies that his homosexuality is not only real but repressed by Dalí's Superego so that he may gain acceptance from those around him.

Narcissus

I believe that the gray figure in The Metamorphosis of Narcissus is the Ego; Dalí's gray figure is flawed and rife with symbolism, including ants, a finger and a narcissus flower. I believe that the Narcissus flower is associated with the psychological death of the Ego which is believed to be caused by the Superego ("Interpreting the Sense of Badness"). It has been noted that those who have histories of CSA experience a particularly nasty battle between the person they are (Ego) and the person they want to be (Superego) (Gill and Tutty, "Sexual Identity Issues for Male Survivors of Childhood Sexual Abuse: A Qualitative Study"). I will reinstate my belief that the finger may represent Dalí's repressed homosexuality. This side of his nature instills a feeling of shame and causes his Ego to hide its face from the viewer. The ants represent sexual sensation and Dalí links sexual feeling with shame (Martinez-Herrera, Alcantara, and Garcia-Fernandez, "Dalí (1904 – 1989): Psychoanalysis and Pictorial Surrealism"). I think the symbols on the gray figure represent how Dalí is in reality, but they also sum up everything he hates about himself. Another peculiar point to be made about the Ego is its own lack of reflection. The distorted structure

connected to the leg is not a reflection because the Ego is not kneeling over water plus, the respective features of the leg and the structure do not match. I believe the Ego's lack of reflection represents Dalí's own identity crisis which stems from being constantly compared to his dead, older brother (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"); Dalí has even called himself his brother's replacement ("The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

I think the golden figure in The Metamorphosis of Narcissus represents Dalí's Superego; the golden figure is of identical physical outline to the gray figure. The golden being is presented as a full-bodied being and holds none of the Ego's iconography whatsoever. I believe this implies that the golden figure embraces sex as a part of life; this type of person is exactly what Dalí wanted to be. The Superego strives for perfection and pushes the Ego to achieve perfection, as well (Merkur, "Interpreting the Sense of Badness"). The golden being may represent two people - Federico García Lorca and/ or Dalí's wife Gala. Dalí idealized Gala (Descharnes and Neret 43) and Federico (Stainton, "From Lorca: A Dream of Life"). I think his admiration for these two people parallels the idealization the Ego has concerning the Superego. Dalí merges his face with the face of Gala in The Invention of the Monster and it is reported that he and Lorca sent each other sketches of their combined faces ("From Lorca: A Dream of Life"). The long hair of the golden figure is the only trait that could be perceived as distinctly female. The golden one has a reflection but said reflection cannot be specified by gender. Taking the hair and the genderless reflection into consideration, I think perhaps the corporeal Superego is Gala (Dalí's Anima) and the Superego's reflection is Lorca (the Animus mirror of Dalí's Anima). The anima and the animus are Jungian figures and they are the female and male (respectively) versions of one's own Superego (Javanbakht, "Was the Myth of Narcissus Misinterpreted by Freud? Narcissus, a Model for Schizoid-Historic, Not Narcissistic, Personality Disorder"). If the golden figure is the Superego then it has nothing to be ashamed of, yet its head is bowed, unable to face its reflection. This implies that the Superego and its reflection are not the same person.

The Id represents the impulses and carnal desire. I believe that the entire background represents the Id. According to the Freudian layout of the conscious, the Ego and the Superego are side-by-side while the Id is in the back of the mind (Fancher 394); the golden figure and the gray figure are side by side while a dark and primitive scene is directly behind them. The same scene holds ominous shadows which could be linked to Jungian psychology, as Jung describes the shadow as a repression of one's impulses, stemmed by fear (Abureesh, "Dr. C.G. Jung Visits the House of Mirth"). There is also the presence of William Tell, who is a Dalían symbol of the castration complex (Taylor, "A Shine on the Nose:' Sexual Metaphors in Surrealism"). Another symbol in the background is that haunting set of ants which represent sexual sensation and decay (Kováry, "The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational"). Sexual attraction and fear of death are very primal characteristics of the mind and Dalí has been known to obsess over such aspects ("The Enigma of Desire: Salvador Dalí and the Conquest of the Irrational").

Christ

I believe that Dalí's Christ figure represents exactly what the Surrealists intend it to mean. Christ is a manifestation of male-oriented father issues (Ades and Bradley 20). Dalí had a very complicated relationship with his father all throughout his childhood, and Dalí's relationship with Gala is suspected to have caused them to break ties completely (Descharnes and Neret 53). When Dalí was directly asked about his and Dalí senior's estrangement, the artist declares that such information is between him and his father and shall stay that way (Ades and Bradley 40).

CONCLUSION

Dalí was a man who constantly fought with himself whether it was over his childhood or his sexuality. Childhood sexual abuse is traumatizing and when it is not properly addressed, the victim risks a lifetime of psychological pain. In the 1920's, homosexuality was considered unthinkable and the social repercussions would help one understand Dalí's refusal to admit to his preferences. Sexual orientation is another personal issue that has the potential to cause irreparable, emotional damage if it is ignored. Dalí felt that he was truly alone

for most of his life. The only outlet he trusted came in the form of border-line nonsensical art. I believe that the sources accumulated for this research have the ability to cause reasonable doubt concerning some undisclosed aspects in Dalí's personal life and the nature of their transference into his richly iconographical art.

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THE EFFECTS OF RESMETHRIN AND PIPERONYL BUTOXIDE ON WHITE SHRIMP (PENAEUS SETIFERUS)

by CASSANDRA RODRIGUEZ



ABSTRACT

White shrimp (Penaeus setiferus) are an ecologically and economically important estuarine species that have been over-harvested in the Gulf of Mexico since the 1960's (Texas Parks and Wildlife, 2002). Spending their juvenile lives in estuarine waters, shrimp may be exposed to insecticides that enter estuaries through run-off and mosquito abatement programs (MAPs). These toxicants could have significant, but unquantified, effects on shrimp populations. This study will investigate the lethal and sub lethal (behavioral) effects of Resmethrin and piperonyl butoxide (PBO) in white shrimp in order to achieve a better understanding of how realistic concentrations of insecticides affect white shrimp. PBO and resmethrin operate together as the active ingredients in pesticides such as SCOURGE®, Which is approved for aerial applications in MAPs and commonly used in ultra-low volume (ULV) sprays that may be potentially toxic to fish, invertebrates, and other aquatic animals (USEPA, 2006). Due to the method by which SCOURGE® is applied, it has the ability to enter aquatic systems via wind-borne drift and runoff. The majority of existing knowledge about anthropogenic pollution from substances such as resmethrin and PBO and how it affects crustaceans is known from freshwater systems (Relyea 2009). Investigating white shrimp may generate current knowledge of how pesticides affect shrimp populations in local estuarine and bay systems.

INTRODUCTION

Contamination by pesticides is increasing in water systems. While ecologists try to better understand the effects of pesticide contamination, they also strive to investigate the impacts it may have on various natural communities (Relyea and Hoverman 2006). Agricultural pesticides comprise three quarters of all chemical pesticide in the U.S. and may pose a potential risk to marine ecosystems (Center for Food and Safety, 2008). Pesticides used in agricultural areas may threaten ecologically significant areas through methods such as storm water runoff, domestic and commercial use, and MAPs (SCOURGE®). PBO is one of several chemicals used to control the West Nile Virus, which has led to the leakage and contamination of surface waters in many fresh water systems (Zulkosky et al. 2005). Synthetic insecticides like those used for treating mosquito outbreaks inhibit insects' nervous systems and sodium



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channels. A huge number of commercial lobsters were affected and killed after resmethrin and other synthetic insecticides were used to treat the first outbreak of West Nile virus in New York, 1999 (Zulkosky et al. 2005). It was that these insecticides may have made the lobsters more susceptible to opportunistic disease and conditions such as immunosuppression, growth inhibition, developmental delays, and reproductive effects. In 2004, a study in California showed that various synthetic pyrethroids can be detected in surface sediments of streams carrying pesticide run-off (Westion et al 2004). In many if these cases, the presorted levels were

toxicologically concern. Contaminants such as Resmethrin and PBO may have detrimental effects on ecologically significant areas such as estuaries and salt marshes as well as important organisms such as crustaceans and fish (Center for food safety and Pennington et al.).

Shrimp are an important marine organism ecologically and commercially. White shrimp spawn off-shore, and newly hatched larva travel to estuarine areas. where they remain before venturing back into the open waters for adulthood. While spending their post larval stages in estuaries, they feed upon plankton and serve as a primary food item for sheepshead minnows, blue crab, and the ecologically significant killifish (NOAA). It is in this critical period of life when shrimp may be exposed to insecticides such as those that drift into estuaries via MAPs or runoff. As human activity and the domestic use of pesticides increases, the risk of harmful chemical levels in fresh water and salt water systems also increases. Mixtures of pesticides have leaked into freshwater streams through a variety of methods and often possess a synergistic effect (Reylea 2009). Synergistic chemicals are often more toxic when mixed with an insecticide than the individual toxins themselves. Over time, synergistic effects along with environmental stressors may have an effect on estuarine organisms' foraging abilities and predator avoidance behaviors (unpublished, Spain 2012). Although brown, pink, and white shrimp fisheries are some of the most lucrative fisheries in the

FIGURE 1. Properties of Piperonyl butoxide and resmethrin

	Piperonyl butoxide	Resmethrin
Type of	Synergist	Insecticide
pesticide	550	
Mode of	Effects target	Interacts
Action	species by inhibiting	with
	microsomal	sodium
	enzymes by binding	channels in
	directly to enzymes	target
	and preventing the	organisms ^A
	breakdown of other	
	pesticides including	
	pyrethroids ^A	
Method of	Aerosol, ready to	Ready to
application	use solution, dust,	use spray,
	wettable powder,	aerosol
	microencapsulate,	cans,
	impregnated	thermal fog
	material,	generators,
	pressurized gas,	electric
	pressurized liquid,	foggers,
	combustible coil ^A	back pack
		sprayers,
		and hand
		held
		sprayers.
		Application
		through
		aircraft.
		Animal
		shampoos
Target	Winged insects,	Broad
Species	particularly	spectrum
	mosquitoes Ants,	of flying
	worms, beetles,	and
	mites, ticks, lice,	crawling
	aphids, fish ^A	insects,
		particularly
		mosquitoes
Max	.98 ppb ^A	15ppb ⁸
HA ^D	20* permethrin	30 d ^A
Half-Life	22-90 hr ^c	

(EPA resmethrin and PBO, A-Eckel et al 2005, B-Zulkosky et al 2005, C-USEPA 2006b, D-USEPA 2011)

southern United States, the white shrimp fishery is the largest and oldest shrimp fishery of all three species harvested in the Gulf of Mexico. In 2010 approximately 3 million pounds of white shrimp was harvested from the Texas Gulf coast. This means approximately 90% of the white shrimp harvested in the U.S. came from the Gulf of Mexico. (NOAA and Texas Parks and Wildlife, 2002). With shrimp populations under the stresses of overfishing, environmental factors, and possible exposure to pesticides, the wide variety of fin fish that prey upon shrimp may eventually lack this essential organism as a primary food source. In this study white shrimp (Penaeus setiferus) were exposed to a 1:3 solution of PBO and resmethrin (R-PBO) to provide a better understanding of their lethal and sub lethal affects and their influences on survivorship.

Resmethrin and PBO were chosen for this study due to their common use in MAPs as well as in personal and domestic use. Resmethrin is a synthetic pyrethroid that is used in as an insecticide in residential, commercial, and industrial settings. PBO is a synergist that is commonly used in combination with resmethrin as a pesticide known as SCOURGE®. Additionally, resmethrin is used in food handling facilities and in the restricted use of mosquito abatement programs by means of ultra-low volume (ULV) spray. It is also used to control flying and crawling insects in animal kennels, warehouses, commercial and industrial premises, and domestic dwellings. These techniques may make it easier for harmful pesticides such as PBO and Resmethrin to find their way into marine environments and potentially affect white shrimp and their predator avoidance strategies (EPA Resmethrin and PBO, 2006). Generally, the use of pyrethroid insecticides is increasing. While birds and mammals are not habitually affected by pyrethroids, toxicity studies have shown that pyrethroids have a highly toxic effect on fish and other aquatic organisms, including invertebrates (WHO 1989 and Demoute 1989 and Paul et al. 2005).

METHODS

White shrimp were exposed to a mixed solution (1:3 ratio) of Resmethrin and PBO at concentrations of 10 ppb (high), 1 ppb (intermediate), and 0.10ppb (low). These concentrations mimic those found in their natural environment. Two control treatments were also included:

the ethanol control (EC) solution, and a PBO control (PC) solution. Instant Ocean was used to formulate sea water at 30 ppb as the initial medium for all solutions. Each individual shrimp was held in an 8 inch bowl complete with an aerator lid to prevent shrimp from escaping, and blinders encasing the perimeter of the bowl. The blinders served as a protective barrier so individual shrimp movement would not affect neighboring shrimp. All individuals were exposed to the treatments for 72 hours, and were observed every 12 hours before and after stimulation. To assess the acute effects of the treatments, shrimp were also observed after 1 hour of exposure. Stimulation was performed by tapping each individual three times on the side of the carapace. The following behavioral traits that were noted: "popping", swimming, movement of walking legs, and movement of swimming legs. Every individual was then observed for 30 second after stimulation. Behaviors that were noted within the allotted 30 seconds were as followed: "popping", swimming, movement of walking legs, movement of swimming legs, responsiveness, and state of mortality. For the final 80 individuals of the experiment, settling time was recorded. Settling time was the range of time from the initial stimulation to the time the shrimp settled at the bottom of the bowl. "Settling" was defined as shrimp having both walking and swimming legs touching the bottom of the bowl. This means that the individual shrimp was no longer swimming or walking on the bowl. Prior to stimulation each aerator was removed to eliminate interference with data. As individuals perished, total length of the shrimp was measured and recorded. An additional survivorship trial was performed for 168 hours, or 7 days. The survivorship trials followed the same methods as stated above, excluding settling time as a recorded behavioral trait (i.e. settling time was not recorded). XLSTAT and SAS statistical software applications were used to analyze data.

RESULTS

A Repeated measures ANOVA was completed to analyze the data, but this proved to be insignificant (P=0.032). A Post-Hoc Tukey Honestly significant difference (HSD) was also used to find the differences between the low (0.10ppb) and intermediate (1ppb) treatments compared to the ethanol control treatment. The Tukey (HSD) test proved to be insignificant in

TABLE 1. Tukey (HSD) test 1.

Hr=0 -72

CE

Treatment	Difference	Standardized difference	Critical value	Pr > Diff	Significant	
low vs inter	1.200	2.672	2.407	0.026	Yes	
low vs EC	0.750	1.670	2.407	0.225	No	
EC vs inter	0.450	1.002	2.407	0.579	No	

Shows results of the differences between the means of settling time when exposed to different treatments of R-PBO at 0.10ppb (low), 1ppb (intermediate), and Ethanol control (EC) treatments for 0-72hours.

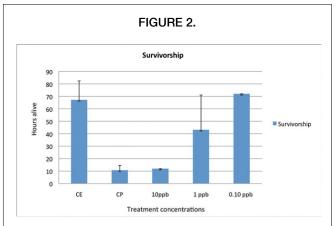
*95% confidence interval.

Shows results of the differences between the means of Ethanol control (EC) settling time compared to the settling time of different treatments of R-PBO: 0.10ppb (low), 1ppb (intermediate), and PBO control (PC) for the final 80 individual shrimp involved in the experiment.

each 12 hour period. However, the difference between the low treatment and the intermediate treatment was significant with Pr>Diff of 0.026. The PC and the high treatment groups were removed, due to the 100% mortality within the initial hour of exposure as seen in Table 1.

The difference between the means of n-alive (number of hours each shrimp lived) of the EC treatments compared to PC treatments, high, intermediate, and low R-PBO treatments was also tested using a Tukey (HSD) test. The results proved to be insignificant for each treatment in each 12 hour period as seen in Table 2.

The differences between the settling time in the EC treatment and the high, intermediate, and low R-PBO



Shows the survivorship, or the average hour the organism stayed alive. White shrimp exposed to Ethanol Control (CE), PBO Control (CP), high treatments (10 ppb), intermediate treatments (1 ppb), and low treatments (0.10 ppb). Shrimp that were exposed to the high concentration (10 ppb) experienced a 100% mortality within the first 12 hours of the trial.

treatments were obtained by using a Dunnett's test. All three treatments were included in the test as well as the EC treatments and PBO control treatments. The results show that there were no significant differences in the means of each treatment in each 12 hour period as seen in Figure 1.

DISCUSSION

The Repeated measures ANOVA showed acute toxicity in white shrimp exposed to the high (10ppb) R-PBO and the PBO control (PC) treatment groups. In these groups 100% mortality was observed within the initial 12 hours of exposure. Confirmation of mortality was examined by stimulating the shrimp following the first 12 hours of exposure. It was common to observe 100% mortality in the high R-PBO treatment group within the first 12 hours of the experiment. PC groups also experienced a high level of mortality within the first

^{*} With high (10ppb) treatment group and PBO control group removed

TABLE 2. Tukey (HSD) test 2.

Treatment	Difference	Standardized difference	Critical value	Critical difference	Pr > Diff	Significant
EC vs inter	-7.325	-1.071	2.531	17.306	0.663	No
EC vs high	-2.446	-0.358	2.531	17.306	0.989	No
EC vs PC	-2.357	-0.345	2.531	17.306	0.991	No
EC vs low	1.153	0.169	2.531	17.306	0.999	No
	1.100	0.100	2.001	17.000	0.555	NO
Hr=1	0.400	4 400	0.504	10.500	0.404	NI.
EC vs inter	-9.188	-1.409	2.531	16.508	0.434	No
EC vs high	12.482	1.914	2.531	16.508	0.186	No
EC vs low	2.603	0.399	2.531	16.508	0.984	No
EC vs PC	1.981	0.304	2.531	16.508	0.994	No
Hr=12						
EC vs low	-12.346	-2.488	2.531	12.561	0.055	No
EC vs PC	9.475	1.909	2.531	12.561	0.188	No
EC vs high	9.475	1.909	2.531	12.561	0.188	No
EC vs inter	0.095	0.019	2.531	12.561	1.000	No
Hr=24						
EC vs low	-4.189	-0.807	2.531	13.133	0.835	No
EC vs PC	11.631	2.242	2.531	13.133	0.096	No
EC vs high	11.631	2.242	2.531	13.133	0.096	No
EC vs inter	5.566	1.073	2.531	13.133	0.662	No
Hr=36						
EC vs low	-8.525	-2.294	2.531	9.408	0.086	No
EC vs PC	5.772	1.553	2.531	9.408	0.349	No
EC vs high	5.772	1.553	2.531	9.408	0.349	No
EC vs inter	1.838	0.495	2.531	9.408	0.965	No
Hr=48						
EC vs low	-3.354	-0.877	2.531	9.676	0.793	No
EC vs inter	-3.097	-0.810	2.531	9.676	0.834	No
EC vs PC	5.607	1.467	2.531	9.676	0.399	No
EC vs high	5.607	1.467	2.531	9.676	0.399	No
Hr=60						
EC vs low	-2.230	-0.830	2.531	6.799	0.822	No
EC vs high	6.812	2.536	2.531	6.799	0.049	Yes
EC vs PC	6.812	2.536	2.531	6.799	0.049	Yes
EC vs inter	2.073	0.772	2.531	6.799	0.855	No
Hr=72						
EC vs low	-5.646	-2.671	2.531	5.352	0.036	Yes
EC vs PC	5.681	2.687	2.531	5.352	0.034	Yes
EC vs high	5.681	2.687	2.531	5.352	0.034	Yes
EC vs inter	2.835	1.341	2.531	5.352	0.478	No

Showed results of the differences between the means of n-alive when exposed to different treatments of R-PBO: .10ppb (low), 1ppb (intermediate), and Ethanol control (EC) for 0-72 hours.

12 hours of the experiment. It was uncommon for PC shrimp to survive past 12 hours of exposure.

Tukey (HSD) test

The Tukey (HSD) test 1 compared the settling time of the intermediate and low treatment groups to the EC treatments groups for the last 80 individuals of the experiment (Table 1). These results yielded no significant data with the exception of the low treatment group compared to the intermediate treatment group. There was a significant difference in settling time (Pr>Diff= 0.026) from the initial hour of exposure to the death hour. If the individual shrimp was still alive at the end of the experiment the death hour was recorded at 72 hours, n-alive = 6 (n-alive is the death hour divided by the total number of hours per 12 hour observation period). It was common for individuals exposed to low, intermediate, and EC treatment groups to survive, exceeding the 72 hour experimental period. If death was to occur in these treatment groups, it was generally attributed to a misplaced aerator or a result of an individual shrimp escaping from its bowl. In the case of an individual popping out of its bowl, it would be removed from the data set.

Death hour was recorded at each individual's time of death. N-alive was also calculated at a later time. The Tukey (HSD) test 2 compared n-alive for low, intermediate and EC treatment groups (Table 2). The High and PC treatment groups were not included in this comparison due to 100% mortality resulting from the first 12 hours of exposure. There were no significant differences in the means of these three treatment groups.

Dunnett's Test

A Dunnett's test was also performed to analyze the settling time for the last 80 shrimp of the experiment including all treatment groups. On average, the settling time for all treatment groups increased compared to the EC treatment group. The high treatment group was excluded from this comparison due to the 100% mortality rate experienced in the within the first hour of exposure. Settling times for intermediate, low, and PC treatment groups increased, with PC group having the most obvious increase in settling time compared to other treatment groups. The PC treatment group was exposed strictly to PBO, meaning the increase in settling time was likely not related to the synergistic

effects of mixing PBO with resmethrin, but to the toxicity of PBO itself. The increased settling time for the PC treatment group may be linked to PBO's ability to inhibit cytochrome P450 (CYP450) (Ankley et al. 1990 and Bainy 2000). However, there is scarce information concerning the induction of CYP450 in *Penaeus* species (James and Boyle, 1998). The intermediate and low treatment groups expressed a similar increase in settling time compared to the EC group. Behavior recorded from before and after stimulation was similar for the intermediate and low treatment groups throughout the 12-hour observation periods. Increases in settling time for these two groups may be related to the toxicity of R-PBO or the stresses of constraining the shrimp in a bowl for 72 hours without food.

The results for the low and intermediate concentrations showed Hormesis. Hormesis is when an organism is exposed to low doses of toxins and responds to them in a relatively favorable way, while organisms exposed to high doses of toxins are inhibited (Calabrese and Baldwin, 2009). It was expected that the individuals with in treatments at a higher concentration of R-PBO and PBO would experience a decrease in settling time and would become more affected. The data supports that the shrimp exposed to higher treatment levels experienced a decrease in settling time, and had little response to stimulation.

Survivorship

Prior to the initiation of the 72-hour experiments, a survivorship trial was conducted. This trial yielded no significant results. There was an unexpectedly high amount of mortality within the overall survivorship trial (Figure 2). The survivorship trial differed from the other 72-hour experiments in that the latter were supplied with aerators. Due to the result of the survivorship trial, it was concluded that each bowl should be equipped with an individual air stone. The behaviors before and after stimulation were also recorded for each individual that was included in the survivorship trial, these results showed no significant correlation with exposure toxicity.

CONCLUSION

The data indicates that resmethrin, PBO, and mixtures of these chemicals increase mortality in shrimp at various concentrations. Results from the survivorship trial reveal that shrimp in lower concentrations (1ppb and 0.1ppb) lived longer than those exposed to higher concentrations (10ppb). PBO alone, without the insecticide Resmethrin, increased shrimp mortality. These results suggest that pesticide run-off can have harmful effects on ecologically and economically important estuarine species and these unintended effects on non-target species should be considered when developing application programs for insecticide use.

The possibility of data producing viable results may have been increased by adding replicates to the experiment. Extending the exposure time for each individual exposed to R-PBO may also have allowed for a more favorable data set. It was also discovered that the likelihood of specimen survival increased when provided with an aerator. A majority of existing knowledge of anthropogenic pollution like resmethrin and PBO and its effects is known from freshwater systems and experiments using single insecticides (Relyea 2009). To gain a better understanding of how insecticide mixtures in estuarine systems affect aquatic organism, future experiments can expose shrimp to mixtures of insecticides in a marine environment.

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OCCUPY THE NEWSPAPERS: A CONTENT ANALYSIS OF NEWSPAPERS FRAMING THE OCCUPY WALL STREET MOVEMENT



by JOHN D. TUCKER

ABSTRACT

The research of episodic framing of social movements by newspapers has been extensive. With the Occupy Wall Street movement's nationwide popularity in 2011, looking at how newspapers framed local protests will add to the research. This study examines the major newspapers in Sacramento, Little Rock, and Madison within a three month period starting at the official start of the Occupy Wall Street protest. Analyzing each individual article, this study looks at how much background the article gave of the original movement, who is being interviewed, whether the article is being episodic or thematic, whether the article is being positive, negative, or neutral, and if the article is mobilizing or demobilizing. The content analysis found that the newspapers often offered little to no background, tended to employ an episodic frame, and often demobilized the movement. The results affirmed previous research that found newspapers employ episodic frames, resulting in the demobilization of social movements.



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OCCUPY THE NEWSPAPERS: A CONTENT ANALYSIS OF NEWSPAPERS FRAMING THE OCCUPY WALL STREET MOVEMENT

Inspired by the Egyptian Revolution in the spring of 2011, two men representing the anti-consumerism publication Adbusters began organizing a protest on Wall Street in response to the growing economic inequality and corporate influence on the government in the United States¹. The occupation began on September 17th in Zucotti Park located in Manhattan's Financial District near the famous Charging Bull sculpture. Occupy Wall Street grew very quickly with estimates of 15,000 protestors, and an average of 150 campers a night during peak involvement.

Soon the protestors formed the New York City General Assembly which would be the official governing body of Occupy Wall Street and met on a daily basis. It was open to the public and debates took place using a "human microphone." All decisions were collectively voted on to determine the direction of the occupation. Occupy Wall Street quickly came up with a "List of Demands" from the government that they felt would greatly reduce social and economic inequality. Some of the demands included: a guaranteed living wage,

¹ http://www.occupywallst.org

free college education, universal health care, and debt forgiveness. Further, Occupy Wall Street quickly voted to set up various stations such as food preparation, education, and media that would be beneficial to the protestors and those who are camping overnight. Occupy Wall Street was able to raise \$700,000 in donations to fund and help sustain their occupation.

The movement spread across the United States to 95 cities and 600 communities, as well as 82 countries around the world. Occupy Wall Street also spawned several spin-offs such as 'Occupy the Hood', 'Occupy Homes', and 'Occupy Marines'. All protests were based around the 'General Assembly' model set by Occupy Wall Street. They also promoted nonviolence, as well as refusing to allow politicians to co-opt the movement. With varying degrees of success, most protests and occupations were gone by December, as authorities began clearing them out.

There hasn't been a social movement based on social and economic inequality in the United States this large since the 1960's when African Americans protested across the nation fighting for civic and economic rights. Occupy Wall Street raised a lot of questions about how the economic system works, who it ultimately benefits, and who ultimately suffers. The movements' widespread appeal changed the discourse² of the nation as thousands of people from over 300 cities took to the streets protesting in solidarity with the greater movement while also demanding change to local issues.³

One of the reasons Occupy Wall Street became widespread was because of the presence of the ever-increasing media. The major news stations and websites, as well as independent newspapers and websites, operate under a 24 hour news cycle. The momentum of these events led to the high profile status of Occupy Wall Street. Soon, this movement became too large to ignore, and within a couple weeks after the first protest in New York City, national and local news stations started covering the movement heavily, as protests started in individual cities with the "Occupy" name attached to the host city, (e.g. Occupy Sacramento).

The attention main stream media gave to the Occupy movement is important to look at due to the impact the media has on the public. Further, the mainstream media is largely funded by advertising money from very wealthy corporations and businessmen (Bagdikian 2004; McChesney 2004); the same entities that the Occupy protesters are protesting. The conflict of interest that main stream journalists have in reporting the Occupy movements influence the accuracy and neutrality to which the media is supposed to adhere. This leads to the questions: How did the mainstream media influence the portrayal of the Occupy movement in regional cities of the United States and did frames employed by regional newspapers favor the status quo?

LITERATURE REVIEW

Countless studies of frames and the effects of frames have occurred over the last several decades since David Manning White first put forth the idea of the news being a "gatekeeper" to its audience in his 1950 article in Journalism Quarterly. News framing is a particular way in which the reporter presents the news to its audience by "selecting and organizing pieces of information to produce stories that makes sense to their writers and audiences" (Ryan 1991:53). Framing is the actual process of creating events by selecting and choosing which topics are the most important to discuss. Robert Entman posits (1993) that "to frame is to select some aspects of a perceived reality and make them more salient in a communicating text" (p. 52). Frames can define problems, diagnose causes, make moral judgments, and suggest remedies. Frames can do all four of these functions at once, or none at all. While some research has shown that main stream media isn't inherently bias and that the viewer's personal bias shapes their interpretation of the news (Turner 2007), there is little doubt that the media has an overwhelming amount of control over deciding what actually is news and which news is worthy of the public's opinion (Chomsky 2002; Iyengar 1991; McChesney 2004; Ryan 1991; Entman 1993; Parenti 1986; Gamson 1994; Gitlin 2003).

Reporters employ one of two types of framing techniques in their articles. The first type is called episodic framing which "involves storytelling, in which a topic is presented in a specific event or in a personal case" (Kim, et al 2010:563). Generally, episodic framing

² http://prospect.org/article/why-we-need-occupy-wall-street

³ http://occupywallst.org/forum/detailed-list-of-demands-overview-of-tactics-for-d/

doesn't focus or elaborate on the events the article is reporting on. The other technique, thematic framing, "places the topic in a larger and more abstract social context" (Kim, et al 2010:563). Thematic framing is a more well-rounded type of framing that focuses and elaborates on the events the article is reporting on. Of the two, episodic framing is more common and more problematic. It is more common because most journalists are under time constraints and must push out a story quickly without giving too much background information on the topic. This is problematic because without proper context, the topic can be interpreted by the audience in any way the individual sees fit, leading to a lesser understanding of the given topic. For social movements, episodic treatment can potentially damage their cause by diminishing the purpose of the movement.

The research showing the influence mainstream media has on its audience has been extensive. Iyengar's (1991) studies demonstrate the media's episodic treatment of crime stories. The reports tended to place the blame of poverty, unemployment or racial inequality on the individual rather than the dominant system. Fleming-Rife (2004) analyzed the dominant newspapers in Topeka, Kansas and their coverage of the Brown V. Board of Education decision in 1955. She found that the coverage was slated to reassure its largely white audience that "social order would be maintained" (243). In their analysis of the media that became the basis for their propaganda model, Herman and Chomsky (2002) found the misrepresentation of foreign conflicts by the media affected the audience's knowledge on the same foreign conflicts, which ultimately led viewers to support the status quo.

Media bias is most telling, however, when it covers social movements. Charlotte Ryan (1991) describes the misrepresentation of social movements as a "demobilization frame" because it makes "problems ever more individual" (p. 71). This deflection of the purpose of a movement is evident in other's research on different social movements in the past that challenged the status quo. Carolyn Bronstein (2005) analyzed coverage of the third wave feminist movement in 1991 and compared it to the coverage of the second wave movement in the 1970's. She concluded that the framing consistently discredited the second wave movement while praising

to the third wave movement. This type of framing undermines the third wave movement by not relating the movement to its predecessor, thus isolating the movement and its protestors as individual agitators.

Other patterns evident in episodic framing of social movements are when articles shift the focus of a movement to aspects that are irrelevant to the issues present. Looking at coverage of the 1970 women's strike for equality, Bonnie Dow (1999) concluded that the media "treated women's liberation much as society treats women-as entertainment not to be taken seriously" (p. 154). Dow attributed these findings to the fact that the media was largely dominated by males and that gender anxiety played a role in their reporting. Looking at coverage of both anti-Vietnam protests in 1967 and the World Trade Organization protests in Seattle in 1999 showed evidence of episodic framing and interviews of "unusual participants, but ignore the rank-and-file demonstrators" (Jha 2007:50). Finally, Todd Gitlin's (2003) historical study of the Students for a Democratic Society movement in the 1960's and 70's showed the many problems the movement faced with the media, including its complete exclusion from the media for the first five years of its existence, then when it did start covering the movement, the media used negative frames that highlighted trivial issues like dress code and language.

Thomas Nelson (1997) argued that "the choice of a frame may have important implications for the balance of public opinion (577)" when showing how passive the media were toward the extremist group Ku Klux Klan. Ultimately, mainstream media has shown that it supports the status quo by downplaying the importance of social issues and by ignoring the relevance of social movements. By looking at newspaper coverage of Occupy Wall Street protests from across the country, one can see whether or not newspapers still adhere to episodic frames which "demobilize" the social movement.

METHODS

Data Collection

When choosing the criteria for the cities to study, I wanted to choose those that were both small enough to not be considered 'major cities,' but also had an Occupy protest large enough that the possibility of the major local newspaper covering it would be high. To determine the cities that were small enough to not be considered a major city, I consulted the "World City" list that sociologist Sasskia Sassen popularized in her 1991 book "The Global City: New York, London, Tokyo" and has since been refined in 1998 by Jon Beaverstock, Richard G Smith and Peter J. Taylor when they established the Globalization and World City Research Network (GaWC). GaWC ranks cities based on their economic influence throughout the world. At the top of the list is New York City and London, and as the list goes down, the economic influence of the city throughout the world reduced. For the purpose of this study, I chose a city that did not make the list of World Cities because I wanted to look at how much influence the major newspaper in a city without the external economic and social pressures like New York City would have on a large social movement.

The next step in choosing the cities to study was determining which cities would have a sizeable turnout in their local Occupy protest as well as a high chance of being covered by a city's major local newspaper. I was able to do that after looking at an unofficial list4 of every city in the United States that had a protest. I then decided to reduce that list to only cities that are state capitals with the assumption that there would be a high chance of the dominant local newspaper having a keen interest in political issues such as social movements. I then picked cities in different regions of the United States from one another as to reduce the likelihood of regional bias. Ultimately, I chose Sacramento, Little Rock, and Madison. I then chose the newspaper company with the largest circulation rate in the city and ran a search for a three month span starting September 17, 2011, when the original Occupy Wall Street movement officially began, until December 17, 2011. The first article to specifically talk about Occupy Wall Street or the local protest was individually numbered. Each article was then individually analyzed using a coding template (See Appendix A) that was numbered and dated with the corresponding article. Finally, the totals of the articles were aggregated. If an article didn't specifically talk about the local protest, it was not counted. Pictorials and letters to the editor were removed because they were not official articles of the newspaper.

In Sacramento, the newspaper company with the largest circulation is the Sacramento Bee. Using the term 'Occupy Sacramento,' I searched the Sacramento Bee's website. Any articles that weren't about Occupy Sacramento specifically were cut out. Within the three month period, fifty-three articles fit the criteria

In Little Rock, the newspaper company with the largest circulation rate is the Arkansas Democrat-Gazette. Using the online database LexisNexis Academic, I search "Occupy Little Rock." Within the three month period, nineteen articles fit the criteria.

In Madison, the newspaper company with the largest circulation rate is the Wisconsin State Journal. Using the online database LexisNexis Academic, I searched "Occupy Madison." Within the three month period, seven articles fit the criteria.

Coding

The following content analysis examines three newspapers and their portrayal of the Occupy Wall Street protests in their respective cities. The content analysis then assesses whether or not the article is using an episodic frame as described in the literature review by Hill, et al that "involves storytelling, in which a topic is presented in a specific event or in a personal case" (2010).

The first step is looking at how much background information the article gives the original Occupy Wall Street protest in New York City. This will be determined by judging if the article is giving "zero background" (no context at all), "little background" (1-2 sentences and vague context), "moderate background" (3-5 sentences that offers a good context and general understanding of the background of Occupy Wall Street), and "detailed background" (6 or more sentences or 2 or more paragraphs that gives a clear and concise understanding of Occupy Wall Street).

⁴ http://en.wikipedia.org/wiki/List_of_Occupy_movement_protest_locations_in_the_United_States

The next step is determining whether the article is using an episodic frame or a thematic frame in reporting the news. An article that is episodic will be determined looking at how focused the story is. If the article is moving quickly from interview to interview without making any clear point, then it will be an episodic frame. The article will be judged as thematic if the story is focused and clear, sticking to a particular theme in the article where the reader will have a clear understanding of what the author is trying to say and a clear understanding of what the protest is about.

The third step is determining if the article is mobilizing or demobilizing for the local Occupy movement. If the article is showing a sense of purpose to the protest and indicates that the protest has potential to grow and prosper, then it will be a mobilizing article. Charlotte Ryan (1991) offers three criteria in determining a mobilizing frame: First, the article offers a collective definition of what the issue is, whose responsibility it is, and what the solution is. Second, there is a clear conflict between two people or groups. Finally, there is a moral appeal that is launched (p.71). If the article doesn't have a sense of purpose, shows no indication of the protest growing, and an indifference of opinion, then the article will be demobilizing. There is no middle ground in this step. If the article isn't mobilizing, then it is demobilizing.

This content analysis also looked at whether establishment figures (i.e. politicians, academics) or non-establishment figures (i.e. students, regular wage workers) were being interviewed, as well as if the article portrayed the protest positively, negatively, or neutrally. These two steps were taken to examine any patterns that might occur when analyzing the articles. No significant patterns from these categories appeared throughout the articles.

FINDINGS

Providing Background for the Local Occupy

The first major theme that quickly became evident during this study was the lack of background information that put the local protest in to context. When the newspapers fail to put the protest in to context, it removes the protest from the greater movement. Carolyn Bronstein (2005) alludes to this problem in her research of the 3rd wave

feminist movement, noting how the newspapers failed to link the $3^{\rm rd}$ wave movement as the direct progression from the $2^{\rm nd}$ wave movement. By removing the protest from the broader movement, newspapers are able to frame the protest in a way that allows the audience to dismiss its importance.

Between the three newspapers, there were a total of seventy-nine articles, and all but seven gave little or no background. One newspaper, the Wisconsin State Journal, offered only articles with little or no background. The one article that gave detailed background was from the Sacramento Bee (10/7/2011) during the beginning stages of the local protest, and while the article was thematic and positive, it was an authorless editorial that compared this protest to the Tea Party movement.⁵

Over half of the articles in the Sacramento Bee gave zero background of the Occupy Sacramento protest. Further, as the three month period went on, the articles increasingly gave zero background of the protest. The chances of the general audience identifying with the movement by the end of the study decreased as the articles with zero background increased. The only other article that gave better than little background was also an authorless editorial that came about two weeks after the start of Occupy Sacramento; it asked if the movement has worn out its welcome (10/18/11). This article portrayed the protest negatively by suggesting neo-Nazi groups would get similar treatment by the local government should they protest in similar fashion as the Occupy movement. Grouping the Occupy Sacramento protest with neo-Nazi groups in the article delegitimizes the movement because it compares the two groups as having similar issues.

The Arkansas Democrat-Gazette in Little Rock made more of an attempt over the three month period to put the movement in context by printing five articles that provided moderate background. However, none of the articles gave detailed background while fourteen gave little or no background. Unlike the Sacramento Bee, only one of the articles that had good background was an editorial(11/15/2011), and it was a very positive article that was thematic. Also unlike the Sacramento

⁵ The Tea Party movement was a conservative movement in the United States in 2009 that had issues with the over spending of the federal budget and demanded strict adherence to the constitution.

Bee, the last article that gave moderate background about the Occupy Wall Street movement came later in the study(11/17/2011). While this observation is worth noting as it credits the newspaper for putting the protest in context two months in to the movement, it's also worth pointing out that the articles about Occupy Little Rock became increasing sparse; only four came in the final month of the study.

As previously stated, the Wisconsin State Journal of Madison printed zero articles that gave anything other than little or no background. Further, the newspaper only printed seven articles over the three month period. The Wisconsin State Journal appeared to have little interest in Occupy Madison since the few articles it printed failed to put the protest in context to the greater movement. With little interest in putting protest in a relevant context, the movement would find it difficult to try to relate a broader audience audience.

If the article takes the time to put the protest in its proper context by relating it to the greater movement, the article stands a greater chance of being thematic. This is important for the protest because it means the audience will have a higher chance of relating to the movement if the newspaper is representing the issue of the protest accurately. The three papers that were studied failed to give their local protest proper context. By failing to do so, the local protests were individualized from the larger Occupy Wall Street movement.

Episodic Framing of the Protest

The amount of background about the Occupy Wall Street movement provided in the articles sets the tone for the rest of the article. If the article fails to put the protest in context to the greater movement it is then easier to stray away from the general point the protesters are trying to get across. When an article is unfocused, it tends to be episodic, which is the type of framing that is harmful to the movement because an unfocused article is an article that fails to grab the attention of the audience in a way that stands a chance of inspiring them to action. The results reflect the theme that an article that fails to put the protest in context will ultimately lead to episodic framing of the protest.

Corresponding with the seventy-two articles that gave little or no background, sixty-nine articles were

episodic. There were three exemplars of the ten thematic articles. While all three gave little background of the Occupy Wall Street movement, they managed to stay focused on a particular topic of the article, providing good commentary that gave the audience a solid understanding of that particular issue. For example, the one thematic article on Occupy Madison (12/3/11) focused on the incoming winter season and how the protesters were dealing with the freezing nights. It interviewed several people without straying from the central topic of coping with the freezing temperatures. Although the article was thematic in its framing of the topic, it failed to give a good background of the movement that put the protest in context. To the audience, the people being interviewed are suffering through freezing temperatures for no reason.

Framing the protest episodically can be detrimental to the movement. As Kim, Carvalho, and Davis (2010) pointed out, episodic framing reduces "important issues to mere individual level problems" (pg. 566). The goal of the Occupy Wall Street movement was to appeal to the wider audience the effects that corporate influence has on politics. When the newspaper frames the issues in a way that delegitimizes the potential for mass appeal, the movement will struggle and ultimately fail. The audience of an episodic article will not relate to a movement if that movement is portrayed as a problem of a particular individual only.

Demobilization of the Movement

It stands to reason that if an article has a combination of poor background information and episodic framing, then the article as a whole will be demobilizing for the movement, since demobilization of an article fails to connect the movement to a greater cause by making it individualistic (Ryan 1991:71). Although the findings on mobilization of this study weren't as deterministic as the episodic findings, the likelihood of an episodic article also being a demobilizing article was high. Fifty-six articles were demobilizing during the three month period even though sixty-nine articles were episodic. The biggest reason for the disparity between episodic articles and demobilizing articles was because several articles were positive.

Given that an episodic article isn't inherently antagonistic of the movement, the author isn't required to be negative

when discussing the protest episodically. In some cases, the article would give little or no background of the protest, leading to an unfocused article, but the interviews that were given were very positive and optimistic of the future of the movement. One such article was the second article printed about Occupy Sacramento by the Sacramento Bee (Hubert 10/6/11). This article gave live updates about Occupy Sacramento throughout the day. Although it interviewed six different protesters, they were interviewed at different times of the day and out of context with each other.

If the ultimate goal of the movement is to mobilize the people in to action, then a series of articles updating the audience on the current legal situation of the protesters that were arrested, as the Sacramento Bee did toward the end of the study, might not mobilize the people in to action. Instead, the audience sees a group of people in legal trouble because the police arrested them for various reasons and are now dealing with the judicial system. Whether or not the protesters should've been arrested is irrelevant to the fact that they are currently being sentenced in court for a violation they were accused of doing while attending the protest. An article talking about someone who got arrested for protesting will likely sound unappealing, resulting in the demobilization effect of the movement.

CONCLUSION

The ability to control what information and how much of it gets out to the public is an influential power that governments, politicians, and other powerful and influential people use to push their own agendas. Attempts to understand what role the media plays in influencing its audience led scholars to examine the media and develop theories explaining how the media functions within a society.

David Manning White "gatekeeper model" concluded that the finished story showed "how highly subjective, how highly reliant upon value-judgments based on the 'gatekeeper's' own set of experiences, attitudes and expectations the communication of 'news' really is" (Reese and Ballinger 2001:646). This model poses a problem for social movements like Occupy Wall Street because they are directly challenging a dominating power structure. As long as "gatekeepers" are ignoring the "power" in the question, then social movements

will struggle to gain followers to their cause, especially if the case is that the "power" doesn't want the social movement to gain momentum.

Edward Herman and Noam Chomsky's "propaganda model" is the "analytical framework that attempts to explain the performance of the U.S. media in terms of the basic institutional structures and relationships within which they operate" (Herman and Chomsky, xi). In other words, the U.S. media distributes information that favors those who have power in the United States. For social activists like those participating in the Occupy Wall Street protests, the propaganda model is a useful tool to show how the Mainstream media acts on behalf of those with power. However, as Charlotte Ryan points out, the propaganda model is over deterministic (1991:15). That is, it shows how futile any attempts the powerless have at shaping the media and how much of a struggle it will be to gain popular support from a grass roots level when the media plays such a big role in producing support.

The cultural studies model was developed from Antonio Gramsci's concept of cultural hegemony that contends that powerful and dominant ruling class uses different institutions, like religion, school, and family, to shape diverse societies to conform to the dominant ideology (Bullock 1999). The cultural studies model is more complex than the propaganda model because it "highlights the capacity of ordinary people to resist, challenge and undermine existing hegemonic reality definitions" (Sasson 1991:12), while also improving the gatekeeper model by "situating the social construction of the news in a broader theory of culture and society (Sasson)." The way in which the mainstream media subtly influences its audience, as the cultural studies model suggests, is evident in this study as newspapers portrayed the protests positively, while subverting its cause by demobilizing the movement with episodic frames. This theory best explains the findings of the content analysis because reporters used positive or neutral episodic frames to demobilize the movement. The reporters gave the impression that they were being fair and honest about the protests through passive tones throughout their articles while undermining the protestors' purpose of being there in the first place. Through the use of passive tones, the regional newspapers are subtly influencing its audience

by not moving them to take action in support of the movement. By dismissing the movement in the articles, reporters are, in turn, forcing its audience to dismiss the movement and therefore adhering to the status quo.

Reporters employ episodic framing often because they may not always have the time or space to offer a detailed report of a current event. In the growing world of the twenty four hour news cycle, reporters are often under constant pressure to put out articles on a regular basis. Doing so prevents them from reporting on major events thoroughly when all they get is a short column. For social movements, this poses a problem because social movements are more complex than the average episodic article can present. If social movements stand a chance in growing and expanding, the major media outlets have historically served as the least useful avenues to do so.

By employing episodic framing when reporting on social movements, newspapers serve to delegitimize the movement. Despite their professional behavior and good intentions, journalists serve the interests of their employing newspaper, and an 800 word limit isn't enough room for a journalist to be comprehensive for a newspaper seeking to print as much as possible in as little time as possible. This might explain why there were more positive articles then negative articles despite the overwhelming majority of demobilizing articles. Unfortunately for social movements, it's not the positive thoughts that count, but what is actually said, and a lack of context fails to inspire an otherwise passive audience.

As the research on framing has shown, newspapers hold a lot of influence on the audience. This study suggests that episodic framing can affect the greater movement negatively. If the article fails to present to the audience an accurate and thorough report about a protest, then the audience will fail to connect to the social movement in a way that is beneficial to the movement. Further, the people already involved in the movement might have a hard time sticking with the movement overtime if there doesn't seem to be any real growth through their work. More often than not, the movement dies out or fades away.

DISCUSSION

As the general population in the United States shifts to the online world to get their news, newspapers have done the same to publish their stories. However, as far as mainstream newspapers are concerned the use of episodic framing stays the same. What the internet offers is a more democratic element in deciding which news is credible to the people viewing it. As the Occupy Wall Street movement is trying to argue, the influence of corporate money in to main stream media is undemocratic in its very essence because the corporations pumping money in to the news are in turn dictating what the news shall be. Allegations that these corporations are corrupt will not win these news companies credibility if they are accepting money from them to stay alive. As the internet viewership begins to questions the credibility of the major newspapers in their local area, the audience will begin to seek other areas to get their news, and the area that has gained the most acceptance online are independent journals, magazines, and blogs.

The popularity of independent media can likely be attributed to the type of journalism it publishes, which promotes a more thematic approach to covering the news. As the population begins to question the power structure of the country, so too do they question the media the power structure financially supports, since it's understood that a corporation expending funds to a newspaper will not allow that newspaper to actively mobilize a movement that is against the interests of the backing corporation. It stands to reason, then, that the shift to independent news sites like Salon.com, truthdig. com, inthesetimes.com, and democracynow.org -news sites that are largely free from corporate influence- will more than likely occur, especially if popular independent journalists like Glenn Greenwald, Chris Hedges, Allison Kilkenney, and Amy Goodman, are among the regular contributors of these sites, and thematically covering the Occupy Wall Street movement.

This idea doesn't appear entirely lost to the newspaper companies, since there was a general level of positivity when dealing with the protestors, but if main stream newspapers expect to stay around further in to the future, they will have to take the lead of independent journalism and start offering a well-researched account of social movements. The alternative is accepting large sums of money from corporations, and losing credibility as a newspaper.

FUTURE RESEARCH

A similar content analysis as this study used, but applied to independent journals and news sites could provide a necessary analysis on the importance of independent journals and how much they differ to main stream newspapers. Alternatively, a content analysis on main stream journals like the Wall Street Journal would allow for a compare and contrast study with independent journals that could further raise the question of corporate influence on the media.

Due to some constraints that affected a more thorough study, some issues are still left unresolved. Choosing more than three newspapers will increase the sample size and give the data results more legitimacy. Further, a system of counting the regularity of the articles can give a clearer picture of the newspaper' interest in covering the protest.

Another area of interest is the effect the Occupy Wall Street Journal, the newspaper created by the protesters of Occupy Wall Street, had on organizing the movement and building collective identity amongst the protesters. V.I Lenin argued ([1901]1969) the importance of a common newspaper within a social movement. It can at once be a collective organizer and a collective agitator, while building group solidarity around a common cause (p.156). Addressing this question in her study, Linda Lumsden (2009) argued that The Black Panther was a crucial newspaper that built the Black Panther Party For Self Defense's identity by allowing for "democratic discourse" (p. 911) within the movement from all members, men and women alike. A closer look at the Occupy Wall Street Journal would be useful in gauging how important it was within the movement.

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APPENDIX

Coding Template

Article Number: Article Date:

How much background information is given about the original Occupy Wall Street movement per article?

- Zero Background (no context at all)
- <u>Little Background</u> (1-2 sentences, vague info/context)
- <u>Moderate Background</u> (3-5 sentences, good info/context, general understanding of background)
- <u>Detailed Background</u> (6+ sentences/2+paragraphs, clear understanding of background)

Who is being interviewed?

- <u>"Establishment" figures</u> (politicians, cops, academics, union officials) M / F
- <u>"Non-Establishment"</u> Figures (regular workers, unemployed, students) M / F

What type of framing is the article using?

- Episodic
- Thematic

How is the author/article portraying the local Occupy protest? How so?

- <u>Positively</u> (encouraging words, good/detail background, supportive interviews)
- <u>Negatively</u> (discouraging words, missing/scant background, unsupportive interviews)
- <u>Neutral</u> (no sense of positive/negative coverage, straight facts)

Overall, is the article mobilizing or demobilizing?

- <u>Mobilizing</u> (sense of purpose, growth and forward thinking
- <u>Demobilizing</u> (no sense of purpose, no chance of growth, stagnant thinking)

EFFECT OF TAURINE CHLORAMINE ON STAPHYLOCOCCUS EPIDERMIDIS AS A POTENTIAL TREATMENT TO PATHOGENICITY

by EMILIO R. VASQUEZ



ABSTRACT

Staphylococcus epidermidis (S. epidermidis) is a Grampositive coccus that inhabits the surface of the skin. While research has suggested that Propionibacterium acnes (P. acnes) has a direct role in the pathogenesis of acne vulgaris, research has also suggested that S. epidermidis may have an indirect role in the pathogenesis of acne vulgaris as well as a direct role in rosacea. Taurine chloramine (TauCl) is an anti-inflammatory chemical produced by activated neutrophils. Previous studies have suggested that TauCl may also have antimicrobial properties as well and should be investigated as a possible topical treatment for skin disease. The research project investigated various



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Professional Assistant Professor of Chemistry Department of Physical & Environmental Sciences College of Science and Engineering concentrations of TauCl applied to S. epidermidis to find the smallest effective millimolar range that will significantly inhibit growth in vitro, as comparing models for topical and systemic treatment to determine the most efficient method. These results will allow for future research that investigates susceptibility of S. epidermidis to TauCl while elucidating the maximum concentration of TauCl that is still safe enough to be widely used for topical and blood-borne syndromes caused by S. epidermidis.

INTRODUCTION

The surface of human skin is home to a diverse population of normal skin flora. The host benefits from these microorganisms inhabiting the skin (Grice, 2011). Two Gram-positive commensals, *P. acnes* and *S.* epidermidis, are found in higher concentration among the drier areas of the skin's surface rather than moist areas (such as the axilla). Although the exact mechanism by which bacteria cause skin disease is not completely understood, research has strongly suggested that they do have direct roles. P. acnes has been found to have a direct role in the pathogenicity of acne vulgaris. S. epidermidis also has clinical relevance in that this bacterium has been reported to cause nosocomial infections in postoperative patients (Vuong, 2002), and other investigations also indicate that *S. epidermidis* may have a direct role in rosacea (Whitfeld, 2010). While rosacea has not been found to be harmful, an estimated 45 million people are affected worldwide (Whitfeld, 2010). Similar to acne, rosacea can cause psychological

and sociological damage; patients may suffer low selfesteem due to their noticeable outbreaks characterized by facial flushing and either papules, pustules or both. Because of the similarity of pustules found in rosacea to acne, bacterial pathogenicity is a suggested explanation. Heat is a hypothesized mechanism of rosacea. Vasodilation occurs when the host is exposed to a hot environment as an attempt to cool off the body. Blood releases heat under the surface of the skin, raising the temperature of the skin. Increase in temperature of the face is common in rosacea patients; S. epidermidis is noted to behave differently when exposed to higher temperatures. Previous research has suggested that at higher temperatures, certain genes in S. epidermidis become activated (Dahl et al, 2004) including a lipase which has been shown to hydrolyze erythrocytes, leading to the redness seen in the faces of rosacea patients. This observation leads researchers to believe that higher cutaneous temperature might be a stimulus for commensal *S. epidermidis* to become pathogenic.

Taurine is an amino acid produced naturally in neutrophils. Once activated, taurine reacts with hypochlorite (HOCl) to form taurine chloramine (TauCl), an anti-inflammatory chemical that previous research has shown may also have antimicrobial activity (Marcinkiewicz, 2006). The reaction of HOCl and taurine to form taurine chloramine (with water as the leaving group) happens spontaneously in vivo but in vitro must be synthesized. Knowledge of how taurine chloramine may be used to control S. epidermidis would be beneficial in the treatment of both rosacea and acne vulgaris. While no direct evidence exists that TauCl may decrease growth of S. epidermidis, prior studies with P. acnes (Schwarz, 2011) suggest that S. epidermidis as a skin commensal may be controlled by a chloramine. This effect may be directly through the action of TauCl, or indirectly by the change in pH. The hypothesis is that TauCl can inhibit growth of S. epidermidis and prevent rosacea. The significance of this project is that use of compounds similar to TauCl may give an alternative to antibiotic use, thus decreasing the probability of side effects from antibiotic treatment.

MATERIALS AND METHODS

Determination of Taurine Chloramine Inhibitory concentrations

Bacterial Strains. Staphylococcus epidermidis was ordered in lyophilized form (Carolina Biological). Because the lyophilized organism was not delivered

early enough, a strain of *S. epidermidis* was donated from Brooke Stanford (Microbiology Lab Coordinator) to begin the growth curve experiments.

Media. Bacterial cultures were grown in Bacto® Brain Heart Infusion (BHI) broth (Becton-Dickinson) at 35-37°C in a rotary shaker. Overnight cultures were plated on Columbia Nutrient Agar containing 5% sheep erythrocytes (BD Diagnostics).

Growth curve analysis and comparison methods. Plates and broth were prepared on the day before growth curve experiments. Three sterile 125mL Erlenmeyer flasks were used to hold 30mL of BHI broth each. Two were for experimental cultures (the duplicates) and one served as the control which remained non-inoculated. *S. epidermidis* was grown in 3 mL Bacto® Brain Heart Infusion broth as an overnight culture. Growth curve experimental trials were done in duplicates. Absorbance values for the growth curves at a wavelength of 600nm were obtained using the BioMateTM spectrophotometer (Thermo Scientific) in Dr. Buck's lab.

From the growth curve, the most reasonable dilution at which to plate S. epidermidis was found. Three time points were taken for the final growth curve- T₀, T₁ and T, were the time points 0 minutes, 120 minutes and 240 minutes respectively. At these time points, 1mL was taken from each experimental culture. The aliquots were diluted from 10° to 10⁻² then to 10⁻⁴, as 1/100 dilutions and then from 10⁻⁴ as 1/10 dilutions to 10^{-5} , 10^{-6} , and 10^{-7} . These dilutions were suspended in PBS for a total volume of 1mL in each centrifuge tube. Aliquots of 100µL from each tube were placed on plates (made with Bacto® Brain Heart Infusion and Bacto® Agar) and spread using a turntable. The plates were incubated over a 24 hour period and colonies were counted. Dilutions of 10⁻⁶ to 10⁻⁵ were found to yield approximately 20-200 colony forming units (CFU). These dilutions were used for the preliminary assay in which the surface method was used.

Preliminary Trial

The preliminary trial was done to determine whether non-diluted TauCl inhibits growth of *S. epidermidis* at all. Eight plates were inoculated with *S. epidermidis* at concentrations of 10⁻⁵ and 10⁻⁶ in triplicates each, leaving two of the eight as controls for the concentrations of 10⁻⁵ and 10⁻⁶. Aliquots of 100µL of *S. epidermidis* diluted in PBS to concentrations of 10⁻⁵ and 10⁻⁶ were

placed at the center of Columbia Blood Agar plates and the aliquots were spread aseptically. Six places then received $100\mu L$ of non-diluted TauCl to the center of the plate and spread, while two plates received $100\mu L$ of PBS. After an incubation period of 24 hours, colonies were counted, shown in Figure 6. Growth of bacteria on Blood Agar plates is described as shown in Figures 7 (dilution method assay) and 8 (surface method assay).

Experimental Trials

For the experimental trials, lyophilized *S. epidermidis* was cultured and an over-night 6mL inoculated BHI broth was prepared. Concentrations of *S. epidermidis* were prepared diluting with PBS. The 4 sets of concentrations 10⁻⁶, 10⁻⁷ and 10⁻⁸ were split into two experimental groups. This experiment tested the smallest concentration at which TauCl inhibits growth as well as the best method for applying the TauCl to experimental *S. epidermidis*. The two methods tested were the 'Dilution' method and 'Surface' method.

The Dilution Method Assay

The Dilution method entails placing $100\mu L$ of TauCl to experimental concentrations of *S. epidermidis* (10^{-6} and 10^{-7}) and placing a $100\mu L$ aliquot onto the center of the Blood Agar plate to be spread. This method simulates a systemic treatment of TauCl to *S. epidermidis*.

Three sets of the experimental concentrations 10⁻⁶ and 10⁻⁷ of *S. epidermidis* were treated each with 100μL of non-diluted TauCl, 1:1 TauCl and 1:3 TauCl. Once suspended in TauCl, a 100μL aliquot of the experimental concentrations of *S. epidermidis* was taken and plated in duplicates. Concentrations of 10⁻⁶, 10⁻⁷ and 10⁻⁸ served as controls and were treated with 100μL of PBS and a 100μL aliquot was plated of each.

The Surface Method Assay

The Surface method involves placing a 100µL aliquot of the experimental concentrations of *S. epidermidis* onto the surface of the Blood Agar plates to be spread.; Plates were allowed to dry at ambient temperature for two to three minutes before placing the 100µL aliquot of TauCl to the center of the Blood Agar plates to be spread. This method simulates a topical treatment of TauCl to *S. epidermidis*.

The experimental concentrations 10^{-6} and 10^{-7} of *S. epidermidis* were plated in duplicates (based on the three

molarities of TauCl they would receive in the second step) by placing a $100\mu L$ aliquot on the center of the Blood Agar plates and spread. The controls consisted of plating a set of concentrations (10^{-6} , 10^{-7} and 10^{-8}) by placing a $100\mu L$ aliquot at the center of Blood Agar plates and spreading aseptically. The experimental and control plates were allowed two to three minutes of wait time at ambient temperature. A $100\mu L$ aliquot of non-diluted TauCl, 1:1 TauCl and 1:3 TauCl was added to the plates and spread. The controls received a $100\mu L$ aliquot of PBS to the center of the Blood Agar plate.

The 100µL aliquots plated at the center of the Blood Agar plates were spread using a turntable. Once spread, the plates were incubated over a 21 hour period and plate counts were performed

Synthesis of taurine chloramine

For taurine chloramine synthesis, leftover taurine was available from the previous project with P. acnes (Schwarz, 2011). Three hundred milligrams of taurine in its solid state was suspended in 100mL of PBS in order to get 100mL of taurine at a concentration of 24mM, which was kept as a stock solution. Sodium hypochlorite (NaOCl; courtesy Gaylen Nuckols, TAMU-CC Physical Science lab coordinator) is the reagent used to synthesize taurine chloramine (rather than hypochlorite, the reagent that undergoes the reaction spontaneously in vivo); 2.5mL of the 6% NaOCl was suspended in 97.5mL of PBS to get 100mL of 20mM NaOCl which was kept as stock solution for synthesis. The NaOCl was added dropwise to 24mM Taurine in a 1:1 molar ratio (Schwarz, 2011). The synthesis was carried by placing 5mL of 20mM NaOCl into a burette and adding the NaOCl dropwise to a 25mL beaker containing 5mL of 24mM taurine under constant agitation with a mini stir bar. Once 5mL of 20mM NaOCl was added to 5mL of 24mM taurine, a Varian Cary 100 Bio UV-Visible spectrophotometer was used to identify which species (TauCl and TauCl2) was synthesized; the former which is the desired species has a λ max of 252nm and the latter, 300nm (Cunningham et al, 1998). Over the two day period, two 10mL batches of TauCl were synthesized using this dropwise method and stored at -4 °C.

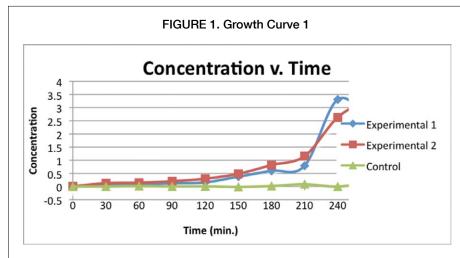


Figure 1 shows the growth curve analysis of *S. epidermidis* in BHI broth. Overnight cultures of *S. epidermidis* were inoculated 1100 into 25 mL of BHI broth contained in a 250 mL flask, and aliquots were taken every 30 min., and measured at 600nm for absorbance. At time points 0 min, 120 min, and 240 min (T_0 , T_1 and T_2), one set of duplicate aliquots were chilled at 4°C and plated onto BHI Agar medium at empirically-determined serial dilutions. The blue curve is experimental *S. epidermidis* 1; the red curve is experimental *S. epidermidis* 2; the green curve is the uninoculated control.

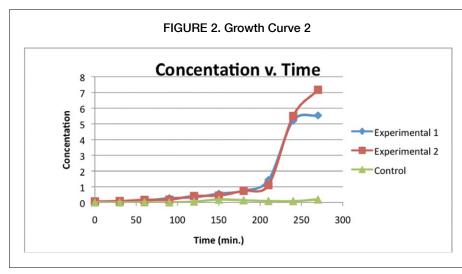


Figure 2 shows the growth curve analysis of *S. epidermidis* in BHI broth. Overnight cultures of *S. epidermidis* were inoculated 1100 into 25 mL of BHI broth contained in a 250 mL flask, and aliquots were taken every 30 min., and measured at 600nm for absorbance. At time points 0 min, 120 min, and 240 min (T_0 , T_1 and T_2), one set of duplicate aliquots were chilled at 4°C and plated onto BHI Agar medium at empirically-determined serial dilutions. The blue curve is experimental *S. epidermidis* 1; the red curve is experimental *S. epidermidis* 2; the green curve is the uninoculated control.

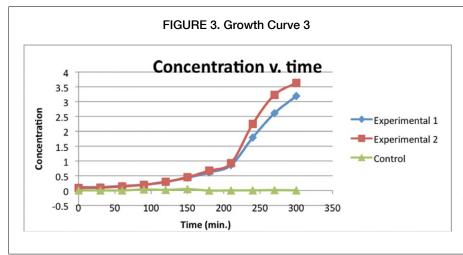


Figure 3 shows the growth curve analysis of *S. epidermidis* in BHI broth. Overnight cultures of *S. epidermidis* were inoculated 1100 into 25 mL of BHI broth contained in a 250 mL flask, and aliquots were taken every 30 min., and measured at 600nm for absorbance. At time points 0 min, 120 min, and 240 min (T_0 , T_1 and T_2), one set of duplicate aliquots were chilled at 4°C and plated onto BHI Agar medium at empirically-determined serial dilutions. The blue curve is experimental *S. epidermidis* 1; the red curve is experimental *S. epidermidis* 2; the green curve is the uninoculated control.

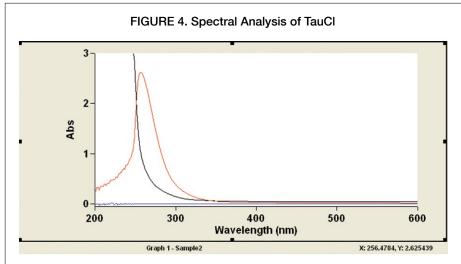


Figure 4 shows the UV-Vis spectra of TauCl, λ max 252nm, using a Cary UV-Vis spectrophotometer. It is known that *in vitro* taurine chloramine degrades to sulfoacetaldehyde within a 12 hour period via consecutive decarboxylation (Olszowski, et al, 2002). After analysis it was found that batches can be stored and kept at -4°C without undergoing consecutive decarboxylation, allowing for more accurate concentrations when performing experimental trials.

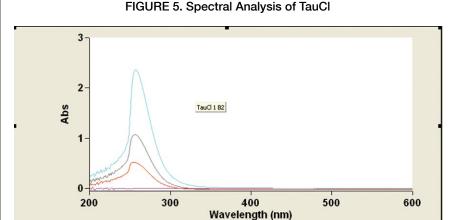


Figure 5 shows the spectral analysis of non-diluted TauCl, TauCl diluted in 1:1 parts and TauCl diluted in 1:3 parts. For experimental trials, two stock solutions of 10 mL TauCl were prepared using the dropwise synthesis method (Schwarz, 2011). The two stock solutions were then used to make stock solutions of diluted TauCl. TauCl was diluted in 1:1 and 1:3 parts using PBS as diluent. Key: Light blue trace – non-diluted (original) TauCl; Dark blue trace – 1:1 TauCl; Red trace – 1:3 TauCl; Pink trace – Blank (PBS).

FIGURE 6. Preliminary trial of S. epidermidis

Graph 1 - TauCl 1:3 B2

Concentration	Colony Forming Units					
10-5	~300	~300	<200	~2000 (Control)		
10 ⁻⁶	62	93	42	~2000 (Control)		

Experimental concentrations 10^{-5} and 10^{-6} treated with 100μ L done in triplicates; one set serves as control treated with 100μ L of PBS. Aliquots spread on Columbia Blood Agar. Incubation time of 24 hours.

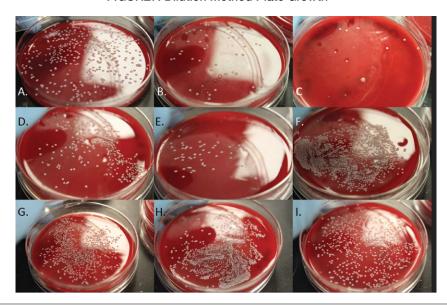
RESULTS

X: 313.6213, Y: 1.608772

Figures 1 through 3 show the growth curves from *S. epidermidis*. The organism shows an elongated slow linear growth trend until approximately 180 - 200 minutes, where it reaches logarithmic growth; stationary growth is reached at approximately 240 minutes. One interesting feature found in *S. epidermidis* growth is that growth plateaus just before logarithmic growth is reached.

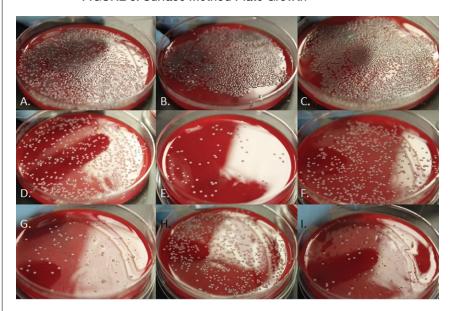
The typical absorbance values for non-diluted TauCl was ~2.57, 1:1 TauCl:PBS ~1.26 and 1:3 TauCl: PBS ~.624. TauCl has an extinction coefficient of 429m²/mol. The concentrations of the original batches and their dilutions were determined using Lambert-Beer's Law as follows:

FIGURE7. Dilution Method Plate Growth



S. epidermidis treated with 100µL of TauCl before being spread on Blood Agar. Incubation time of 21 hours. A. - Control 10⁻⁶; B. - Control 10⁻⁷; C. - Control 10⁻⁸; D. - S. epidermidis at concentration 10-6 treated with non-diluted TauCl; E. - S. epidermidis at concentration 10⁻⁷ treated with non-diluted TauCl; F. - S. epidermidis at concentration 10-6 treated with 1:1 TauCl; G. - S. epidermidis at concentration 10⁻⁷ treated with 1:1 TauCl; H. -S. epidermidis at concentration 10-6 treated with 1:3 TauCl; I. -S. epidermidis at concentration 10-7 treated with 1:3 TauCl. (Images D-I only show 1 plate out of 2 as the trials were done in duplicates.

FIGURE 8. Surface Method Plate Growth



S. epidermidis plated on Blood Agar. Bacteria were aseptically spread on plate surface, then incubated 2-3 minutes at ambient temperature before adding a 100µL aliquot of TauCl and spreading aseptically before incubating at 35oC for 21 hours. A. -Control 10⁻⁶: B. – Control 10⁻⁷: C. – Control 10⁻⁸; D. - S. epidermidis at concentration 10^{-6} treated with non-diluted TauCl; E. - S. epidermidis at concentration 10-7 treated with non-diluted TauCl; F. - S. epidermidis at concentration 10⁻⁶ treated with 1:1 TauCl; G. - S. epidermidis at concentration 10-7 treated with 1:1 TauCl; H. - S. epidermidis at concentration 10-6 treated with 1:3 TauCl; I. - S. epidermidis at concentration 10⁻⁷ treated with 1:3 TauCl. (Images D-I only show 1 plate out of 2 as the trials were done in duplicates.)

Absorbance(A) = Extinction Coefficient(\sum)*Length of the path light travels(1cm)*Concentration(C)

A=
$$\sum (1 \text{ cm}) * \text{c}$$

Therefore $\text{c} = \frac{A}{\sum (1 \text{ cm})}$

Below are the calculations for non-diluted TauCl, 1:1 TauCl and 1:3 TauCl respectively:

$$c = \frac{2.57}{(429m^2/mol)(1cm)} = 599$$
mM

$$c = \frac{1.26}{(429m^2/mol)(1cm)} = 294\text{mM}$$

$$c = \frac{.624}{(429m^2/mol)(1cm)} = 145$$
mM

FIGURE 9. Plate counts for Dilution and Surface methods/TauCl treatment

Concentration	Controldm	599m M TauCloм	294mM TauCl (1:1)рм	145mM TauCl (1:3)рм	ControlsM	599mМ TauClsм	294mM TauCl (1:1)sм	145mM TauCl (1:3)sм
10 ⁻⁶	250 CFU	320, 251 CFU	TNTC ~1000, TNTC ~1500 CFU	TNTC ~1500, TNTC ~1500 CFU	TNTC >2000 CFU	2, 364 CFU	TNTC ~400, TNTC ~500 CFU	TNTC ~300, TNTC ~300
10 ⁻⁷	58 CFU	105, 61 CFU	TNTC ~400, TNTC ~400 CFU	TNTC ~400, ~250 CFU	TNTC >2000 CFU	76, 60 CFU	79, 48 CFU	67, 52 CFU
10-8	6 CFU				TNTC >2000 CFU			

After an incubation period of 21 hours, plate counts were performed. CFU - Colony Forming Unit; DM - dilution method; SM – Surface Method

TNTC - Too numerous to count (200<)

Because *S. epidermidis* at concentration of 10⁻⁵ yielded >200 CFU, it was determined that this concentration was too high to form a reasonable number of CFU. It is possible that *S. epidermidis* plated on Brain Heart Infusion Broth and incubated over a 24 hour period yields reasonable amount of colonies at 10⁻⁵. However it was experimentally observed with this preliminary assay that *S. epidermidis* grows in higher yield on Blood Agar. It was then decided that for the experimental trials, *S. epidermidis* should be at concentrations 10⁻⁶ and 10⁻⁷.

DISCUSSION

With respect to the lowest concentration that inhibits growth for the dilution method, 599mM TauCl solution inhibited growth most effectively; 294mM and 145mM TauCl still yielded plates with CFU too numerous to count, and therefore did not inhibit growth significantly. The dilutions method for the control yielded significantly lower growth than expected. One reason for this could be that because the concentration of bacteria was already diluted with PBS, further treating the controls with 100µL more PBS. This further dilution would be expected to give a smaller yield of colony forming units.

The surface method mistakenly plated the bacteria onto the surface, followed by the TauCl; in reality, the TauCl should have been plated first, allowed to dry at ambient temperature, then aliquots of bacteria at various dilutions should have been spread aseptically to the surface. When comparing the surface method growth to the surface method controls (which yielded expected heavy growth), even 145mM TauCl significantly inhibited growth of *S. epidermidis* even with the highest

dilution of *S. epidermidis* (10⁻⁶). Future experiments will perform the method in this order. These data provided here cannot be used to suggest that the surface method was more effective at inhibiting growth than the dilution method.

The pharmacological data for TauCl *in vivo* were not available, including the volume of distribution in blood versus tissues, the final blood concentration when applied topically, and the level of toxicity when ingested. Hence, the concentration of TauCl that would be allowed to be applied either topically or ingested would need to be tested by clinical trials, as the LD50 of TauCl is not yet known. Future areas of research can include the pathogenesis of *S. epidermidis* and its possible role in rosacea as well as other skin pathologies once an effective molarity is found. Future research could also test different types of agar, possibly levels of salt content and acidity to more accurately simulate the skin once a proper effective concentration is found(this applies to the surface method and topical treatment).

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EFFECT OF A PRE-EXERCISE, ENERGY DRINK (REDLINE POWER RUSH®) ON PHYSICAL PERFORMANCE IN COLLEGE-AGED MALES AND FEMALES



by DIANEA "DA DA" WILLIS

ABSTRACT

The consumption of caffeine-containing energy drinks and supplements has increased dramatically in popularity over the last several years. Many of these products are marketed toward individuals seeking to boost their energy and arousal levels, allowing individuals to work at greater intensities and for a longer duration during an intense bout of exercise. For these reasons, many exercisers consume energy drinks with the hope they will provide an ergogenic effect and facilitate faster adaptations to training. The purpose of this study was to investigate the effects of a commercial energy supplement on physical performance in college-aged students.

Keywords: caffeine, mood, performance, fatigue, cognitive function, alertness, beta-alanine



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INTRODUCTION

Over the last several years, the use of energy drinks as an ergogenic aid has dramatically increased in popularity (Ishak, Ugochukwu, Bagot, Khalili, & Zaky, 2012; Heckman, Weil, & Gonzalez De Mejia, 2010; Davis & Green, 2009). Caffeinated energy drinks are typically marketed to consumers as a method of improving mental alertness and reducing both cognitive and physical fatigue (Heckman, Sherry, & Gonzalez de Mejia, 2010). These drinks have been shown to elicit a stimulant effect on the central nervous system (Green, 2009). Therefore, consumers typically expect some type of improvement in physical and/or mental performance when utilizing such products (Ishak, et al., 2012).

Most commercial energy drinks include a variety of ingredients which may lead to improved time to fatigue. Some of these ingredients include caffeine, beta-alanine, taurine, and green tea extract (Alford, Cox, & Wescott, 2000), 2000; Ishak, et al., 2012) These ingredients have been shown to potentially facilitate better mental performance, improve Na+/K+ levels, and assist with muscle contractions (Alford, Cox, & Wescott, 2000). At this time it is unclear as to whether this effect can be directly attributed to a specific ingredient or to the combination of ingredients found in a particular beverage (Ishak, et al., 2012; Alford, Cox, & Wescott,

2000)., 2000; Heckman, Weil, & Gonzalez De Mejia, 2010).

The literature indicates that there is a relationship between caffeine consumption and fatigue reduction (Stuart, Hopkins, Cook, & Cairns, 2005). It has been suggested that caffeine may positively influence performance by hindering the binding of adenosine to the heart and brain by acting as a receptor antagonist. This action may slow down brain activity, thus reducing the perception of pain, while motor unit firing remains constant (Davis & Green, 2009; Ruxton, 2008). This explanation appears plausible, as caffeine and adenosine have a similar molecular structure (Ruxton, 2008; Heckman et. al., 2010). Consequently, caffeine has been shown to help improve time to fatigue in a variety of anaerobic and aerobic performance tests (Ishak et. al., 2012; Stuart et. al., 2005.)

In addition, several studies have found that caffeine ingestion had a significant impact on both reaction time and mental alertness in cognitive tests and other concentration tasks (Heckman, Weil, & Gonzalez De Mejia, 2010; Ishak, Ugochukwu, Bagot, Khalili, & Zaky, 2012; Stuart, Hopkins, Cook, & Cairns, 2005; Alford, Cox, & Wescott, 2000). For instance, Alford et al. (2000) showed significant improvement in cognitive function for subjects who took the Red Bull Energy Drink relative to those who ingested a taurine. People who consume caffeine on a regular basis seem to experience fewer ergogenic benefits from caffeine prior to exercise than those who moderately or rarely consume caffeine (Kreider, Wilborn, Taylor, Campbell, Almada, Collins, Cooke, Earnest, Greenwood, Kalman, Kerksick, Kleiner, Leautholtz, Lopez, Lowery, Mendel, Smith, Spano, Wildman, Willoughby, Ziegenfuss, Antonio., 2010).

Recently, Beta-Alanine (BA) has also been included in many pre-workout energy supplements. Carnosine is a dipeptide which is made up of amino acids (Kreider, et al., 2010). Consuming BA has been shown to elevate muscle carnosine levels which may enhance the buffering of metabolic waste products in the muscle, specifically hydrogen ions (Stout, Cramer, Zoeller, Torok, Costa, Hoffman, Harris, O'Kroy., 2007; Smith, Walter, Kendall, Graef, Lockwood, Moon, Beck, Cramer, Jeffery., 2008). This buffering effect may translate into strength gains

and improved performance by helping to delay time to fatigue during intense physical activity and increase work capacity (Kreider, et al., 2010).

Baquet and colleagues (2010) found a positive correlation between baseline muscle's carnosine content and performance, due to an increase in rowing speed. Stout (2009) and Walter (2010) found that BA improved ventilatory threshold, physical working capacity at fatigue threshold to physical working capacity at fatigue threshold (PWCFT), and time to exhaustion on cycle ergometers (stationery cycles) compared to those receiving a placebo. In a study conducted by Stout et al. (2008), untrained elderly women that received BA showed an increase in work capacity and fatigue threshold (Stout, et al., 2008). BA has also shown to improve performance in both trained and untrained men. For instance, Sale et al. (2011) found that BA supplementation resulted in significant improvements in rowing performance after four weeks of receiving 6.4 grams per day. Research by Derave, et al. (2007) discovered that BA supplementation raised carnosine levels and found a slight but significant attenuated fatigue in continual sessions of extensive dynamic contractions during the Wingate test after four weeks of receiving 4.8 grams per day. BA enhances buffering capacity, but its role as a high energy supplement is still uncertain given its unknown acute effects on metabolic rate and adrenergic receptors (Hoffman, Ratamess, Kang, Mangine, Faigenbaum, Stout., 2006).

METHODS

EBSCO Host Discovery Service was searched for peer reviewed studies in the English language. Search terms included 'caffeine' combined with other terms such as "effect on," "performance," "mood," "cognitive function," and "endurance." Other terms explored were "sales" and "use." Any study design concentrating on caffeine consumption and its performance effects was reviewed.

Nineteen (n=19, 8 men, 11women; age: 22.42 ± 3.15 years, body mass: 68.95 ± 12.70 kg, BMI: 23.86 ± 2.85 , ht: 168.7 cm.) individuals volunteered to participate in this study. All test subjects completed a health history and medical questionnaire, as well as an informed consent form, prior to participating in this study. Participants completed a pre- and post- test consisting

of the following: anthropometric measurements (height, weight, body composition), the vertical jump, YMCA Bench press test, sit-ups to fatigue: Dynavision™ reaction test, and pre- and 20-meter sprint repeat test. The pre- and post- test sessions were conducted approximately 48 hours apart for each subject.

Pre-Test:

On their scheduled pre-test date, each subject underwent an array of tests to determine anthropometrics (height, weight, body mass index, and body composition) and physical performance. Physical performance factors measured included anaerobic power and muscular endurance. Anthropometric information, including height (cm) and weight (kg) measurements, were collected using standard procedures on a doctor's beam scale (Cardinal/Detecto Scale Co, Webb City, MO.). Body fat was collected via bioelectrical impedance (BIA) using an OMRON HBF-306 Body Fat Analyzer. Body fat was measured using a 3-site skinfold measurement as described by Jackson and Polock (1978) and Jackson Pollock and Ward (1980), as well as via BOD POD (COSMED srl - Rome - Italy) measurements. Body Mass Index (BMI) was calculated using the Quetelet index, which is calculated by dividing bodyweight in kilograms by height in meters squared (kg*m -2) (ACSM, 2010).

Vertical jump height was obtained via a Just Jump System (ProBotics Inc, Huntsville, Al.) and Myotest® Pro CMJ. The Just Jump Mat is a 27 inch x 27 inch mat that calculates vertical jump height by measuring vertical displacement time. Vertical jump height for this device is calculated by measuring the amount of time the feet are not in contact with the mat. All subjects were instructed to step on the mat and when ready, perform a maximal jump with a countermovement arm swing, which was used to determine vertical jump height. All subjects were wearing the Myotest® Pro CMJ device while performing the jumps. The best of 3 attempts was taken and maximal jump height was recorded to the nearest 1.3 cm (0.5 inch).

Upper-body muscular endurance was tested via the YMCA Bench-Press test using the technique detailed by Nieman (2011). All subjects lie on a bench with their feet flat on the floor; a spotter hands the 35-lb barbell to the subject in the "down position" then the subject presses the barbell upward and lowers it back to the starting

position. They lift to the rhythm set by a metronome at 60 bpm. The subjects performed as many lifts as possible using this technique. Muscular endurance data for the abdominal muscles was collected via the sit-up to fatigue test. The technique used for this test has also been adapted from the technique described by Hoffman and Collingwood (1995). Subjects were instructed to lie on their back with their knees bent, heels flat on the mat or ground, hands across the chest, and a partner anchoring them to the ground by holding their feet. The subjects were then instructed to perform as many correct sit-ups as possible.

Subjects also performed the Dynavision™ reaction time test to assess their reactive capabilities. Participants stood with a Dynavision™ trainer about 15 inches in front of them. Subjects placed their hand on a solid green light button, and then waited for a solid red light button to appear. Once the red stimulus light appeared, subjects used their hand to press the red button as soon as it appeared. The same scenario was performed multiple times for both the right and left hands, and the system's computer will collected the data.

Anaerobic power was measured using ten, 20-meter sprints performed repeatedly with 10 seconds of rest between the sprints. Subjects began at the starting point and sprinted 20-meters, recovered for 10 seconds, then sprinted back to the starting point. This was done ten times and all times were recorded using the Smart Speed System.

Post-Test:

Prior to the second testing session subjects were randomly provided with either an energy supplement (ES was Redline Power Rush by VPX) or a placebo (PL) administered in a randomized and double-blind fashion. The dosage of caffeine in the ES was 175mg. Both the ES and PL were 37mL of liquid. Approximately 30 minutes post-consumption of either the ES or PL the subjects repeated the array of tests they performed during the first testing session with the same testing procedures. Ten (n=10) participants received the ES, while nine (n=9) participants received the PL. A paired samples t-test was used to determine between group differences for the selected assessments, at an alpha level of 0.05

RESULTS

Data analysis revealed a significant interaction between the treatment effect and the trials of participants scores on sit-up to fatigue scores, t (9) = 0.80, p = 0.05. Further examination of post-test main effects revealed a significant difference between pre- and post-test scores on the DynavisionTM reaction test for both the placebo, t(8) = -3.12, p = 0.01, and the treatment t (9) = -2.92, p =0 .02. This represented a 13.40% increase in the treatment group's post-test sit-up scores and a 3% increase in the DynavisionTM reaction test post-test scores for both groups.

DISCUSSION

In this study the investigators sought to determine whether a pre-exercise energy supplement had any impact on selected measures of anaerobic performance and reaction time. The treatment group showed significant improvements in muscular endurance as measured by the sit-up to fatigue test. This is similar to results found by Temple et al. (2011), they also found that a caffeinated pre-exercise energy drink showed significant improvements in upper-body muscular endurance as measured by the sit-up to fatigue test. However, no significant improvements were seen in upper-body endurance performance as measured by the YMCA Bench press test. These results differed from those discovered by Dawes et al. (2011), who found participants that consumed a caffeinated preexercise energy drink showed significant improvements in the push-up to fatigue test. While they work the same muscle group, these differences may be due to the difference in the nature of the tests. The YMCA bench press is performed to the cadence of the metronome while the push-up endurance test did not require subjects to maintain a specific cadence and were allowed an opportunity to take longer rest periods between repetitions. This may also explain the significant differences seen in the sit-up to fatigue test in our treatment group.

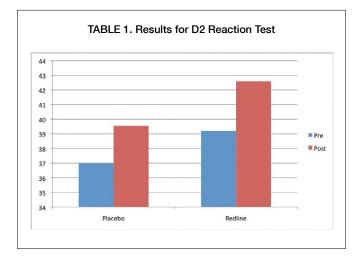
Both groups saw improvements in scores on the Dynavision[™] reaction test. This was most likely due to a learning effect. This is not surprising as many studies have found caffeine to improve cognitive function and reaction time. Ishak et al. (2012) reported improved cognitive functioning on subtraction tasks and a five

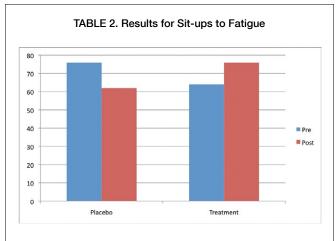
minute Rapid Visual Information Processing test at both dosages containing 68g of glucose in addition to either 30 or 36mg of caffeine. In another study they also found a significant improvement in secondary memory, reaction time, and immediate and delayed word recall. Alford et al (2000) found that ingestion of a Red Bull Energy Drink showed significant increases in alertness and immediate recall when compared to carbonated water. This study did not note if the improvements in memory and alertness were due to caffeine alone or the combination of ingredients with the Red Bull Energy Drink. The results of the Hoffman, Hoffman, and Tranchina (2008) study showed that 120 ml of Redline® supplement pre-exercise gave a significant increase in reaction time in repeated bouts on the Makoto testing device (Makoto USA, Centennial CO) as compared to the placebo group.

While Beta- alanine has been shown to improve physical work capacity and muscle carnosine levels the acute effects of beta-alanine are unknown (Van Thienen, R., Van Proeyen, K., Vanden Eynde, B., Poype, J., Lefere, T., Hespel, P., 2009). Most of the research on beta –alanine has measured performance differences after weeks of supplementation as it takes time for carnosine levels to increase (Van Thienen, et al., 2009; Derave, et al., 2007; Hoffman, et al., 2006; Smith, et al., 2008) . Thus, an acute dose of beta-alanine would most likely provide no ergogenic benefit.

CONCLUSIONS

The results of this study indicate that the pre-exercise energy supplement investigated in this research had a significant effect on muscular endurance as measured by the sit-up to fatigue test. The improvements in performance on the DynavisionTM reaction tests by both groups suggest a learning effect may have occurred. However, it should be noted that while significance was not found on any other tests, there appeared to be a marked difference between groups in post-test performance in vertical velocity and height as measured by the MyotestTM accelerometer. While improvements in these tests do not reveal clinical significance they may have practical significance for those seeking even a marginal performance advantage.





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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 causes more than \$1,000,000 dollars in damage to the campus. In 1971, the Baptist General Convention of Texas sold UCC to the state of Texas and the Texas Legislature authorizes the Texas A&I University System to establish a state-supported upper-level institution of higher education in Corpus Christi. In 1973, Texas A&I University at Corpus Christi opens its doors on 4 September 1973 to 969 students as an upper-level institution of higher education. In 1977, the Texas Legislature changes the name of the University to Corpus Christi State University. In 1989, Corpus Christi State University joins the Texas A&M University System. In 1993, the Texas A&M University System Board of Regents renames the institution Texas A&M University - Corpus Christi and a year later it becomes a four-year comprehensive university and

enrollment increases to 5,000 students. In 2004, the Board of Regents approves the College of Nursing and Health Sciences which opened in 2005. In 2005, Dr. Flavius Killebrew becomes President/CEO and initiates Momentum 2015, a ten year plan to establish Texas A&M University – Corpus Christi as the flagship university of South Texas. Today the University has over 10.000 students.

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

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