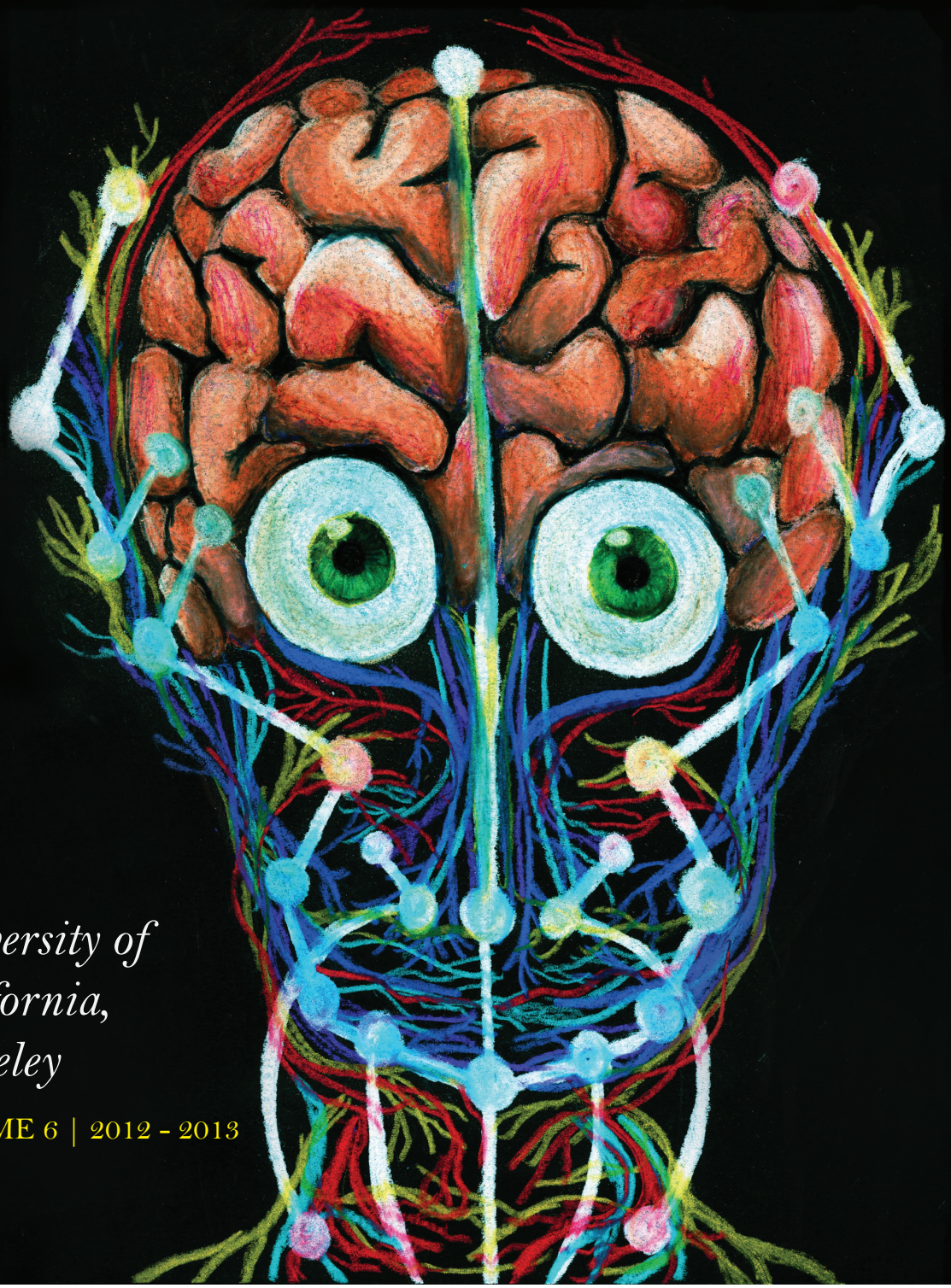
PSYCHOLOGY AT BERKELEY

Highlights of Insight and Excellence in Undergraduate Research



University of California, Berkeley

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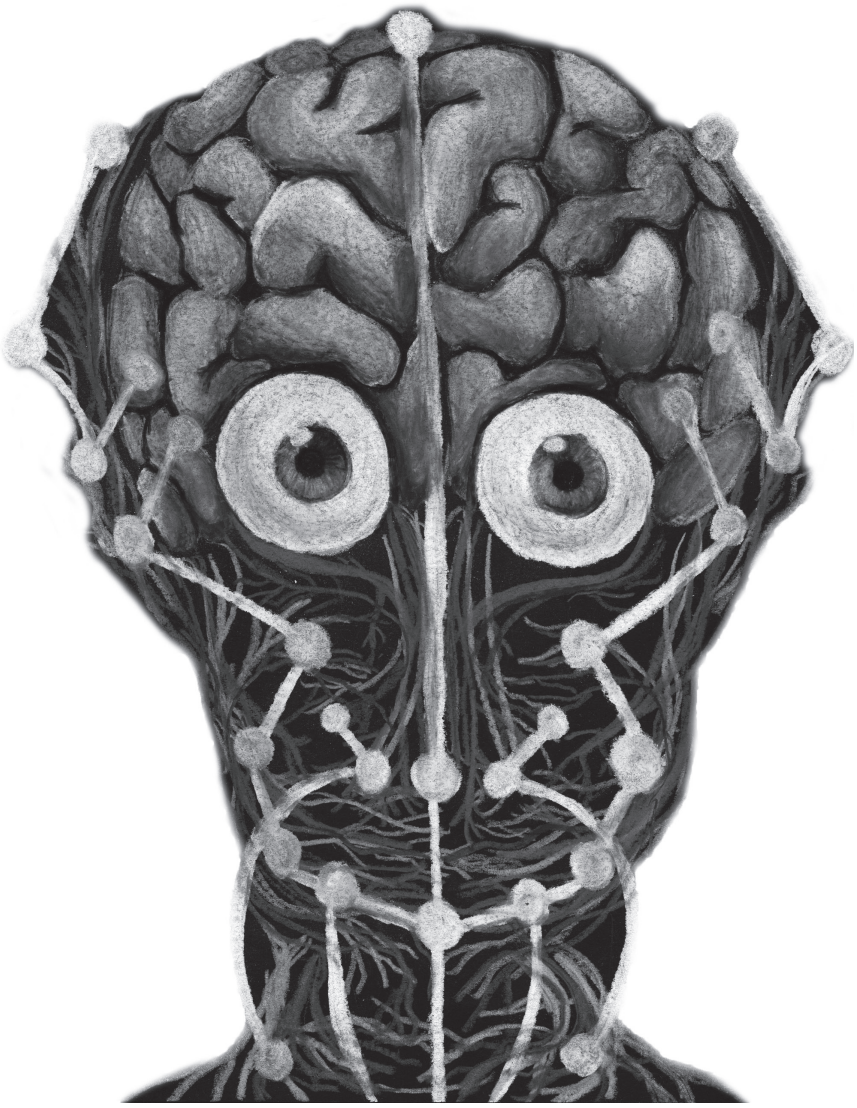

University of California, Berkeley
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Journal Staff

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Editors' Note

Welcome to the 6th Edition of The Undergraduate Journal of Psychology at Berkeley! As the title suggests, this publication is the product of a variety of undergraduates from across the nation!

From cover to cover, this issue is a celebration of the ingenuity of these undergraduates and their dedication to celebrating the works of several inspiring undergraduates. By providing these authors a platform on which to speak, we hope that their work will motivate each reader to discover the true potential that lies within each budding undergraduate professional. Featured in this issue are the works of eight authors from across the nation – from our own University of California, Berkeley to Kansas University all the way to the eastern seaboard at New York University.

This journal is dedicated to the numerous undergraduates who made this journal possible. First, we would like to thank our eight authors for their creativity and hours of elbow grease that have culminated in the form of their manuscripts. In addition, we extend our thanks to our editing staff, who have been dedicated to strengthening the author's voice through revision, and to those in layout and graphic design, who have been focused on putting this issue together with care and talent. This issue was arranged, designed, inspired and made possible by an impressive team of undergraduates. Above all else, however, this journal is the direct manifestation of a collaborative effort of these undergraduates who have worked on this edition from page to page.

To our readers, we thank you for your support. By purchasing a copy of this issue, you are empowering these undergraduates by making their voices heard. By flipping through the pages of this issue, we hope that you are as inspired by their research as we are!

Bella Rivaldi & Laila Soudi
Editors-in-Chief

Preface

I am pleased to introduce the 2013 edition of the Undergraduate Journal of Psychology.

The discipline of psychology entails a broad intellectual effort, one that spans the social and life sciences. This volume reflects this breadth, with contributions spanning the many subfields of psychology.

At the University of California, Berkeley, our faculty are honored to have the opportunity to teach, and collaborate, with such a talented population of undergraduates. Across the country, psychology is a very popular major, frequently resulting in large classes at the lower and upper division. Nonetheless, as shown by the work presented here, undergraduate students are able to create an intimate learning experience through their research projects. They are able to not only engage in the intensive study of a problem that builds on their idiosyncratic interests, but, as important, gain skills in the scientific method. An important part of this skill set is translating laboratory observations into a written work, one that makes clear the question at hand and then presents the results and conclusions in a concise and engaging manner. The reporting process is what makes science a cumulative, community endeavor. Our editors were pleased to receive submissions for this issue from universities and colleges across the country. The four articles you will find here have been selected as representative examples of this excellent body of work.

I also want to congratulate our student editors for assembling the journal. They have refined a different set of skills, helping shape the ideas and writings of other individuals to ensure that the papers are maximally impactful.

Congratulations to all of the participants who have put together this fine edition of the Undergraduate Journal of Psychology.

Richard Ivry
Professor and Chair, Department of Psychology
University of California, Berkeley

Getting to know: *Veronica Calkins*

Biography

Veronica Calkins recently graduated from UCLA with her degree in Psychology and minor in Applied Developmental Psychology. She graduated with Latin Honors (Summa Cum Laude) in the top 5% of her class, completed college honors, and finished a Psychology Departmental Honors independent research thesis. During her senior year, she worked as the study coordinator for the Social Encounters and Health study in the UCLA Department of Psychology. Prior to her role as study coordinator, she worked on an alcohol intervention project in the Semel Institute of Neuroscience and Biobehavioral Sciences at the UCLA David Geffen School of Medicine. She has also received grants to participate in numerous research conferences, including the Stanford Undergraduate Psychology Conference, the Berkeley Interdisciplinary Research Conference, and the UCLA Psychology Undergraduate Research Conference.

Q&A

What sparked your interest in psychology?

Since my mother had a hypoxic brain injury, I have been very interested in how the mind works. It was a traumatic experience for me. I have always wanted to make a difference and help other individuals who are struggling with hard times.

What led you to this topic?

After working with Dr. Bernard Weiner at UCLA, he sparked my interest in attribution theory (which he founded). After investigating research in this area, it was obvious that there were many holes in the fundamental attribution error area. I wondered whether a link existed between attribution, individual situations, and mood states. It was incredible to find linkage between these variables!

How long have you been working on this paper? What has the process been like for you?

I began writing this paper in October 2011. The process of publishing has been very interesting and much more thorough than I anticipated!

What was it like to be an undergraduate student completing your own research project?

It was definitely challenging to learn new research skills! I enjoyed reading books that described writing results, introductions, and discussions. Learning to write the statistical results was definitely my greatest challenge.

Effect of Gender and Situational Mood on the Fundamental Attribution Error

Veronica Calkins
University of California, Los Angeles

The fundamental attribution error (FAE) is the tendency for individuals to overestimate the role of dispositional factors and underestimate the role of situational factors when observing others'. Although individuals tend to be less likely to commit the FAE when observing others' in negative situations, the extent to which the FAE is committed when viewing individuals in positive situations is not yet understood. In addition, although individuals tend to commit the FAE when viewing females, the extent to which the FAE is committed when viewing males has not been examined. To test the extent in which subjects committed the FAE when viewing individuals in positive versus negative situations and the degree to which gender impacted these results, undergraduate students (N = 16) rated the degree to which they believed hypothetical characters were situationally responsible. As expected, participants were significantly less likely to commit the FAE when viewing individuals in negative situations as opposed to positive situations, $p < .05$. However, no significant difference was found in relation to gender. Implications are discussed as applicable to criminal sentencing.

Individuals make attributions about people every day, judging whether others' are responsible for their actions. Many people perform actions as a result of external factors for which they have no control, but it is common for observers to view their actions as being purely due to personality traits. The tendency for individuals to overestimate the impact of dispositional factors and underestimate the presence of situational factors is known as the fundamental attribution error (Forgas, 1998). An individual would be committing the fundamental attribution error if, for example, he or she attributed a homeless man's condition to laziness (internal attribution), instead of considering the poor economy (external factor).

It has been well-documented that individuals commit the fundamental attribution error more often when they are in positive moods, as opposed to negative ones (Forgas, 1998). Forgas approached individuals who had just seen happy or sad films and measured the extent to which they committed the FAE by presenting them with a written controversial scenario and asking them to rate the degree to which the author was coerced into writing. The scenario described the author (a Cuban civilian) pledging full support for Fidel Castro, who at the time was arguably one of the most disliked men in the world. The rationale in using coercion as a rating was that individuals who believed the author was coerced into writing should have made more external attributions (believing he had no control), and hence would not commit the FAE. On the other hand, individuals who believed the author was free to write should have made internal attributions (believing the author made the conscious choice), and thus would be committing the FAE. The assumption was that individuals who had seen happy films would be in positive moods and thus more likely to commit the FAE (rating the author as having been free to write), whereas participants who had just seen sad films would be less likely to commit the FAE (making external attributions and believing the author was coerced into writing). As hypothesized, participants were more likely to make internal attributions towards the author when they were in positive moods (believing he had freely elected to write). Likewise, participants who were in negative moods were less likely to commit the FAE towards the author (i.e., they were more likely to believe that he had been coerced into writing), which suggests that positive mood states may inhibit one's ability to thoroughly examine the causes of another's actions.

In addition to the mood of the participants, the mood of the situation (situational mood) has also been shown to influence the degree to which individuals commit the fundamental attribution error. Riggio and Garcia (2009) showed that students who watched a documentary film of the Jonestown tragedy (depicting a negative situation) were less likely to commit the fundamental attribution error following the film. Rather than the researchers focusing on mood induction, situation type was manipulated (negative vs. control conditions). After participants watched the film, subjects rated the phrase, "Ron's bad day," on both situational and personality factors. Participants who had just been exposed to the negative situation (tragic film) were much more likely to rate Ron's bad day as being due to situational, rather than dispositional factors, potentially because participants were better able to relate to Ron. The individuals who had not seen the film of the Jonestown tragedy (the control condition) were much more likely to rate Ron's bad day as being due to Ron's personality (internal attributions), which suggests that individuals exposed to negative situations are significantly less likely to commit the FAE. However, since a positive situation was not presented, it is unclear whether the negative situation is truly what caused the FAE commission, as opposed to general stimulation (which the control condition did not receive).

Situational mood is not the only variable that has been shown to affect the degree to which individuals commit the fundamental attribution error. Barrett and Bliss-Moreau (2009) found that individuals were more likely to commit the FAE when observing a female, as opposed to a male, in a photograph. Barrett and Bliss-Moreau examined how people's judgments may be affected by the gender of the person being observed by presenting subjects with photographs of a character whose gender was manipulated across participants. Accompanying the photograph, a written situation was described and the researchers asked the participants to make a snap-judgment as to whether the individual was "emotional" or "having a bad day," as measured on a dichotomous categorical scale. Participants were significantly more likely to rate the women as being emotional (internal attributions) as opposed to having a bad day (external attributions), suggesting that that individuals tend to commit the FAE more frequently against females.

We expected to find results similar to those found by Barrett and Bliss-Moreau (2009), in that viewing females perform a behavior will make people more likely to commit the fundamental attribution error, as opposed to viewing males. However, unlike Barrett and Bliss-Moreau, we will be examining participants' ratings of questions that attempt to measure the FAE by having subjects read a scenario that specifies the gender in words, as opposed to showing subjects' photographs of males or females, which will help determine whether participants have the same gender biases when reading as opposed to visually seeing. We also use an interval-based Likert-type scale as opposed to a dichotomous categorical scale, which will yield greater accuracy as a result of being less prone to floor and ceiling effects. As compared to the scale used by Forgas (1998), our scale has greater face validity in that we are directly asking participants the degree to which they feel the character is personally responsible for being in that situation, instead of attempting to use a more hidden and less detectable measure (free or coerced to write). The greater face validity may be a better direct measure of the FAE, whereas the indirect scale used by Forgas may not have measured the FAE with as great of accuracy. In addition, we are not testing an impulsive snap-judgment, as was done by Barrett and Bliss-Moreau. Giving participants the chance to rationally decide whether the character is responsible allows participants to engage with rational thought as opposed to impulsive conclusions, better representing real-world judgments.

Riggio & Garcia (2009) found that participants, having been exposed to a negative situation, were less likely to commit the FAE. We also expect to find that participants will be less likely to commit the FAE when presented with a negative situation. However, the negative situation in Riggio and Garcia's experiment was presented as a visual stimulus rather than a written scenario. It is not known whether learning of a situation in writing (e.g. reading the newspaper) also causes people to make more internal, as opposed to external, attributions. Situation type may be highly relevant to the FAE stemming from anthropological roots. As humans, our survival has depended on receiving help from others in times of need. Sympathy is elicited when we believe that others, who are in negative situations, had no control over their state, as opposed to seeing individuals who clearly inflicted their own problems (e.g., people may be more likely to help a homeless man knowing he lost his home in a tornado, as opposed to knowing he is lazy and refuses to work). Thus, the survival of our species has flourished from the sympathy elicited from truly believing others had no control over their negative situations. Individuals in positive situations, on the other hand, do not receive the same benefit when we jump in to help them. Thus from an evolutionary point of view, it makes sense that seeing someone in a negative situation tends to trigger a belief that they had no control, because it encourages a sympathetic, help-giving response.

In addition to predicting that individuals will be more likely to commit the FAE when observing females, we also expect that individuals will be more likely to commit the FAE when observing females in positive situations, but not males in positive situations. As Barrett and Bliss-Moreau (2009) found, viewing a female makes people more likely to commit the FAE. Additionally, Riggio and Garcia (2009) determined that having been exposed to a negative situation makes individuals less likely to commit the FAE. Since people generally attribute males' behavior to situational factors, we are not expecting people to commit the FAE when observing males in positive situations, but are expecting people to commit the FAE when observing females in positive situations.

Method

Participants

Young adults (N = 16, 5 males and 11 females, age range: 19–28) at the University of California, Los Angeles participated in this study for course credit in their Research Methods class (Psychology 100B, discussion section 1B). All students were at the undergraduate level.

Design

The experiment used a two-way within-subjects design. Situational mood and gender of the character in the scenario were manipulated. Gender was manipulated by creating half of the scenarios with female characters and half of the scenarios with male characters. Situational mood was manipulated by creating two levels of situation type (positive and negative situations). A positive situation is operationally defined as an experience or event that typically elicits satisfaction and enjoyment (e.g. getting married, winning money, etc.), whereas a negative situation is one in which most individuals would experience a great amount of dis-

comfort and/or find very unfavorable (e.g. failing a class, getting fired, etc.). Crossing the two levels of each independent variable yielded four total conditions: a female in a positive situation, a female in a negative situation, a male in a positive situation, and a male in a negative situation. All conditions were randomized across subjects. The questions probed the degree to which individuals committed the FAE by asking subjects to rate the degree in which the character was in the situation because of situational factors or personality factors. To measure the degree to which individuals committed the FAE, a 7-point Likert scale on an interval measure was used with "one" being defined as due to purely situational causes and "seven" being defined as due to purely dispositional causes. "Four" represents a neutral view between situational and dispositional factors, three and five were moderate measures, and two and six were strong feelings of situational or dispositional factors.

Materials and Apparatus

Thirty one-sentence scenarios were shown to each participant on a Power Point presentation. Ten of each set of scenarios were distracter questions. A PowerPoint presentation was viewed by each subject with each presentation consisting of 30 one-sentence scenarios, 10 of which were distracter/control scenarios. Each slide displayed a scenario, each of which corresponded to an interval-based 7-point Likert-type scale question that subjects answered in their provided answer packets. Each question following the scenarios was identical, asking the participant to rate the degree to which they believed the characters situation was due to situational causes (representing a rating of one) or dispositional causes (representing a rating of seven). PowerPoint slides consisting of the various scenarios were randomized across participants to control for order and sequence effects; no two PowerPoint presentations had identical orders of questions, but each participant had the exact same scenarios and distracter questions.

Four conditions were presented: a female in a negative situation, a female in a positive situation, a male in a negative situation, and a male in a positive situation. Each condition had five distinctly different scenarios, which were averaged in efforts to control for bias related to a single scenario. Positive scenarios included marriage, gaining a million dollars in the stock market, etc. The same situations were used for the negative conditions, but in a negative fashion (divorce instead of marriage, losing one million dollars in the stock market instead of gaining, etc.). Using the same situations in opposition allowed previous experiences that carry biases to be uniformly expressed in both conditions and thus minimize error due to situational bias. In addition, each scenario was presented twice: one with a male and one with a female, allowing different reactions to both genders to be tested in the same situation to minimize situational bias. For instance, a scenario that stated that a female was getting married would also be presented as a male getting married (in the opposition scenario, both the female and male are depicted as getting divorced).

Within the twenty questions used to measure the FAE, ten distracter questions were included in random order. Distracter questions asked the same questions following the scenarios, but had situations in which it was clearly someone's fault (a female got drunk and crashed her car), or clearly situational causes (a male lost his home in an earthquake). The distracter questions were intended to serve as an artificial measure that would make participants believe something else was being measured (e.g. severity of the situation and responsibility judgments), and thus participants would be less likely to figure out what is actually being measured (which could potentially bias the results).

Procedure

Participants were randomly assigned numbers and instructed to open the corresponding PowerPoint presentation (e.g. participant #1 opened PowerPoint #1). The first slide consisted of instructions which were read orally by the administrator and visually followed by the participants. Paper was distributed to allow participants to write their responses to each question. Participants were also instructed not to talk or discuss any questions with peers until after everyone had submitted their packets. In addition, participants were instructed not to go back to any previous slides. A time limit was not implemented and participants were encouraged to take their time in responding to questions. The room was kept quiet to limit distractions.

Results

Figure 1 presents the average degree to which participants attributed the situations of hypothetical characters as being caused by situational factors or dispositional factors, representing the degree to which subjects committed the FAE, and as a function of situational mood and gender of the character. The pattern of results displayed in Figure 1 suggest that the hypothetical characters, in general, were rated as being more personally responsible when the situation was positive as opposed to negative. These apparent effects were tested and analyzed using a two-way within subjects ANOVA, which revealed a significant main effect of situation type, such that participants rated characters situations as being due to situational factors significantly higher when presented with a character in a negative situation ($M = 5.013$, $SD = .572$) as opposed to being presented with a character in a positive situation ($M = 5.331$, $SD = .416$), regardless of the gender in which the character was presented, $F(1, 15) = 5.800$, $MSE = 1.626$, $p = .029$. No significant main effect was found for gender of the hypothetical character, such that participants were not more likely to commit the FAE when presented with a female character ($M = 5.163$, $SD = .496$), as opposed to a male character ($M =$

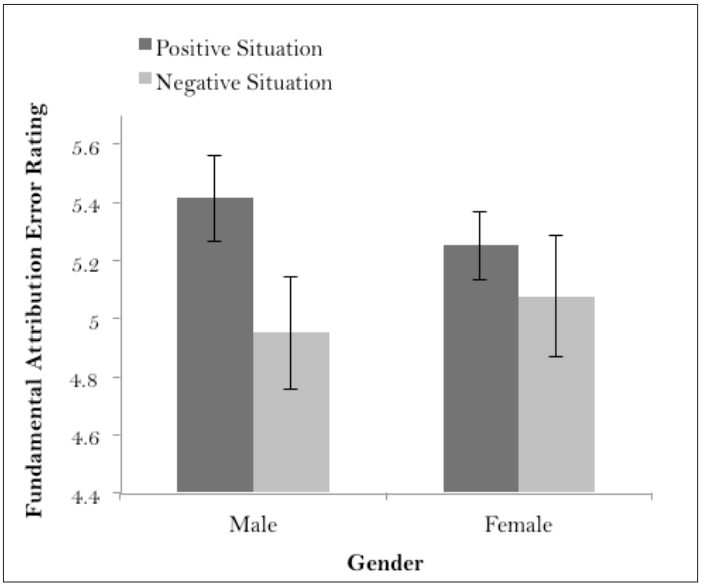


Figure 1. *Individuals were rated as being more personally responsible when in positive situations as opposed to negative situations, regardless of gender. No significant interaction was found between gender and situation type. The y-axis represents the 7-point interval-based Likert scale with "seven" representing a rating of an individual being entirely responsible for the situation and "one" representing an individual's situation being caused entirely by situational factors. Standard errors are depicted by error bars attached to each column.*

5.181, SD = .512), regardless of the type of situation presented, $F(1, 15) = .019$, MSE = .006, $p = .892$. Additionally, as apparent in Figure 1, no significant interaction was found to exist between gender and situation type, $F(1, 15) = .622$, MSE = .331, $p = .443$.

To compare individual condition means, multiple dependent sample t-tests were conducted, with a Bonferroni correction to maintain the alpha level at .05. When presented as a positive situation, the average degree to which participants committed the FAE was not revealed to be statistically significant when the character was presented as being female (M = 5.250, SD = .459) as opposed to male (M = 5.413, SD = .586), $t(15) = 1.006$, $p = .330$. Likewise, when presented as a negative situation, the average degree to which participants committed the FAE was also not found to be significant when presented with a female character (M = 5.075, SD = .832) as opposed to a male character (M = 4.950, SD = .764), $t(15) = -.449$, $p = .660$. Thus, as illustrated in Figure 1, the degree to which subjects committed the FAE was not significantly dependent on gender, and gender did not significantly interact with situation type.

Furthermore, when subjects were presented with situations involving male characters, the average degree to which subjects committed the FAE was not found to be significantly different when they were presented as positive situations (M = 5.412, SD = .586) as opposed to negative situations (M = 4.950, SD = .764), $t(15) = 2.063$, $p = .057$. Likewise, when subjects were presented with situations involving females, the average degree to which subjects committed the FAE was also not found to be significantly different when presented with positive situations (M = 5.250, SD = .459) as opposed to negative situations (M = 5.075, SD = .832), $t(15) = .773$, $p = .452$.

Discussion

The hypothesis addressed in the present study was that individuals would be significantly more likely to commit the FAE when observing situations involving females as opposed to males, and when observing individuals in positive situations as opposed to negative situations. Our results did not support the former statement which expected participants to commit the FAE to a significantly greater degree when observing females. Instead, no main effect was found in relation to gender, suggesting that the degree to which individuals committed the FAE was not dependent on whether the observed character was male or female. However, in accordance with situation type, our results did support our proposal that individuals would be more likely to commit the FAE when presented with a positive situation as opposed to a negative situation. In addition, our experiment tested the proposed interaction that individuals would be more likely to commit the FAE when observing a female in a positive situation, but not a male in a positive situation. However, our results did not support this proposal and thus, no interaction was found with respect to gender and situation type. In simpler terms, subjects attributed characters' situations as being due to situational factors significantly more often when presented with negative situations, regardless of gender.

Our results successfully replicated previous findings that suggest that individuals presented with negative situations are less likely to commit the FAE. Unlike previous studies, we tested positive situations as the second level of our independent variable as opposed to neutral situations and found that individuals in positive situations may be more prone to having the FAE committed against them. We speculated that previous research may have showed lack of FAE commission with control conditions because of lack of overall stimulation, regardless of situation type. To test whether it was truly the negative situation producing the result, we added a positive situation, which would be equally stimulating and thus allow us to rule out stimulation as a cause for the lack of FAE commission. Indeed, our results confirmed that individuals were less likely to commit the FAE when presented with a character in a negative situation, as opposed to a positive one.

Although previous research has found that individuals are more likely to commit the FAE when observing females, our results do not suggest this to be the case. Perhaps we did not replicate previous findings because our sample size was considerably smaller. In addition, the breakdown of our sample reveals a much higher number of female participants (n = 11) as opposed to male participants (n = 5), which leads us to

believe that our sample may be somewhat biased. Perhaps females do not view other females as having as great of responsibility for their situations, whereas males may have entirely different views. Thus, if more males were represented in our sample, perhaps we may have seen similar results to Barrett and Bliss-Moreau. Future researchers may want to consider keeping participant gender levels constant to avoid possible gender bias differences between males and females. In addition, it may be interesting to collect participant gender data to determine if females view other females as being less responsible for their situations, as opposed to males, and vice versa.

In addition, Barrett and Bliss Moreau use photographs to depict gender instead of text. It is also possible that individuals are more likely to commit the FAE when seeing an individual as opposed to reading about someone. The level of visual processing required when viewing a photograph may cause viewers to actively engage more of their brains when making attributions. Future researchers may want to examine type of processing more carefully to determine if the manner in which a situation is presented may impact attributions. Furthermore, Barrett and Bliss-Moreau asked subjects to make "snap-judgments" about whether the individual in the photograph was emotional (internal attributions) or having a bad day (external attributions). Our study encouraged rational thought and discouraged "snap-judgments." It is possible that Barrett and Bliss-Moreau found significant results because processing at the impulsive level may cause individuals to be more prone to gender stereotyping, but by thinking more carefully, as we encouraged, individuals may be less likely to engage with impulsive stereotypical thoughts.

Finally, Barrett and Bliss-Moreau used a dichotomous categorical scale to measure participants' responses. This may have resulted in individuals who did not have a strong opinion to be forced into choosing the maximum rating; hence their results were prone to floor and ceiling effects. Our results used a 7-point Likert scale which allowed individuals to express strong thoughts if they existed, but more importantly allowed subjects to express neutral thoughts. Allowing participants to express indifference to attribution may be why we did not have the same significant results as Barrett and Bliss-Moreau.

Another limitation of our study is that our sample consists of well-educated individuals. Perhaps people who are well-educated may not commit the FAE to the same degree as individuals from the general population, due to their increased knowledge. Our highly educated sample does not accurately represent the population at large and thus the generalizability of our results is threatened. Future researchers may consider gathering a sample of a variety of individuals. In addition, it would be insightful to examine whether differences occur across cultural backgrounds. Knowing how different cultural groups perceive others' can allow us to be more culturally sensitive and aware. Furthermore, future researchers may want to examine the extent to which early adversity and childhood stress impact FAE commission. If childhood upbringing impacts the degree in which individuals commit the FAE as adults, a stronger case may be made for particular parental practices and environmental constructs in childhood.

Our study has implications in the real world because it can be applied to multiple domains, specifically criminal sentencing and conviction. Since our results replicate previous findings in supporting the notion that people are less likely to attribute individuals in negative situations as being personally responsible for their situation, one may wonder whether imprisoned criminals (who are in negative situations by virtue of being in jail) elicit more sympathy among jurors and judges. In other words, if our findings generalize to legal domains, jurors may be more likely to view the defendant (who is in a negative situation) as less responsible, and thus may be potentially more likely to find him or her not guilty. Perhaps this is why there have been murderers who have been exonerated despite mounds of evidence against them; jurors may inadvertently view the criminal as less personally responsible for his or her crime (i.e. jurors may be more prone to believe that the criminal was acting in "self-defense" as opposed to being an aggressive cold-hearted person). On the same note, judges may also tend to give lighter sentences to criminals in negative situations if our findings generalize to legal and sentencing domains. Future researchers may want to test the fundamental attribution error in application to our justice and sentencing system. If it is found that our results generalize to legal domains, it may be important to educate lawyers about this potential juror bias and test ways to counteract this effect.

References

Barrett, L. F., & Bliss-Moreau E. (2009). She's emotional. He's having a bad day: Attributional explanations for emotion stereotypes. *Emotion*, *9*, 649-658.

Forgas, J. P. (1998). On being happy and mistaken: Mood effects on the fundamental attribution error. *Journal of Personality and Social Psychology*, *75*(2), 318-331.

Riggio, H. R., & Garcia, A. L. (2009). The power of the situation: Jonestown and the fundamental attribution error. *Teaching of Psychology*, *36*, 108-112.

Getting to know: *Emma Hamilton*

Biography

Emma Hamilton is a recent University of Minnesota graduate with a double major in Psychology and Spanish Studies. She currently holds a full-time position at the renowned Minnesota Center for Twin and Family Research, works in Dr. Moin Syed's Narrative, Identity, Culture, and Education lab at the University of Minnesota, and volunteers with Latino youth through La Oportunidad in Minneapolis. In the past, she has worked with Dr. Bonnie Klimes-Dougan in the Research on Adolescent Depression (RAD) lab exploring suicidality in youth and at risk populations. Emma graduated with distinction, received the Sharon Borine Award for best major project in psychology, and is a member of the Phi Beta Kappa and Psi Chi honor societies. Emma hopes to enter graduate school in the near future and intends to continue working with underserved and at risk populations.

Q&A

What sparked your interest in psychology?

I've always been interested in the human condition, how individuals interact, think, feel, and behave. A good place to start was my Introduction to Psychology course, where I was exposed to two-week successions of topics taught by leading researchers in the field. Each topic was engaging and I was able to 'sample' the various domains of psychology and eventually hone my exposure to reflect my true interests (which is the beauty of the expansiveness of psychology!).

What led you to this topic?

I've worked continuously with Dr. Bonnie Klimes-Dougan at the University of Minnesota researching suicidality in minority youth and at risk populations. Paired with my Spanish major and previous volunteer positions at the Minneapolis American Indian Center and the Harriet Tubman Center, I was inspired to explore racial/ethnic and cultural differences in rates of, vulnerability to, and protection against suicidal behavior, which remains a major public health phenomenon.

Did you have a mentor, and how did you get involved with him/her?

For my senior thesis I took a concurrent course in a research lab led by Dr. Bonnie Klimes-Dougan. I first inquired about her research one year earlier when I took her Abnormal Psychology course, and discovered that our research interests regarding suicide overlapped. I continued working as an RA in her lab for one year and still unofficially assist in projects post-graduation.

How long have you been working on this paper? What has the process been like for you?

I worked on this paper continuously for about five months. The process was harrowing at times, but enlightening to compile such a variety of research and findings. Throughout the process, I felt like the work I was doing would be a significant contribution to the literature and to public health knowledge in general, which was a motivating thought.

How was collaborating on a paper with another author?

At first I felt like I was over my head, but it was an excellent learning experience. The best advice I can give is to explore all avenues when determining a research topic. You will undoubtedly run into findings you didn't expect and will come out of the experience as a much stronger researcher!

A Review of Cultural Disparities Regarding Suicidal Behavior in At Risk Populations

Emma Hamilton
University of Minnesota

Suicide is a ubiquitous phenomenon that permeates all cultures and socioeconomic strata. In recent years it has been determined that the prevalence of suicidal thoughts, suicide planning, and suicide attempts is significantly higher among young adults aged 18 to 29 years than among adults aged 30 years and older (Centers for Disease Control and Prevention [CDC], 2010). In conjunction with adolescence, culture and ethnicity have been regarded as influences of suicidal behavior. At risk racial/ethnic groups are classified as those with disproportionately high suicide attempt rates, among them being Latinos, African Americans, and American Indian/Alaska Natives. Cultural factors exist that may act as protectors or precipitants of suicidal behavior in certain racial/ethnic groups. Family, history, environment, identity, religion, and help seeking behaviors were recurring themes in the literature and were found to have disparate effects on manifestation of suicidality. By targeting these specific ethnic differences, culturally sensitive treatment and prevention approaches can anticipate higher success rates among suicidal individuals.

Adolescent suicide remains a debilitating and tragic phenomenon in the United States. Suicide is the third leading cause of death among adolescents, accounting for a greater number of fatalities than the next seven leading causes combined for 15- to 24-year-olds (Centers for Disease Control and Prevention [CDC], 2006). Distinct ethnic groups show unique patterns of suicidal behavior. "At risk" populations are those with elevated rates of suicide death, attempt, or ideation, among them being Latinos, African Americans, and American Indian/Alaska Natives. A mass survey conducted by the Centers for Disease Control and Prevention in 2006 showed that suicide attempts were highest among American Indian/Alaska Natives, followed by Latinas (CDC, 2006), yet in 2010 African-American adolescents showed the highest likelihood for suicide attempts (16.2%) along with Hispanic adolescents (16.8%), as compared to their Caucasian peers (10.3%) (CDC, 2010).

Because of the statistical differences of suicide rates and the distinct suicidal backgrounds of minority populations, further research is necessary to explore suicidal behavior according to ethnicity and cultural. This literature review explores three demographic groups at risk for suicide in the United States: Latinos, African Americans, and American Indian/Alaska Natives. The purpose of this study is to pinpoint the cultural context within which suicidal behavior occurs, to determine through relevant literature the mechanisms underlying varying rates of suicide by racial/ethnic group, and to suggest future preventive directions based on group-specific suicidal patterns, vulnerabilities, and immunities. This analysis will follow the model proposed by Sue (1991) and further explored by Phinney (1996), which puts forth the term "ethnicity" not to be used as a means of rigid categorization, but rather to represent aspects of psychological importance: 1) the cultural values, attitudes and behaviors that distinguish ethnic groups; 2) ethnic identity, or the subjective sense of ethnic group membership; and 3) the history and experiences associated with minority status, including powerlessness, discrimination, and prejudice.

Suicidal patterns

Latinos represent the largest minority population in the United States (14.1% of the U.S. population as of 2004, U.S. Bureau of the Census), and are also the fastest growing racial/ethnic minority group. Hispanic adolescents have shown a tendency to be at greater risk for depressive symptoms, suicide ideation, and attempts than other adolescents (Canino & Roberts, 2001; Hovey & King, 1997; Zayas, Lester, Cabassa, & Fortuna, 2005). Yet Latino subgroups in the United States, the largest being Mexican Americans, Puerto Ricans, and Cubans, have shown varying rates of suicide (Ungemack & Guarnaccia, 1998), with Puerto Ricans represented as having more-than-most instances of suicidal ideation (Fortuna, Perez, Canino, Sribney, & Alegria, 2006). One common factor between Latino subgroups is a history of immigration and transplantation, an important consideration when assessing mental health in this racial/ethnic group. A widely held belief assumes that patterns of immigration, acculturation, and sociocultural support systems ultimately shape patterns of depressive symptoms and suicidal behavior, as being a cultural transplant creates tension and conflict among psychologically-developing immigrant youth.

Suicide remains the third leading cause of death for African American 15- to 19-year olds in the United States (CDC, 2006). Across the lifespan, the median age

of suicide death is approximately a decade earlier for African American suicide victims than for other ethnic groups (CDC, 2006). Yet a fairly common phenomenon occurring within this population may skew suicide statistics, and actually neglect to account for many yearly deaths by suicide. Victim-precipitated suicide, in which individuals provoke others into killing them instead of committing suicide themselves has been observed among many African American males (Klinger, 2001; Stack & Kposowa, 2011). The stigma associated with suicide (weakness, vulnerability) results in a tendency for African Americans to seek death by homicide rather than suicide. As with Latino subgroups in the United States, differences also exist among African subgroups (e.g. rural South vs. urban Midwest, immigrants vs. descendents of African slaves in America). For example, Joe, Baser, Breeden, Neighbors, and Jackson (2006) found in the National Survey of American Life that Black immigrants of Caribbean descent in the U.S. had higher rates of suicide attempts than African Americans, and that Blacks in the Midwest were at a significantly higher risk for attempted suicide than those residing in the South. Overall, a slow increase in the rate of suicide and nonfatal suicidal behavior since the 1980's among young blacks has narrowed U.S. racial disparities in suicidal behaviors (Joe et al., 2006).

Among American Indians between the ages of 15 and 19, suicide accounts for nearly 20% of deaths (CDC, 2006). A particular phenomenon unique to the AI/AN populations is suicide clustering, a contagion in which several suicides occur during a short period of time. More so, life in an isolated environment with smaller and more tightly knit social sub-groups spawns greater exposure to suicidal behavior and an increased risk for the suicide contagion (Bechtold, 1988). It is important to note that suicidal behavior in American Indians predominantly takes the form of substance abuse and other life-endangering behaviors. In fact, the death rates for unintentional injuries combined among 10- to 19-year-old American Indian/Alaska Natives are 50% higher than the overall United States rates (CDC, 2006) and accidental death rates for Alaska Natives are five times the national average (Mohatt, McDiarmid, & Montoya, 1988). These rates may be representative of true accidental deaths, but may also conceal deaths resulting from undetected suicidal intent. In fact, in 1994 it was reported that Alaska's overall suicide rate was twice that of the national average (25.1 per 100,000 in 1989 and 19.3 per 1000,000 in 1991, compared with the national rate of 11.4 per 100,000) (Municipal Health and Human Services Commission, 1994).

The inevitable shift of cultural dynamics within populations over time creates disparities in determining racial/ethnic minority groups at highest risk for death by suicide (Goldston et al., 2008). As these rates and patterns fluctuate, the precipitants associated with suicide and the manner in which minority groups react to suicidal thoughts also change. To understand cultural protective and risk factors for suicidality means to understand how to efficaciously diagnose and treat potential self-injurious tendencies, and poses the greatest potential for reaching minority youth at risk.

Protective and Risk Factors

Of the general established risk factors, depression accounts for the largest proportion of variance in suicidal behavior (Greening & Stoppelbein, 2002; Roberts, Roberts, & Chen, 1997). Yet culture-specific beliefs and behaviors can also act as either hazardous or preventative agents on self-injurious behaviors. Rigorous analysis of the literature has produced five salient motifs accounting for cultural disparities in suicidality: family, cultural environment, history, identity, and religiosity, each of which will be discussed in relevance to Latinos, African Americans, and American Indian/Alaska Natives in the subsequent sections.

Family

Unique social structures within the Latino population create conflictive psychological boundaries within the adolescent mind. Familial expectations (familismo), unity and cooperation are obligatory among Latinos; collectivism is enforced while the importance of individual achievements and identity is deemphasized (Goldston et al., 2008; Zayas et al., 2005). One fourth of Latino-American adolescents in a study by Hovey & King (1996) reported critical levels of depression and suicide ideation, which through multiple regression analyses revealed family dysfunction as strongly predictive of depressive symptoms. On the other hand, higher scores on a responsibility to family subscale implicated strong familial connectedness as a disincentive for suicidal behavior (Oquendo et al., 2005). Hispanic domestic environments may emphasize certain assertiveness and male-dominant behaviors, or machismo, among sons while enforcing passivity and subservience, or marianismo, to daughters (Goldston et al., 2008). Lack of mutuality and connectedness between Latina mothers and daughters has also been attributed to high suicide risk (Zayas et al., 2005; Zayas & Pilat, 2008). The struggle between two feminine cultural ideals, that of a modest and traditional Latina and of a sexy and assertive American female presents a social pressure unknowable by older generations. For rapidly acculturating adolescents, the strain between authoritarian, conservative parenting and a lassiez-faire American culture can result in psychological distress and confusion.

Family plays a role in moderating suicidal behavior among African American youth. A study by O'Donnell, O'Donnell, Wardlaw, and Stueve (2004) found that family closeness and parental support from families has been shown to predict depression and suicidal behavior over time. Increased family support and peer support are associated with decreased suicidality (Matlin, Molock, & Tebes, 2001), while deficits in family functioning and support are strongly associated with suicide attempts among low-income African American

men and women (Compton, Thompson, & Kaslow, 2004). From a historical perspective, positive social and family connectedness has been an important coping mechanism for African Americans living in an adverse society and is consistent with greater values essential to African American culture, i.e. the interdependence of individuals and communalism (Harris & Molock, 2000; Matlin, Molock, & Tebes, 2001).

Though social support is undeniably important to mental wellbeing among American Indian/Alaska Native adolescents, family was not emphasized as a component of potential suicidality. Rather, strength of the larger collective (i.e. tribe) is valued above the nuclear family, and will be discussed in the following sections. Familismo and familial connectedness proves to be a unique and protective stronghold against suicidal behavior for Latinos, yet stringent expectations, in particular machismo for young Latinos or complete subservience for Latina adolescents can prove detrimental. The same is true for African American youth; family cohesion and support reduces risk of suicidality, while dysfunction increases that risk. Overall, family acts as a predictive domestic unit, whether beneficial or harmful, for both Latino and African American adolescents.

Environment

Emotional disturbances associated with immigration, and the various adaptations brought on from contact with a foreign culture, place the Latino population at an elevated risk for suicidal behavior (Goldston et al., 2008). The process of acculturation to American society and the stressors related to transitioning are positively associated with depression and suicidal ideation among Latino adolescents in particular (Hovey & King, 1996). Immigration is found to disrupt family ties, increase feelings of insecurity and loneliness among family members left behind, and induce additional stress and demands on immigrant family members, greatly increasing one's risk for suicidality (Borges et al., 2009). Additionally, Vega, Gil, Zimmerman, and Warheit (1993) deemed acculturative stress as an important factor in drug use and increased vulnerability for suicide attempts in Hispanic adolescents.

Deindustrialization in urban areas related to various socioeconomic difficulties such as lack of education, community resources, and employment have been attributed specifically to the urban African American population as risk factors for suicidality (Kubrin, Wadsworth, & DiPietro, 2006). For example, Joe et al. (2006) found that blacks with less than a high school education were more likely to have attempted suicide. Other environmental components such as greater access to firearms, exposure to violence, and prolonged aggression or abuse from significant others also appear to place African Americans at a higher risk for suicide (Joe & Kaplan, 2001). Lasting effects of poor environment usually results in a sense of hopelessness, isolation, and looming realization of low socioeconomic status, all of which negatively affect the individual's psychological wellbeing and contribute to depressive symptoms.

Life on an isolated reservation produces higher rates of suicide among American Indian/Alaska Native youth. Higher average rates of poverty, isolation, abuse, alcoholism, and other drug abuse are among the load of risk factors for reservation youth (Frantz, 1999). Perhaps the greatest risk factor for adolescents living on a reservation is the repeated exposure to a friend or family member's suicidal behavior, which may in turn result in the aforementioned phenomenon of suicide contagion (Bechtold, 1988). At the same time, tribal life can incite a desire to maintain cultural identity and create tight-knit community relations (Johnson & Tomren, 1999), known protective factors for AI/AN youth and mentioned in the following sections.

Although not widely mentioned in previous comprehensive literature as a prominent risk factor for suicide, environment undoubtedly poses a great hazard for young adolescents struggling to adapt to their surroundings. For Latinos, emigrating from a native country is not only a stressful process in and of itself, but acclimating to a foreign environment delivers a lasting psychological strain for the developing adolescent, especially when considering the inevitable divergence between immigrant and first-generation family ideals. Environment takes a different form when considering urban African Americans living in disadvantaged neighborhoods. Living among violence in a neighborhood with generally poor physical appearance may incite hopelessness and a realization of poverty among adolescents feeling trapped in threatening surroundings. For American Indian/Alaska Natives, isolated reservations create a unique communal environment that may either provide support for developing adolescents or may instigate alcoholism, abuse, or suicide clustering among young peers. Though, of course, heterogeneity of racial/ethnic groups means that not all members experience the same environment, the previously mentioned and more prominent shared surroundings play a role in psychological wellbeing.

History

Two widely established stressors that have been linked to psychological distress in the African American population are racism and discrimination (Goldston, et al., 2008). Perceived discrimination has been associated with depression, increased substance use, and hopelessness among African American adolescents (Gibbons, Gerard, Cleveland, Wills, & Brody, 2004). Past historical abuses, including slavery, and the more recent civil rights movement, have presently resulted in greater awareness of social and economic inequalities and increased desperation among youth (Kubrin et al., 2006).

Due to historical trauma of forced relocation of AI/AN families and children in the late 1800s, and the subsequent stifling of traditional language, religion and cultural practices, a sense of intergenerational trauma created by this ethnic cleansing produced a pervasive

feeling of demoralization and increased ongoing suicide risk within these populations (Goldston et al., 2008; Whitbeck, Adams, Hoyt, & Chen, 2004). As previously mentioned, the context of rural reservations foments a high prevalence of alcoholism, drug dependence, which in turn precipitates suicidal behavior (Beals et al., 2005). Furthermore, there is evidence that alcohol being introduced by white settlers into the AI/AN populations, and genetic inexperience of metabolizing alcohol for these populations, largely contributes to the high rates of suicide by intoxication (Silk-Walker, Walker, & Kivlahan, 1988). Alcohol abuse at a young age is strongly associated with increased risk of suicidality, and a study by Wallace et al. (2003) reported that almost a quarter of American Indian eighth graders taking part in the Monitoring the Future national survey testified to drinking five or more drinks at a single sitting within the past two weeks.

A traumatic past is a risk factor for self-injurious behavior primarily among African Americans and American Indian/Alaska Natives. Though Latinos have undoubtedly faced hardship in the United States, unique periods of discrimination, prejudice, and suffering have been delivered upon the former ethnic groups. Historical injustices produce lasting effects: for African Americans, perceived bigotry, poverty, and economic immobility, and for AI/AN, life on government-bestowed lands, alcoholism, and substance abuse.

Identity

Identity protects adolescents from suicidal behavior when fomenting a sense of belonging or collectivity, but becomes a risk factor when considering multiple identities competing for salience in the adolescent psyche. For African Americans, positive racial identity or racial centrality is associated with lower depressive symptoms and higher esteem (Sellers, Copeland-Linder, Martin, & Lewis, 2006). More so, African Americans who have attempted suicide feel more disconnected from their own ethnic group as compared with their nonsuicidal peers (Kaslow et al., 2004). Yet mixed-ancestry or biracial adolescents may have an increased risk for suicidal intent. Among a sample of biracial African American/White adolescents, lack of adherence to a concrete reference group, or identification with a White instead of a Black or bicultural reference group was positively correlated with lower global self-worth (Goldston et al., 2008).

A study by Roberts, Roberts, and Chen (1997) determined that mixed-ancestry (Hispanic and White) adolescents reported increased rates of suicidal thoughts (6.7% reported) and suicidal plans (10.3% reported) when compared to their Anglo peers (3.2% and 5.1% reported, respectively). Also, in a study by Olvera (2011), 45.5% of mixed-ancestry adolescents admitted to engaging in suicide ideation, compared with 34.8% of adolescents of solely Hispanic ancestry. American-born adolescents may be particularly sensitive to being labeled "different" because of their ethnic status, and may not receive consolation from immigrant family members who are more secure in their ethnicity (Olvera, 2011). Studies have shown that Hispanic youth suffer from many of the insecurities that come with discrimination and marginalization, yet they lack the sense of identity and belonging displayed by older-generation immigrants (Borges et al., 2010). Conversely, found that being Latino and self-identifying as such served as a proxy for cultural constructs protecting against suicide (Oquendo et al., 2005). That is, individuals accepting belongingness to the Latino group were found to possess the culturally driven protective factors associated with the Latino identity (i.e. family and religiosity).

There exists a much greater sense of identity and belonging among American Indian/Alaska Native tribes. Specifically, the degree to which an individual is embedded in traditional cultural values plays a large role in inspiring prosocial behaviors and preventing suicidality among American Indians and Alaska Natives (Whitbeck et al., 2004). Yet, lack of sense of ethnic identity, attributed as a result of past forced relocation and loss of language and culture, has also been deemed a risk factor for suicidality among AI/AN adolescents (Goldston et al., 2008). Growing up in the midst of persistent discrimination, torn between tradition and modernity, may also produce psychological stress among adolescents.

For adolescents in general, taking pride in and maintaining a cultural identity is difficult; with pressure from peers, family, and society as a whole, reaching an agreement with the self can be virtually impossible. Positive racial identity and centrality is a protective factor for African Americans. Among Latinos, acceptance and endorsement of racial/ethnic identity is also associated with positive outcomes and more reasons to live. Involvement in traditional culture for AI/AN youth acts as a buffer against suicidality yet becomes a risk factor when active embedment in identity wanes. Biracial and immigrant adolescents possess an increased risk for suicidality that is mainly attributed to conflicting racial/ethnic identities, insecurities, and perceived lack of belonging. Overall, attaining comfort in identity is the ideal achievement for at risk youth and offers protection from psychological stressors.

Religion

Religion has been universally considered a mitigating force against suicidal behavior. Oquendo et al. (2005) found that Latino participants scored relatively high on the Reasons for Living Inventory (RFLI; Linehan, Goodstein, Nielsen, & Chiles, 1983), indicating particular cultural factors as deterrents from suicidal behavior. The exact protective factors implicated in this low rate of suicide ideation are associated with one's self-identification as Catholic and thus, high moral objection to suicide (Oquendo et al., 2005). Eighty-seven percent of participants in a study by Cabassa, Lester, and Zayas (2007) reported that faith in God heals depression, and 77% agreed that praying to God for forgiveness would

relieve depressive symptoms. The majority of Latino participants upheld firm, positive attitudes toward the role of faith in coping strategies, thus suggesting religion as a strong protective factor within this population (Cabassa et al., 2007).

African American youth have been consistently found to report more religious activities than other groups (Molock, Puri, Matlin, & Barksdale, 2006). For African American students, self-directed religious coping (the belief that God plays an indirect and passive role in one's life) is positively associated with more hopelessness, depression and suicide attempts (Molock et al., 2006). Contrastingly, a cooperative religious style, or the belief that the individual is in an interactive and symbiotic relationship with God, has been found to be positively associated with increased reasons for living (Molock et al., 2006), thus deeming religiousness as a deterrent for suicidal behavior in appropriate conditions.

Many AI/AN groups focus heavily on traditional healing ceremonies, rituals, and spirituality in their every day. A study by Novins, Beals, Moore, Spicer, and Manson (2004) found that the use of traditional healing ceremonies is positively linked to strength of American Indian/Alaska Native identity, which in turn is associated with lower risk of suicidal behavior. Similarly, a study by Garroutte, Goldberg, Beals, Herrell, and Manson (2003) found that commitment to cultural spirituality was significantly associated with a reduction in attempted suicide among a sample of 1,456 American Indian tribe members living on or near the Northern Plains reservations. Those with high levels of cultural spiritual orientation had a reduced prevalence of suicide compared with those possessing low cultural spirituality (Garroutte et al., 2003). Regular church attendance was the strongest negative correlate of attempted suicide identified for Inuit youth in a study by Kirmayer, Boothroyd, and Hodgins (1998). Those who attended church regularly were one-third as likely to make a suicide attempt than those who did not (Kirmayer et al., 1998).

Religious devotion appears to protect against suicide the Latinos, African Americans, and American Indian/Alaska Natives who take an active role in their beliefs. For Catholic Latinos, high moral objection to suicide, prayer, and religious coping skills make death by suicide an unpardonable alternative. Committed and active religious participation for African Americans protects against self-harm if a perceived relationship with God exists. Cultural spirituality, and the adherence to beliefs and ceremonies associated with AI/AN tradition, reduces suicide attempts, strengthens ethnic identity, and promotes prosocial behavior among adolescents. For all three groups, religious devotion may play a role in the healing of depressive symptoms.

Help Seeking

Help seeking is often regarded as its own predictor of suicide, but may also be considered the outcome of the battle between risk and protective behaviors. Those who possess a strong connection to community, religiousness, or identity, for example, will most likely seek professional help for an emotional disturbance before those who lack the former. At risk individuals may deny existence of a disorder to avoid seeking help, and may instead rely on informal outlets or coping strategies. This pattern is apparent: Latinos, Blacks, and American Indian/Alaska Natives each display particularly low rates of service utilization (Breland-Noble, 2004; Frantz, 1999; Katoaka, Stein, Lieberman, & Wong, 2003). A shared apprehension behind help seeking avoidance exists. Bearing the stigma associated with a psychological abnormality is perhaps the greatest obstacle that Latinos, African Americans, and AI/AN mutually face in receiving professional mental health services.

Among depressed Latino adolescents, both the use of denial as a coping strategy and the subsequent refusal of professional mental help were significantly correlated with suicidal ideation (Olvera, 2011). Apprehensions surrounding pharmaceutical depression treatments were expressed by Latino participants in a study by Cabassa et al. (2007), and 60% of participants reported thoughts of antidepressants as being addictive. Furthermore, Latino families are unlikely to seek mental health services as a first option in help-seeking behaviors and, because of their strong familial connectedness, most often turn to family (Cabassa et al., 2007). In fact, in a study by Kataoka et al. (2003), Latino youths were least likely to receive crisis intervention in an institutional setting and least likely to be identified as suicidal compared to other ethnic groups, regardless of true suicidal intent that may have been left unreported.

Yet African American youths are perhaps the most underrepresented sub-group in outpatient mental health services (U.S. Department of Health and Human Services, 2001). The low rate of help-seeking behaviors of this population has been attributed to mistrust of the professional mental health institution. In particular the widespread publication of the Tuskegee experiment created long-lasting effects on service utilization among African Americans because of the mass deception and systematic treatment withholding for syphilis by doctors (Breland-Noble, 2004). Other barriers include lack of health insurance and perceived threat of culturally inappropriate treatment or diagnoses may also act as service-utilization deterrents (Goldston et al., 2008). It appears that different measures such as the formerly mentioned victim-precipitated suicide may be taken to avoid, at all costs, the stigma associated with being labeled "suicidal" (Klinger, 2001; Stack & Kposowa, 2011). For this reason, African American adolescents often seek out informal sources, creating among individuals a sense of social connectedness, which, for females, accounts in part for their lower rates of death by suicide (Nisbet, 1996).

Within the American Indian/Alaska Native communities, utilization of traditional healing services as a help-seeking behavior is common; less than 30% of American Indian adolescents and adults with a lifetime

history of a mood disorder sought help from a mental health professional, yet 34% to 49% sought services from a traditional healer (Beals et al., 2005). The higher rate of traditional healing utilization may exist because of the stigma associated with psychiatric service-utilization or possibly because of lack of professional resources on the small and isolated reservations (Frantz, 1999; Novins et al., 2004). More so, historical loss and a succeeding mistrust of the mental health field may contribute to AI/AN individuals' avoidance of formal services and desire for self-reliance in healing (Whitbeck et al., 2004).

Patterns of seeking help for depressive symptoms vary by racial/ethnic group, although each has reported wariness due to perceived stigmatization. Latinos rely on family and informal support sources above professional therapeutic and pharmaceutical treatment. Apprehensions toward mental health professionals based on past exploitation, along with a reliance on social networks for support, prevent African Americans from seeking formal help. American Indian/Alaska Natives rely on traditional healing for emotional disturbances, due in part by a lack of and cultural preference over mainstream professional services. Hesitancies toward help seeking pose a formidable impediment, as suicidal youth go unseen and untreated by those able to provide therapeutic intervention.

Discussion

Among the various facets of cultural context that influence suicidal behavior in adolescents, family unity and the role of collectivism in one's daily life, environment, religiousness, cultural history, and strength of identity appear as recurring themes throughout the relevant literature. Although common precipitants and protectors exist between racial/ethnic groups, many extreme differences were highlighted throughout this paper. Treatment approaches to suicidal behavior among ethnically diverse individuals must be tailored to the unique needs of the collective, and should incorporate culturally relevant protective factors and coping mechanisms.

Implications and Suggestions for Treatment

Familial connectedness among Latino youth is an important factor when considering mental wellbeing: since Latinos rely heavily on family as a support structure, positive-influence members should be incorporated into suicide prevention efforts. Practicing religious activities in place of negative coping mechanisms was shown to be favorable among young Latinos facing emotional disturbances, and may be an important component to consider for treating suicide risk (Cabassa et al., 2007). Unfortunately, immigration and acculturative stress often inhibit Latinos from seeking professional help, whether it is a language barrier, economic barrier, or general wariness of the health field preventing those in need from receiving therapy or intervention. There exists a great need for bilingual, anonymous mental health services for undocumented immigrants, focusing primarily on cultural understanding and openness to curtail negative help seeking attitudes.

African American adolescents, along with Hispanics, were perhaps the most underrepresented group in treatment interventions (Kataoka et al., 2003; U.S. Department of Health and Human Services, 2001). Factors to address in suicide prevention for this group include incorporation of informal sources of support (Nisbet, 1996), religion as appropriate (Molock et al., 2006), and culturally sensitive programs that foster openness and trust of mental health professionals while expunging perceived judgment. Integration into familial and community networks without creating a stigma weakness or instability, although important for all racial/ethnic groups, is perhaps more so for black individuals given the reduced rates of suicide among socially engaged individuals and the utilization of informal support sources in times of distress (Goldston et al., 2008; Joe et al., 2006).

Among American Indian/Alaska Native individuals, traditional healing approaches appear to be the most frequently sought means of treatment (Beals et al., 2005); therefore if integrated into professional treatment may perhaps increase success rates. Because of the high rate of associated fatalities, alcoholism and substance abuse awareness and treatment should be the highest priorities in suicide intervention (Wallace et al., 2003). Isolated reservations place American Indian/Alaska Natives at a great psychological disadvantage compared to other minority populations due to extremely low access to professional mental health services (Johnson & Tomren, 1999). Significantly greater efforts should be made to introduce suicide prevention programs into these communities, focusing primarily on strengthening cultural identity, observing spiritual practices, and fortifying reservation-wide support systems to improve mental health and wellbeing.

Limitations and Future Directions

An unfortunate hindrance to drawing conclusions about suicidal behavior in minority groups, in particular American Indians and Alaska Natives, is the recurring issue of small sample sizes. For example, Alaska Native data regarding suicidal behavior is often merged with American Indian data and therefore promoting an overall lack of understanding of their respective cultural differences. Further efforts should be made to recruit larger samples of minorities and isolate the population in question. Future research would also benefit from understanding within-group differences, since drawing significant conclusions from the entire African American population in the United States, for example, could result in overly generalized and possibly presumptuous interpretations. Also, many studies neglected to control for socioeconomic status and educational backgrounds, which undoubtedly affect cultural context and suicidal risk.

Future studies may also want to focus exclusively

on mental health and depressive symptoms among mixed-ancestry adolescents, as this literature review only briefly mentions mixed-ancestry as relevant to racial/ethnic identity salience. Throughout the literature, conflicting racial/ethnic identities were deemed a source for psychological stress, confusion, and perceived alienation among biracial adolescents (Borges et al., 2009; Goldston et al., 2008; Olvera, 2011). Contrastingly, the mention of race as a determinant of suicidal ideation suggests that personally identifying oneself as part of a larger, collective ethnic group may be somehow associated with less individual risk for suicide. Given the obvious heterogeneity of the young biracial population, further research is necessary to determine proper suicide prevention protocol.

Needless to say, treatment approaches must take into account every demographic and cultural characteristic when tailoring therapy to distinct populations. There are various factors to consider when referring to an ethnic group, and it is quite difficult to make robust conclusions when considering, for example, immigration status or rural versus urban settings. Yet an all-encompassing ideal prevails: to understand the individual, while keeping in mind factors such as family, environment, history, identity, and religion, that amalgamate to create the individual within the context of the larger racial/ethnic group. The dire purpose remains: only through greater understanding and development of effective, culturally sensitive interventions, will professionals be able to successfully treat and prevent suicidal behavior among ethnically diverse adolescents.

This study precludes a comprehensive review of current tested suicide prevention strategies in racial/ethnic minority populations. Suicidal patterns, risk and protective factors were discussed in terms of racial/ethnic considerations in suicide prevention and intervention. An evaluation of existing culturally sensitive treatments, and their level of employment of group-specific protective factors, is necessary to further mobilize the suggestions mentioned above.

References

Alaska Native Commission (1992). *Alaska Nation: Final Report, Vol. II*. Anchorage, AK: Author.

Beals, J., Novins, D., Whitesell, N., Spicer, P., Mitchell, C., & Manson, S. (2005). Prevalence of mental disorders and utilization of mental health services in two American Indian reservation populations: Mental health disparities in a national context. *American Journal of Psychiatry, 162*, 1723-1732.

Bechtold, D. (1988). Cluster suicide in American Indian adolescents. *American Indian and Alaska Native Mental Health Research, 1*, 26-35.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry, 4*(6), 561–71.

Borges, G., Breslau, J., Su, M., Miller, M., Medina-Mora, M., & Aguilar-Gaxiola, S. (2009). Immigration and suicidal behavior among Mexicans and Mexican Americans. *American Journal Of Public Health, 99*(4), 728-733.

Borges, G., Mondragón, L., & Breslau, J. (2010). Suicidal behavior among Hispanic immigrants in the United States. *Immigration and Mental Health: Stress, Psychiatric Disorders and Suicidal Behavior Among Immigrants and Refugees*.

Breland-Noble, A. (2004). Mental healthcare disparities affect treatment of Black adolescents. *Psychiatric Annals, 34*, 535-538.

Cabassa, L., Lester, R., & Zayas, L. (2007). "It's like being in a laby -rinth:" Hispanic immigrants' perceptions of depression and attitudes toward treatments. *Journal of Immigrant Health, 9*, 1-16.

Canino, G. & Roberts, R. E. (2001). Suicidal behavior among Latino youth. *Suicide and Life-Threatening Behavior, 31*, 122-131.

Centers for Disease Control and Prevention (2006). *Welcome to WISQARS (Web-based Injury Statistics Query and Reporting System)*. Retrieved February 11, 2012, from Centers for Disease Control and Prevention, National Center for Injury and Prevention Control Website: http://www.cdc.gov/ncipc/wisqars/

Centers for Disease Control and Prevention (2010). Youth Risk Behavior Surveillance – United States, 2009. *MMWR [Morbidity and Mortality Weekly Report] Surveillance Summary, 55*(No. SS-5), 1-108.

Compton, M. T., Thompson, N. J., & Kaslow, N. J. (2005). Social environment factors associated with suicide attempt among low-income African Americans: The protective role of family relationships and social support. *Social Psychiatry and Psychiatric Epidemiology, 40*(3), 175-185.

Frantz, K. (1999). Indian reservations in the United States: Territory, sovereignty, and socioeconomic change. Chicago: University of Chicago Press.

Garroutte, E. M., Goldberg, J., Beals, J., Herrell, R., & Manson, S. M. (2003). Spirituality and attempted suicide among American Indians. *Social Science & Medicine, 56*(7), 1571-1579.

Gibbons, F., Gerard, M., Cleveland, M., Wills, T., & Brody, G. (2004). Perceived discrimination and substance use in African American parents and their children: A panel study. *Journal of Personality and Social Psychology, 86*, 517-529.

Goldston, D. B., Molock, S. D., Whitbeck, L. B., Murakami, J. L., Zayas, L. H., & Nagayama, G. C. (2008). Cultural considerations in adolescent suicide prevention and psychosocial treatment. *American Psychologist, 63*(1), 14-31.

Greening, L., & Stoppelbein, L. (2011). Religiosity, attributional style, and social support as psychosocial buffers for African American and White adolescents' perceived risk for suicide. *Suicide and Life Threatening Behavior, 32*(4), 404-417.

Harris, T. L., & Molock, S. D. (2000). Cultural orientation, family cohesion, and family support in suicide ideation and depression among African American college students. *Suicide and Life Threatening Behavior, 30*, 341-353.

Hovey, J., & King, C. (1996) Acculturative stress, depression, and suicidal ideation among immigrant and second-generation Latino adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry, 35*, 1183-1192.

Joe, S., Baser, R. E., Breeden, G., Neighbors, H. W., & Jackson, J. S. (2006). Prevalence of and risk factors for lifetime suicide attempts among Blacks in the United States. *Journal of the American Medical Association, 296*(17), 2112-2123.

Johnson, T., & Tomren, H. (1999). Helplessness, hopelessness, and despair: Identifying the precursors to Indian youth suicide. *American Indian Culture and Research Journal, 23*, 287-301.

Kaslow, N. J., Price, A.W., Wyckoff, S., Bender, M., Sherry, A., Young, S., … Bethea, K. (2004). Person factors associated with suicidal behavior among African American men and women. *Cultural Diversity and Ethnic Minority Psychology, 10*, 5-22.

Kataoka, S., Stein, B., Lieberman, R., & Wong, M. (2003). Suicide prevention in schools: Are we reaching minority youth? *Psychiatric Services, 54*, 1444.

Klinger, D. (2001). Suicidal intent in victim-precipitated homicide: Insight from the studies of "suicide-by-cop." *Homicide Studies, 5*, 206-226.

Kubrin, C., Wadsworth, T., & DiPietro, S. (2006). Deindustrialization, disadvantage and suicide among young Black males. *Social Forces, 84*, 1559-1579.

Lester, D., & Anderson, D. (1992). Depression and suicidal ideation in African-American and Hispanic American high school students. *Psychological Reports, 71*(2), 618.

Linehan, M. M., Goodstein, J. L., Nielsen, S. L., & Chiles, J. A. (1983). Reasons for staying alive when you are thinking of killing yourself: The Reasons for Living Inventory. *Journal of Consulting and Clinical Psychology, 51*, 276–286.

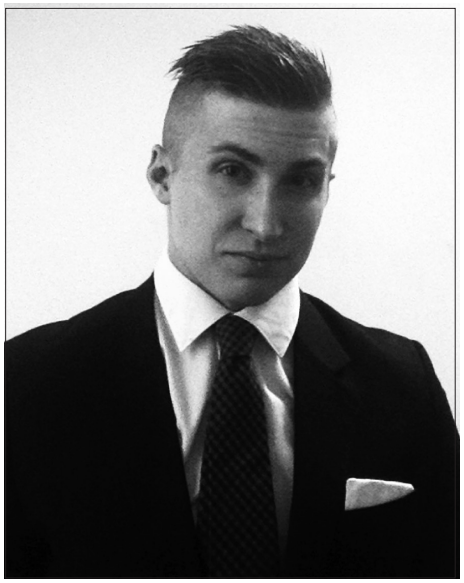
Matlin, S. L., Molock, S. D., & Tebes, J. K. (2011). Suicidality and depression among African American adolescents: The role of family and peer support and community connectedness. *American Journal of Orthopsychiatry, 81*(1), 108-117.

Mohatt, G. V., McDiarmid, G. W., & Montoya, V. C. (1988). Societies,

families, and change: The Alaskan example. *American Indian and Alaska Native Mental Health Research, 1*, 325-365.
Molock, S., Puri, R., Matlin, S., & Barksdale, C. (2006). Relationship between religious coping and suicidal behaviors among African American adolescents. *Journal of Black Psychology, 32*, 366-389.
Municipal Health and Human Services Commission (1994). *CORE services study: An assessment of Anchorage's physical, social, and environmental health*. Anchorage, AK: Municipality of Anchorage.
Nisbet, P. (1996). Protective factors for suicidal Black females. *Suicide and Life Threatening Behavior, 26*, 325-341.
O'Donnell, L., O'Donnell., C., Wardlaw, D. M., & Stueve, A. (2004). Risk and resiliency factors influencing suicidality among urban African American and Latino youth. *American Journal of Community Psychology, 33*, 37-49.
Olvera, R. L. (2011). Suicidal ideation in Hispanic and mixed-ancestry adolescents. *Suicide and Life Threatening Behavior, 31*(4), 416-427.
Oquendo, M. A., Dragatsi, D., Harkavy-Friedman, J., Dervic, K., Currier, D., Burke, A. K., Grunebaum, M. F., & Mann, J. J. (2005). Protective factors against suicidal behavior in Latinos. *The Journal of Nervous and Mental Disease, 9*(1), 438-443.
Phinney, J. S. (1996). When we talk about American ethnic groups, what do we mean? *American Psychologist, 51*(9), 918-927.
Roberts, R. E., Roberts, C., & Chen, Y. (1997). Ethnocultural differences in prevalence of adolescent depression. *American Journal of Community Psychology, 25*, 95-110.
Sellers, R. M., Copeland-Linder, N., Martin, P. P., & Lewis, R. L. (2006). Racial identity matters: The relationship between racial discrimination and psychological functioning in African American adolescents. *Journal of Research on Adolescence, 16*, 187-216.
Silk-Walker, P., Walker, R. D., & Kivlahan, D. (1988). Alcoholism, alcohol abuse, and health in American Indians and Alaska Natives. *American Indian and Alaska Native Mental Health Research, 1*, 65-83.
Stack, S. & Kposowa, A. J. (2011). The effect of survivalism-self-expressionism culture on black male suicide acceptability: A cross-national analysis. *Social Science & Medicine, 72*(7), 1211-1218.
Sue, S. (1991). Ethnicity and culture in psychological research and practice. In J. Goodchilds (Ed.), *Psychological perspectives on human diversity in America* (pp. 51-85). Washington, DC: American Psychological Association.
U.S. Bureau of the Census. (2004). *2004 American Community survey: Hispanic or Latino origin by specific origin-universe: Total population.* Retrieved February 2, 2012.
U.S. Department of Health and Human Services. (2001). *Mental health: Culture, race and ethnicity- a supplement to mental health: A Report of the Surgeon General.* Rockville, MD: Author.
Ungemack, J. A. & Guarnaccia, P. J. (1998). Suicidal ideation and suicide attempts among Mexican Americans, Puerto Ricans and Cuban Americans. *Transcultural Psychiatry, 35*, 307-327.
Wallace, J., Bachman, J., O'Malley, P., Schulenberg, J., Cooper, S., & Johnston, L. (2003). Gender and ethnic differences in smoking, drinking, and illicit drug use among American 8th, 10th, and 12th grade students, 1976-2000. *Addiction, 98*, 225-234.
Whitbeck, L., Adams, G., Hoyt, D., & Chen, X. (2004). Conceptualizing and measuring historical trauma among American Indian people. *American Journal of Community Psychology, 33*, 119-130.
Zayas L., Kaplan C., Turner S., Romano K., & Gonzalez-Ramos, G. (2000). Understanding suicide attempts by adolescent Hispanic females. *Soc Work, 45*(1), 53–63.
Zayas, L., Lester, R., Cabassa, L., & Fortuna, L. (2005). "Why do so many Latina teens attempt suicide?" A conceptual model for research. *American Journal of Orthopsychiatry, 75*, 275-287.
Zayas, L. H., & Pilat, A. M. (2008). Suicidal behavior in Latinas: Explanatory cultural factors and implications for intervention. *Suicide and Life Threatening Behavior, 38*(3), 334-332.

Getting to know: *Matthew Riccio*

Biography



Matthew T. Riccio graduated from New York University in May of 2012, Magna Cum Laude, with a major in Psychology and minor in Social Work. He was a four-year varsity starter and three-year team-captain for the university's golf team, and a 2011-2012 Student-Athlete Academic Achievement Award recipient. He was named to the Dean's List, Student-Athlete Academic Honor Roll, and Intercollegiate Athletics Advisory Committee Honor Roll in every semester while at NYU. Additionally, Matthew was a 2011-2012 Collegiate Research Scholar and Dean's Undergraduate Research Fund Award Recipient. At NYU, Matthew worked with Assistant Professor of Psychology Emily Balcetis and the Social Perception, Action, & Motivation Lab. He is currently serving as Lab Manager & Study Coordinator for Professor Niall Bolger & the Columbia University Couples Lab and plans to pursue a Ph.D. in Social Psychology. He is interested in social perception, self-regulation, motivation, volition, feelings of self-efficacy, and the influence of social relationships on action and emotions, particularly with regards to how these factors affect health-related behaviors.

Q&A

What sparked your interest in psychology? What led you to this topic? Did you have a mentor and how did you get involved with him/her?

For as long as I can remember, I have been interested in the conscious and unconscious underpinnings that shape and guide motivations, goals, and behaviors, and, in particular, the processes that influence action (and interaction). While this general curiosity guided me to the field of psychology, it was not until taking a course with Assistant Professor of Psychology Emily Balcetis that I truly discovered my passion for Social Psychology and psychological research. I cannot thank Emily enough for serving not just as a research advisor but also as a true mentor, role model, and friend, guiding and supporting me with this line of research and much, much more.

How long have you been working on this paper? What has the process been like for you? What was it like to be an undergraduate student completing your own research project?

By the time this manuscript is published, I will have been working on this paper, in one form or another, for over two years. While grueling at times, the process in general has been one of the most satisfying and rewarding experiences I have ever had. Conducting research with Professor Emily Balcetis, Shana Cole, Yael Granot, and the rest of NYU's Social Perception, Action, & Motivation Lab has been an honor and a pleasure, and is an experience I will not forget for the rest of my time as a researcher in the field of Social Psychology.

The Influence of Attentional Scope on Egocentric Distance Perception and Goal-Relevant Behavior

Matthew Riccio
New York University

Given the rising obesity epidemic in America, research must explore why people are exercising insufficiently and investigate strategies to increase successful self-regulation and exercise behavior. Past research shows that spatial perception can be biased by physiological potential such that people with lower fitness levels tend to perceive distances as farther, discouraging continued movement or action in the environment. This is one reason that being out of shape is a difficult state to get out of, but what if a distance could be made to appear shorter? If a target or goal appeared closer or seemed more attainable, would this encourage goal-promoting behavior and increase the likelihood of reaching it? We tested one strategy to induce perceptions that a target is closer and asked whether perceived proximity encourages exercise goal-promoting behavior. We induced a focused attentional style and tested perceptions of egocentric distance—the distance from oneself to a target or object. In a subsequent fitness task, we examined the relationship between perceived closeness to that target and the encouragement of action that may help with the pursuit and achievement of fitness goals. These studies suggest that not only can increased attentional focus make distances seem closer and, in turn, tasks more manageable, but that doing so can also encourage goal-promoting behavior, such as faster, more intense action. Implications for self-regulation despite obstacles to goal pursuit, particularly among at-risk and overweight populations, are discussed.

Introduction

Results from the 2007–08 National Health and Nutrition Examination Survey (NHANES) indicate that two-thirds of American adults aged 20 and older as well as 53% of young people are overweight or obese (Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006; Ogden, Carroll, & Flegal, 2008). In the three decades since 1980, obesity prevalence among children, adolescents, and adults has nearly tripled (Ogden & Carroll, 2010). Obesity has now become the second-leading contributor to premature death in America, contributing to 112,000 deaths each year (Flegal, Graubard, Williamson, & Gail, 2005). Moreover, the Healthy People 2010 Final Review, published by the Centers for Disease Control and Prevention, reports that no state has met the nation's Healthy People initiative goal to lower its obesity prevalence to 15%.

Among other factors, obesity comes as a result of failure to engage in sufficient exercise. In general, 73% of Americans and 80% of those who are obese fail to meet healthy exercise goals (Gallup & Newport, 2009). The present research offers two explanations for these failures. First, in order to lose weight, one must engage in intense exercise; however, those who are lower in fitness tend to perceive environments in ways that discourage action. Second, those who are lower in fitness also tend to maintain lower levels of exercise self-efficacy. Self-efficacy refers to one's own belief that they can be effective or successful in a given circumstance, task, or situation (Bandura, 1977), and has been found to be an important predictor of the adoption of, maintenance of, and adherence to exercise behaviors (McAuley, Lox, & Duncan, 1993). Given these explanations, the present research aimed to identify a visual technique that could aid in countering these two effects, in turn promoting exercise goal-relevant action. The studies tested whether, by focusing visual attention, we can induce egocentric perceptions of proximity to a target and thereby increase subsequent exercise intensity in reaching it, even among people who believe they have difficulty meeting exercise goals.

Biased Perceptions of Visual Stimuli

Our sensory systems are constantly receiving incoming stimuli. Sights, sounds, and smells are taken in, interpreted, and pooled to construct an understanding of the world in which we live. Yet research consistently shows that the perception and processing of visual stimuli and the environment are biased by a multitude of factors intrinsic to the perceiver. For instance, motivations filter and guide attention, influencing the initial gathering and receiving of information (Balcetis, 2007). Likewise, motivated processing biases the manner in which received information is subsequently processed (Balcetis, 2007). While "bottom-up" information, composed of the fine details and basic features that our eyes take in for interpretation and processing, is undoubtedly utilized by the perceptual system, the role and influence of higher level schema, or concept-driven "top-down" processing, is becoming increasingly more evident. The energy people have available for action, as well as their personal goals, emotions, and desires, have all been shown to influence distance and spatial perceptions (e.g., Bhalla & Proffitt, 1999; Witt, Proffitt, Epstein, 2004). For example, golfers who played better judge the hole to be bigger than golfers

who did not play as well (Witt, Linkenauger, Bakdash, & Proffitt, 2008); participants shown ambiguous figures see the interpretation that results in a more favorable outcome (Balcetis & Dunning, 2006). Perception is a product of both the information that is actually present in the environment and the internal qualities of perceivers.

While the idea that top-down influences can filter and bias perception dates back to New Look researchers of the 1940s and 1950s (Bruner, 1957), recent research has built upon those initial concepts significantly, providing increasingly more evidence of biased perception based on internal states. Particularly, action-specific influences have been identified and shown to have a significant role in distance and spatial perception. For example, physiological resources (e.g. fitness level, age, being physically refreshed) and non-visual factors that lead to increases in metabolic demand (e.g. physical cost, bio-energetic cost) produce action-specific influences that bias perception (Schnall, Zadra, & Proffitt, 2010). Hills appear steeper to those burdened with a heavy backpack, as well as to those less physically fit or who are fatigued (e.g., Bhalla & Proffitt, 1999; Proffitt, Bhalla, Gossweiler, & Midgett, 1995). Similarly, distance is perceived as farther if one is required to walk that distance (Witt, Proffitt, & Epstein, 2010). Perception, research shows, functions within a behavioral economy of action, where a perceiver's physical capacity and physiological resources are considered in addition to the objective features of the environment (Proffitt, 2006). Consequently, if and when people have to exert more effort, particularly in cases where energy is in short supply, the environment appears more extreme.

Action-specific influences, however, are not limited to physiological resources, as recent research has also demonstrated that psychosocial resources can affect visual perception. The desirability-closeness effect in distance perception, for instance, suggests that the more wanted an object or target, the closer it seems (Alter & Balcetis, 2011; Balcetis & Dunning, 2010). Desirable objects, such as a bottle of water when thirsty, appear closer than less desired objects (Balcetis & Dunning, 2010). Similarly, focused visual attention has been found to distort perception both at and away from the attentional locus (Baden, Warwick-Evans, & Lakomy, 2004; Downing, 1988; Chen, Marshall, Weidner, & Fink, 2009; Wardak, Denève, & Ben Hamed, 2011), such that target objects will appear closer if one is provided with specific attention-focusing instructions or if an observer's visual field is restricted to only the area directly around a target (Balcetis & Cole, 2011; Wu, Ooi, & He, 2004). Moreover, the manipulation of attentional focus has even been shown to bias perceptions of physical exertion and effort required (RPE) in the context of expected exercise duration (Baden, Warwick-Evans, & Lakomy, 2004). Together, all of these findings show that a collection of physiological and psychosocial resources, ranging from one's physical fitness level to one's locus and amount of visual attention, result in action-specific influences on egocentric distance and spatial perception (Witt & Proffitt, 2008; Witt, Proffitt & Epstein, 2005; Schnall, Harber, Stefanucci, & Proffitt, 2008; Baden et al., 2004).

Biased Perceptions of Exercise Self-Efficacy

Research shows that those lower in fitness also maintain lower levels of perceived exercise self-efficacy (Bandura, 2002; McAuley et al., 1993). Self-efficacy refers to a person's beliefs about their own capabilities to produce effects (Bandura, 1977). It has been found to influence nearly every aspect of personal change and self-regulation, from goal setting to perseverance and recovery following setbacks, as well as the maintenance of habit changes if successful (e.g., Bandura, 1989; Deci, 1975; Gekas, 1989; Bandura, 2002). Exercise self-efficacy specifically refers to these beliefs within the domain of exercise and fitness (Bandura, 2001; Fletcher & Banasik, 2001). Researchers have shown that exercisers higher in self-efficacy set more challenging goals and maintain stronger commitment to them than those low in exercise self-efficacy. Moreover, when faced with failure, those higher in exercise self-efficacy sustain their efforts and recover more quickly, whereas those lower in self-efficacy respond with lessoned efforts and are more likely give up (Bandura, 1994; Bauman, Sallis, Dzewaltowski, & Owen 2002). Thus, any effective intervention strategy to encourage goal-relevant exercise behavior must aim to offset or overcome the effects of lower exercise self-efficacy, allowing those who believe they do or will have difficulty meeting fitness goals to exercise more successfully.

Current Research

Given the prevalence and scope of the obesity epidemic in America, this research examined biased visual perception of egocentric distance in the context of exercise and fitness goals. It is clear that visual perception is and can be biased. What is less clear is the extent to which these perceptual biases can be manipulated and the effect these influences have on subsequent behavior and action. For example, while past research has demonstrated that the tendency to approach a goal and the efforts put forth to achieve that goal increase as actual distance from the goal decreases (Hull, 1932; Dollard & Miller, 1950; Kivetz, Urminsky, & Zheng 2006), research has yet to examine whether misperceived closeness to a goal leads to similar goal-pursuing behavioral effects. Accordingly, the current research aimed to examine whether, when a goal is falsely perceived as being more proximal, comparable rises in both approach tendencies and goal-pursuant effort would occur.

We demonstrate that functional perceptual biases can be induced. Particularly, we induced relative feelings of closeness to an object, known as perceived proximity, as a result of an attention-focus manipulation. Upon inducing perceived proximity, this research further examined the action-specific influence this per-

ceptual bias has on subsequent goal-relevant behavior. With this research we asked whether, by manipulating the scope of visual attention, we can induce a functional perceptual bias that could mimic the effects of actual proximity to a goal and similarly contribute to goal-promoting action.

If, as described earlier, people who are lower in physiological resources and/or less physically fit see distances as further, which is conjectured to be a signal to stop moving or acting in the environment, this research proposes one possible intervention by trying to get people to see distances as shorter. If such perceived proximity to a target can be induced, particularly by something as simple as the attention-focusing instructions provided in the current study and even among people in poor shape or low in exercise self-efficacy, this could be an effective strategy to lead them to move further or engage in more intense action than they otherwise would.

We hypothesized that perceptions of egocentric distance to a target would depend on attention style. Specifically, we predicted that the participants who assumed a focused attentional style to a target would perceive themselves as significantly closer to that target than those in a no-manipulation, control condition. We additionally hypothesized that a focused attentional style could induce perceived proximity even among people low in self-efficacy. That is, people low and high in self-efficacy would perceive distances as shorter when in the focused attention condition, compared to the control condition.

It was also predicted that task-specific perceived proximity to a target, as induced by increased attentional focus, would influence subsequent behavior in an exercise task requiring participants to reach that target, again regardless of exercise self-efficacy level. By this, we mean that our focused attention manipulation was expected to show significant effects for all participants in that condition, whether high or low in exercise self-efficacy. Finally, we hypothesized that perception of distance would significantly influence behavior, such that those perceiving the distance to the target object as shorter (as a function of focused attention on the target) would engage in more intense action, taking less time to complete the exercise performance task, while also, consistent with the findings of Baden et al., rating their own perceived feelings of exertion as less severe.

Method

Participants

Participants (n = 70) were recruited in conjunction with ongoing exercise classes occurring in Jerome S. Coles Sports Center. All interested participants were accepted and allowed to take part in the study. There were no ethnic, gender, or linguistic restrictions placed on recruitment. Participants were tested one at a time and compensated $10 for their participation.

Materials and Procedure

The present research utilized a 2 (Exercise Self-Efficacy: High, Low) x 2 (Attention Focus: Narrow Attention, Control) between-subjects design.

	Narrow Attention (Focused Attention)	Control (No Focus Manipulation)
High Self-Efficacy	High Self-Efficacy & Narrowed Attention	High Self-Efficacy & No Focus Manipulation
Low Self-Efficacy	Low Self-Efficacy & Narrowed Attention	Low Self-Efficacy & No Focus Manipulation

The experimenter greeted the participant, gave an overview of the procedure, explained the confidentiality policy, and stressed that participation was voluntary. Subjects then gave their informed consent and the study commenced.

Participants began by answering a series of questions about their physical fitness level and health goals. Perceived efficacy for meeting exercise goals was measured using the Exercise Self-Efficacy Scale (See Appendix A) (Bandura, 2006). Self-reported current potential, chronic fitness, and chronic fatigue levels were also measured using a set of 7-point Likert scales ranging from 1 (e.g., "At this moment I am not physically exhausted at all"; "In general, I feel extremely fit"; etc.) to 7 (e.g., "At this moment I am extremely physically exhausted"; "In general, I do not feel fit at all"; etc.). Objective measures of fitness, such as height, weight, and waist-to-hip ratio (WHR) were also collected.

Participants were then randomly assigned to an Attention Focus condition. Subjects in the focused, experimental condition (Narrow Attention) (n = 34) were given instructions to narrow their focus on an assigned target object (a decorated 24" traffic cone) prior to estimating the distance from themselves to their respective target. Participants in this condition were instructed to imagine that a spotlight was shining only on the target object, to focus their attention solely on that target object, and to avoid looking around while estimating the distance. Participants randomly assigned to the control condition (No Focus Manipulation) (n = 35) were given instructions to attend to the environment in whatever way felt most natural. Participants in this condition were instructed to look around or take a few glances at the target while estimating the distance, attending to their environment in whatever manner they normally would.

All participants were then instructed to describe out loud what they saw. Experimenters recorded participants' descriptions and coded for whether it was a target-related observation or an outside-environment observation. A target-related observation was defined as any description of the target object (the decorated orange street cone), while an outside-environment ob-

servation was defined as any reported sight other than the target object.

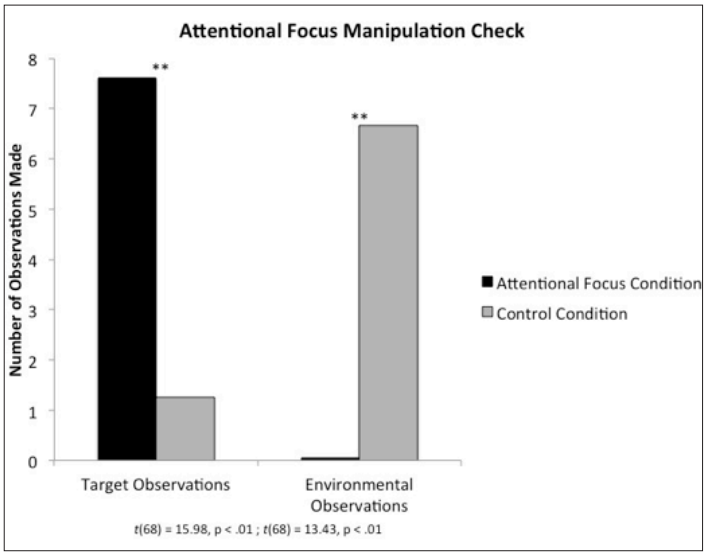
After describing aloud what they saw while using one of the two attentional strategies, all participants estimated distance in three ways. First, participants provided a verbal estimate of distance in either feet or meters (whichever they were more familiar with; all verbal distance estimates were later converted to inches). Next, participants reported how far away the target object felt, using a 7-point scale (1 = feels extremely close; 7 = feels extremely far away). Third, all participants received instructions on how to provide an estimate of the distance using a visual matching measure of distance perception. For the visual matching measure of distance perception, participants were told to observe the distance to the target object. A research assistant was poised to move laterally along a plane perpendicular to the plane separating participants from the target cone. Participants then told the assistant to move closer or farther away until the assistant appeared to be equidistant to the distance they perceived. After the participant positioned the experimenter, the experimenter measured the distance on the flat ground to the participant; this distance represented the perceived distance to the cone (adapted from Stefanucci & Proffitt, 2009; Yang, Dixon, & Proffitt, 1999).

Lastly, participants completed what was described as a "physical reactiveness test." The cover story explained that the study was an investigation of a new measure of physical fitness that looks at one's whole-body response to new stressors—in this case, ankle weights. The ankle weights were weighted to 15% of the specific participant's body weight. After fitting the ankle weights to the participant, the experimenter told the participant to take a few steps in place. The experimenter then explained the manner in which participants were to complete the task. For the task, participants were instructed to walk as quickly as possible while raising each leg, one at a time, until the area from the hip to the knee was flat and horizontal. At this time, the experimenter also familiarized participants with the Borg Scale (Borg, 1992). The 15-point scale provides a rubric to report the degree to which exercise requires light, moderate, hard, or exhaustive effort. Performers' rates of perceived exertion using this scale and their heart rate, lactate levels, % VO2 max, and breathing rate have been found to be highly correlated (Chen, Fan, & Moe, 2002), suggesting that reported rate of exertion is predictive of actual physiological changes in exertion. To measure goal-promoting action, participants' speed completing the task while encumbered by the additional weights was measured. The faster participants completed the task under conditions of physical strain, the more intense the exercise and more goal-promoting their action. To measure participants' perceived intensity of their exercise, participants provided self-reports of their Borg Rating of Perceived Exertion upon completing the task. After completing the above-described fitness task, the experimenter then debriefed the participant.

Results

Manipulation Check

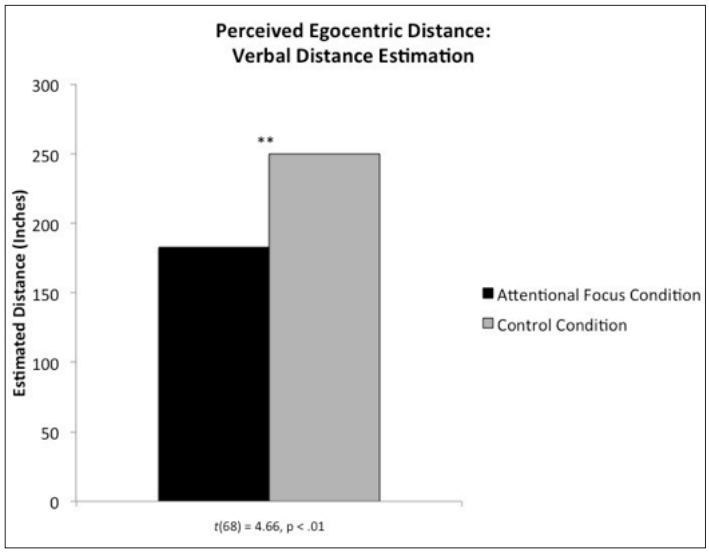
Because our main interest was in examining the effects of focused attention, all participants were asked to describe aloud what they saw prior to making any estimates; this served as an attention focus check, ensuring that participants were attending to their environment according to the instructions provided by the researcher. As anticipated, participants who were provided with an attention-focus strategy (n = 35) noted significantly more target-related observations (M = 7.61, SD = 2.15) than participants in the control condition (n = 35) described (M = 1.25, SD = 1.02), $t(68) = 15.98$, $p < .01$. Additionally, participants in the attention-focus condition reported significantly fewer outside-environment observations (M = .06, SD = .24) than those in the control condition (M = 6.67, SD = 3.04), $t(68) = 13.43$, $p < .01$.

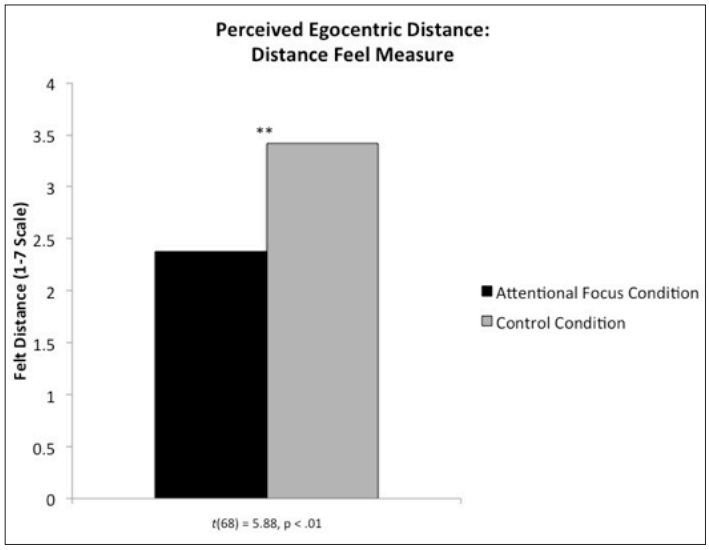


Scope of Attention & Perceived Distance

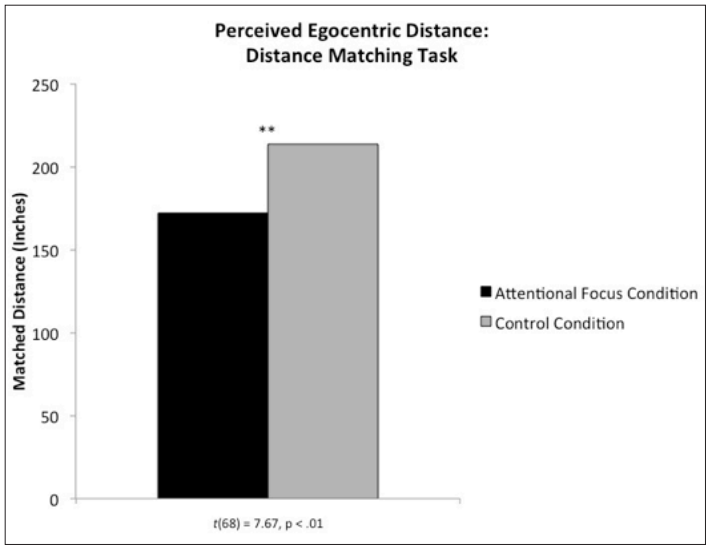
Differences in participants' perceived egocentric distance from the target object between those in the attention focus condition and those in the control condition were examined. As hypothesized, a significant main effect of attentional focus was found such that participants' perceived distance from the target object in the attention focus condition was significantly different than perceived distance from the target object in the control condition. Specifically, as we expected, those in the attention focus condition verbally estimated themselves to be closer to the target object (M = 182.83, SD = 33.95) than those in the control condition (M = 249.92, SD = 78.27), $t(68) = 4.66$, $p < .01$.

Those in the focus condition also reported feeling significantly closer to the target object (M = 2.38, SD = .60) than those in the control condition (M = 3.42, SD = .85), $t(68) = 5.88$, $p < .01$.





Finally, those in the focus condition positioned the experimenter significantly nearer in the distance-matching task (M = 172.24, SD = 21.65) than those in the control condition (M = 213.41, SD = 31.01), $t(68) = 7.67$, $p < .01$.

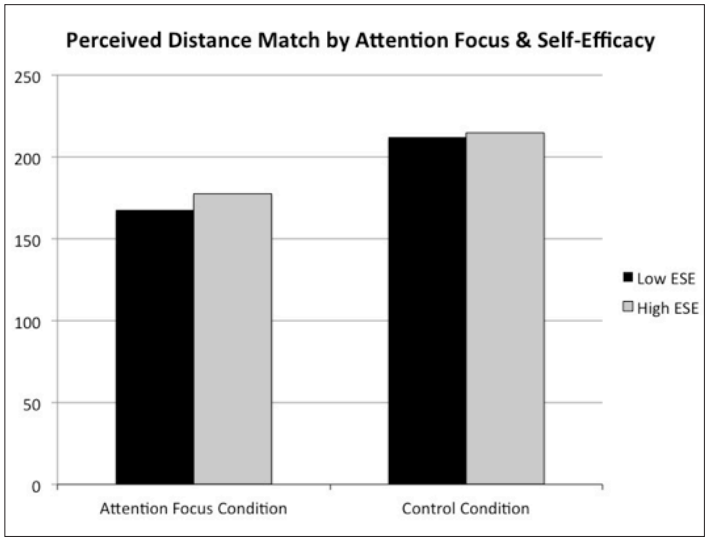


Self-Efficacy and Perceived Distance

To test whether the effects of attentional focus were moderated by participants' prior feelings of self-efficacy, we ran a regression. We included the attention condition (dummy coding focus condition as 2, control condition as 1), self-efficacy scores, and the interaction as variables predicting each distance estimate. When predicting verbal distance estimates, the overall model was significant, $R^2 = .24$, $F(3, 66) = 7.00$, $p < .001$. However, this model was driven only by the significant main effect of attentional focus condition, $\beta = -.49$, $t(68) = -4.55$, $p < .001$. The main effect of efficacy was not significant, $\beta = -.04$, $t(68) = -0.12$, $p = .91$, nor was the interaction, $\beta = .09$, $t(68) = 0.27$, $p = .79$.

When predicting felt distance to the target, the overall model was also significant, $R^2 = .35$, $F(3, 66) = 13.03$, $p < .001$. However, this model was also driven only by the significant main effect of attentional focus condition, $\beta = -.58$, $t(68) = -5.96$, $p < .001$. The main effect of efficacy was not significant, $\beta = -.39$, $t(68) = -1.36$, $p = .21$, nor was the interaction, $\beta = .23$, $t(68) = 0.73$, $p = .47$.

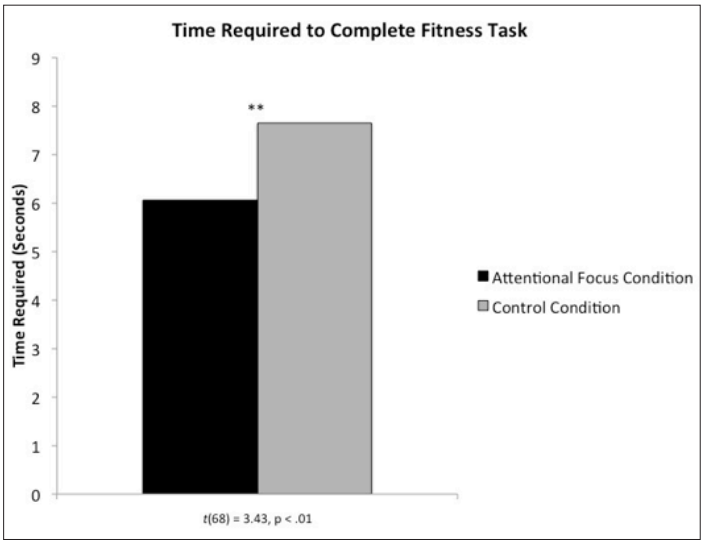
Finally, when predicting the distance matching measure, the overall model was again significant, $R^2 = .44$, $F(3, 66) = 16.82$, $p < .001$. However, this model was again driven only by the significant main effect of attentional focus condition, $\beta = -.65$, $t(68) = -6.99$, $p < .001$. The main effect of efficacy was not significant, $\beta = .25$, $t(68) = 0.87$, $p = .39$, nor was the interaction, $\beta = -.16$, $t(68) = -0.56$, $p = .58$. Because exercise self-efficacy did not predict distance estimates, we did not include it in further analyses.



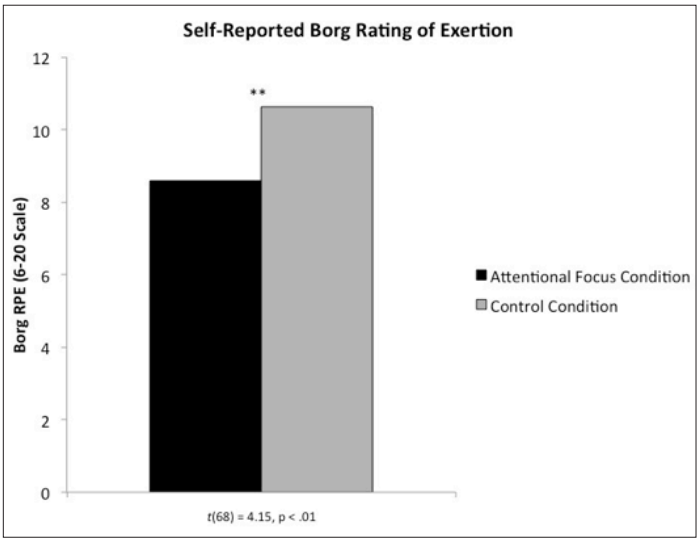
There was no significant difference between those low or high in exercise self-efficacy in either condition for the distance matching task (represented above), nor was there a significant difference between those low or high in ESE for any of our other measures. All significant models were driven only by the significant main effect of attentional focus condition.

Task Performance

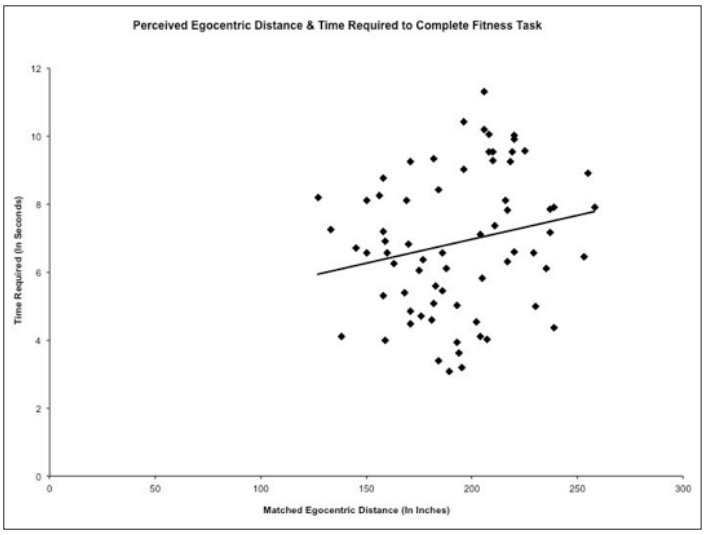
Lastly, the relationship between induced perceived proximity as a result of attentional focus and subsequent goal-relevant behavior was examined. Participants in the attention-focus condition required significantly less time to complete the exercise performance task (M = 6.06, SD = 1.88) than those participants in the control condition (M = 7.73, SD = 2.06), $t(68) = 3.51$, $p < .01$.



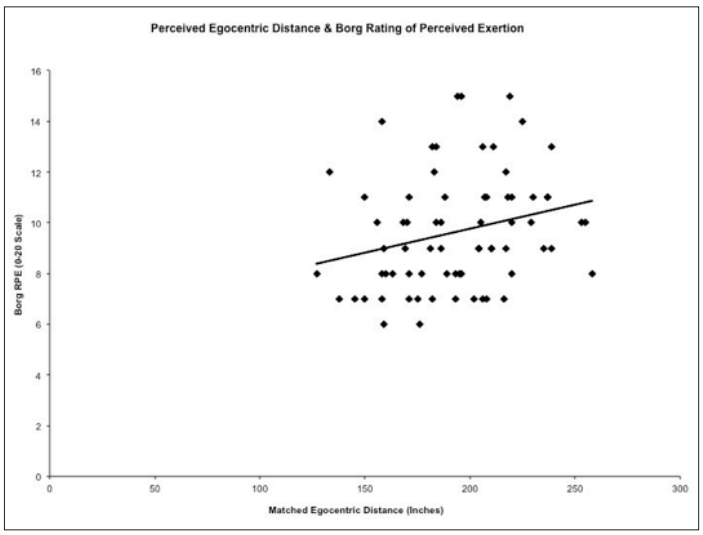
Borg Ratings of Perceived Exertion, an indicator of perceived task difficulty and effort required, also differed among these groups as hypothesized, with those in the attention-focus condition reporting significantly less perceived exertion (M = 8.59, SD = 1.84) than those participants in the control condition (M = 10.69, SD = 2.30), $t(68) = 4.17$, $p < .01$.



The amount of time required to complete the exercise task was significantly correlated to perceived distance from the target in the distance-matching task, $r(68) = .206$, $p < .05$.



Ratings of perceived exertion were also significantly correlated to perceived distance from the target in the distance-matching task, $r(68) = .251$, $p < .05$.



Discussion

We tested whether attentional style biased egocentric distance perception to a goal-relevant target. As previously mentioned, people lower in physiological potential tend to see distances as further (e.g., Bhalla & Proffitt, 1999; Proffitt, Bhalla, Gossweiler, & Midgett, 1995). We suggest that this is one important reason why those who are overweight or out of shape struggle and fail to engage in enough exercise. When distances appear far, people do not act. This is particularly true, we propose, for people who do not believe that they can produce effects or successfully perform a given activity—such as those people lower in perceived self-efficacy.

Yet just as perceiving distances as farther and interpreting one's environment as more extreme discourages action, it is reciprocally true that more effort is expended as one actually approaches a goal or reward (Hull, 1932). Accordingly, the present research aimed to and succeeded in identifying a visual technique that

not only counteracted those biases that tend to induce more extreme negative perceptions but also mimicked and promoted the positive effects of actual proximity on goal-relevant behavior. We showed that while actual distance influences behavior, so too does perceived, or *mis*perceived, distance.

Our findings demonstrate that narrowing one's scope of attention to a target can induce perceived proximity to that target. While our manipulation check confirmed that the attention-focusing strategy provided was, in fact, leading participants in that condition to observe different elements of the environment than those in the control condition, and particularly to make more observations about the target cone and less observations about their environment, our three distance measures showed the effect this differing scope of attention had on spatial perception. Participants in the attentional focus condition not only verbally estimated themselves to be closer to the target but also reported feeling significantly closer. Furthermore, when moving a confederate researcher (meant to be positioned the same distance away from them as the cone), participants in this condition positioned that researcher nearer, again indicating feelings of proximity to the target. In all three measures, by increasing one's level of focus on a target object, egocentric perception of distance was biased such that the target object was perceived as closer.

Perhaps even more notably, these studies illustrate an important subsequent behavioral effect of biased distance perception. Our findings suggest that as perceived egocentric distance to a target is closer, goal-pursuant behavior to reach that target, such as faster, more intense action, is encouraged. Participants in the attention focus condition, those who reported significantly increased feelings of perceived proximity to the target in all three egocentric distance measures, tended to walk at a faster pace and reached that target significantly faster than those participants in our control condition. Furthermore, despite walking at a more vigorous pace throughout the exercise task, these participants reported the task as being more manageable and as requiring significantly less physical exertion than those in the control condition. Thus, just as the idea of economy of action suggests that vision may be biased to discourage action in favor of the conservation of energy, our findings suggest that it can also be biased to assist in the expenditure of energy in order to attain goals perceived as close (and may even influence how we consequently judge that energy expenditure post-action).

Future Research and Implications for (Induced) Misperception and Action

Given the prevalence and scope of the obesity epidemic in America, perhaps the most significant contribution made by this study is in regards to research on factors related to self-regulatory success and failure within health goals related to weight loss. This research identifies a potential solution to overcoming obstacles that threaten goal-pursuit. Crucially, this intervention significantly influenced behavior for both participants high in exercise self-efficacy and the more at-risk participants, low in exercise self-efficacy. Thus, this research, and the adoption of such focus when pursuing exercise and fitness goals, could help to increase the likelihood of success for this vulnerable population in the fight against obesity.

Additionally, this strategy is cheap, easy, and efficient. Increasing one's attentional focus on a target can be done independently, free of charge, and, as illustrated by our studies, quickly and with relatively little effort or training required. Such simplicity and convenience can only aid in the intervention strategy's adoption and success.

The current studies may also have implications for research examining the function and consequences of perceptual biases. It confirms past findings on the induction of visual perceptual bias and perceived proximity. Furthermore, our findings suggest that attention manipulation, specifically increased attentional focus, is one effective means through which these perceptual biases can be induced. Research on the effects of attentional focus is sparse, so the current study could provide a framework for future research.

Likewise, these studies demonstrate the potential subsequent action-specific behavioral effects of increased attentional focus. If, as we suggest, the perceived proximity induced by focusing one's attention leads to similar behavioral consequences as actual proximity to a goal (Hull, 1932), attention focus manipulation and induced perceived proximity could prove to be valuable tools in goal pursuit and goal research. Future research, for example, could examine the influence of increased attentional focus on a narrowed, more specific goal, such as losing five pounds or dropping one pant size, rather than broader, more expansive goals or levels of focus, such as the general aim to lose weight.

Moreover, though this study focuses on the domain of health and fitness, our findings are likely generalizable and relevant to many other domains of research, including areas of psychobiology, social and cognitive psychology, and vision science. For example, while we know this strategy works for people low in efficacy, it may also work for those people lower in physiological potential, current or chronic. Future research could examine whether narrowed attentional focus increases goal-relevant behavior for those with higher body mass indexes (BMI) or waist-to-hip ratios (WHR)—both of which indicators of poorer health and increased risk of developing serious health conditions. Future studies could also look at whether this strategy is effective for those lower in blood glucose levels, or for those who have already physically exerted themselves, as a tool to combat fatigue.

It is also important to note limits to the generalizability of this research. Given that this study was run in collaboration with a sports complex, it is possible

that this strategy may only work for people who already know that they need to exercise and are trying to take action. Despite the fact that all willing participants were accepted into the study, it is possible that our sample population, having been recruited from an exercise complex, is not completely representative of the greater U.S. population. Accordingly, future research may look to increase the generalizability of this research by recruiting participants unaware of this need or not actively pursuing exercise or fitness goals.

Finally, and potentially most important for future research, while this study aimed to and succeeded in demonstrating the effect of increased focus and attention on a target, we did not examine the mechanisms involved or look into more underlying explanations for our discovered effects. Follow-up research could more deeply explore these specifics with regards to perceived proximity and its subsequent behavioral effects, adding further to the findings of this study.

Concluding Remarks

In spite of the aforementioned limitations, the current research successfully identified a visual technique that will aid in promoting goal-relevant action, even among people low in exercise self-efficacy and who believe that they have difficulty meeting exercise goals. Results suggest that the focusing of one's attention on a target object or goal leads to that target object appearing closer. Moreover, this perceived proximity increases goal-relevant behavior, and increases self-reported ease in reaching that target. Exercise self-efficacy was measured in order to ensure that the effects of attentional focus were universal and not limited to only those high or low in exercise self-efficacy. As hypothesized, exercise self-efficacy had no significant main or interactive effect, meaning that increased attentional focus, regardless of exercise self-efficacy level, is a successful strategy for inducing perceived proximity and encouraging subsequent goal promoting behavior. Furthermore, this strategy appears to be successful both in terms of improving performance (e.g., faster walking) and with respect to perceived difficulty in successfully engaging in the task (e.g., lower ratings of perceived exertion), irrespective of exercise self-efficacy level. Given that action and exercise are necessary components in the fight against obesity, this research offers a promising potential intervention strategy in the form of a perceptual bias that can aid against the effects of lower exercise self-efficacy and discouraging perceptions of the environment.

Acknowledgements

I would like to thank Professor Emily Balcetis, Shana Cole, and the members of the Social Perception Action and Motivation (SPAM) Laboratory. Without their guidance and aid, this research would not have been possible. I would also like to thank the College of Arts and Science's Dean's Undergraduate Research Fund for its financial assistance with this project. Finally, I would like to acknowledge the Jerome S. Coles Sports Center for allowing this study to be conducted within the facility's gymnasium.

References

Alter, A., & Balcetis, E. (2011). Fondness makes the distance grow shorter: Desired locations seem closer because they are more vivid. *Journal of Experimental Social Psychology*, *47*, 16-21.

Baden D, Warwick-Evans L.A., & Lakomy J. (2004). Am I nearly there? The effect of anticipated running distance on perceived exertion and attentional focus. *Journal of Sports and Exercise Psychology*, *27*, 215–31.

Balcetis, E., & Cole, S. (2011). [Effects of attentional focus on distance perception]. Unpublished raw data.

Balcetis, E., & Dunning, D. (2006). See what you want to see: Motivational influences on perception. *Journal of Personality and Social Psychology, 91*, 612–625.

Balcetis, E., & Dunning, D. (2007). Cognitive dissonance reduction and perception of the physical world. *Psychological Science*, *18*, 917–921.

Balcetis, E., & Dunning, D. (2010). Wishful seeing: Desired objects are seen as closer. *Psychological Science, 21*, 147–152.

Balcetis, E., Lassiter, G.D. (2010). The social psychology of visual perception. *Psychology Press*, New York (2010).

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, *84*(2), 191.

Bandura, A. (2001). Guide for constructing self-efficacy scales. *Monograph*. Stanford, CA: Stanford University. Retrieved November 15, 2008.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior*, *31*(2), 143-164.

Bhalla M., & Proffitt, D.R. (1999). Visual–motor recalibration in geographical slant perception. *Journal of Experimental Psychology: Human Perception and Performance*, *25*, 1076–1096.

Bauman, A. E., Sallis, J. F., Dzewaltowski, D. A., & Owen, N. (2002). Toward a better understanding of the influences on physical activity: the role of determinants, correlates, causal variables, mediators, moderators, and confounders. *American journal of preventive medicine*, *23*(2), 5-14.

Borg, G. A. (1982). Psychological bases of physical exertion. *Medicine & Science in Sports & Exercise*, *14*, 377-381.

Chen, Q., Marshall, J. C., Weidner, R., & Fink, G. R. (2009). Zooming in and zooming out of the attentional focus: An fMRI study. *Cerebral Cortex*, *19*, 805–819.

Dollard, J., & Miller, N. E. (1950). Personality and psychotherapy.

Downing, C. J. (1988). Expectancy and visual-spatial attention: Effects on perceptual quality. *Journal of Experimental Psychology: Human Perception and Performance*, *14*, 188–202.

Flegal, K. M., Graubard, B. I., Williamson, D. F., & Gail, M. H. (2005). Excess deaths associated with underweight, overweight, and obesity. *JAMA: the journal of the American Medical Association*, *293*(15), 1861-1867.

Fletcher, J. S., & Banasik, J. L. (2001). Exercise self-efficacy. *Clinical Excellence for Nurse Practitioners*, *5*, 134–143.

Gallup, A. M., & Newport, F. (2009). *Gallup Poll: Public Opinion 2008*. Rowman & Littlefield Pub Incorporated.

Harmon-Jones, E., Gable, P. A., & Hobbs, J. (2009). Neural activity underlying the effect of approach-motivated positive affect on narrowed attention. *Psychological Science*, *20*, 406–409.

Maner, J. K., Gailliot, M. T., Rouby, D. A., & Miller, S. L. (2007). Can't take my eyes off you: Attentional adhesion to mates and rivals. *Journal of Personality and Social Psychology*, *93*, 389-401.

McAuley, E., Lox, C., & Duncan, T. E. (1993). Long-term maintenance of exercise, self-efficacy, and physiological change in older adults. *Journal of gerontology*, *48*(4), P218-P224.

Ogden, C., & Carroll, M. (2010). Prevalence of obesity among children and adolescents: United States, trends 1963–1965 through 2007–2008. *Atlanta: Centers for Disease Control and Prevention. National Center for Health Statistics*.

Ogden, C. L., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA: the journal of the American Medical Association*, *295*(13), 1549-1555.

Ogden, C. L., Carroll, M. D., & Flegal, K. M. (2008). High body mass index for age among US children and adolescents, 2003-2006. *JAMA: the journal of the American Medical Association*, *299*(20), 2401-2405.

Proffitt, D. R. (2006). Embodied perception and the economy of action.

Perspectives on Psychological Science, *1*, 110-22.
Proffitt, D. R. (2006). Distance perception. *Current Directions in Psychological Research*, *15*, 131–135.
Proffitt, D. R., Stefanucci, J., Banton, T., & Epstein, W. (2003). The role of effort in perceiving distance. *Psychological Science*, *14*, 106–112.
Stefanucci, J. K., & Proffitt, D. R. (2009). The roles of altitude and fear in the perception of heights. *Journal of Experimental Psychology: Human Perception & Performance*, *35*, 424-438.
Wardak, C., Denève, S., & Ben Hamed, S. (2011). Focused visual attention distorts distance perception away from the attentional locus. *Neuropsychologia*, *49*, 535-545.
Witt, J. K., Linkenauger, S. A., Bakdash, J. Z., Proffitt, D. R. (2008). Putting to a bigger hole: Golf performance relates to perceived size. *Psychonomic Bulletin & Review*, *15*, 581-585
Wu, B., Ooi, T.L. & He, Z.J. (2004) Perceiving distance accurately by a directional process of integrating ground information. *Nature*, *428*, 73-77.

Getting to know: *Casey Burton*

Biography

Casey Burton is a senior Chemistry student from Missouri University of Science and Technology with a minor in Biology. Continuing his research pursuits from high school, he now works under the guidance of Dr. Yinfa Ma where he specializes in bioanalytical chemistry in his search for noninvasive, early cancer detection techniques. His work has resulted in a half dozen papers and over 20 professional presentations at conferences, symposia, and members of Congress. In his spare time, he owns and operates a web development firm, Sapentia Development, LLC, specializing in providing innovative web technologies and infrastructures for an ever-evolving market. Casey will be furthering his cancer detection work at Missouri University of Science and Technology as a graduate student, and plans on remaining in academia and building his company.

Q&A

What sparked your interest in psychology?

There is no spark from psychology in general; rather, it is the spark, that burning curiosity, wherever it may lie, that pulls you, the researcher, ever deeper into the question, and that knowledge you gain and the more questions you create through the research process, that can only serve you better no matter what field you are in.

What led you to this topic?

As a pseudo-possessor of absolute pitch myself, I had always been naturally curious toward the ability, and had presumed that the skill had never been innate in me, but on the contrary, acquired, so I developed a model to see whether the skill was acquirable or not.

Did you have a mentor and how did you get involved with him/her?

I did not have a mentor; most of my psychological studies, being professionally a bioanalytical chemist, are designed on my own accord. After my findings and presentations of those findings, however, I did receive a lot of interest from experts in the field including Dr. Allan Snyder from the Centre from the Mind.

How long have you been working on this paper? What has the process been like for you?

This study was actually conducted my sophomore year in high school. The paper submitted is largely unchanged from six years ago, but at the time, that was my first professional manuscript preparation. Fast forward six years as a chemistry student with a half dozen publications, that process, although much more mechanical and automated now, is still fundamentally the same. The preparation of a manuscript can often be as exciting as the research study itself.

What was it like to be an undergraduate student completing your own research project?

As an undergraduate who has completed over a half dozen studies, there is always a sense of accomplishment at the end of a project, but there is also a sense that the project is never truly completed - a good scientist will find that answering one question leads to so many more questions.

A Non-Musical Paradigm That Isolates Pitch Recognition Mechanisms

Casey Burton
Missouri University of Science and Technology

Absolute Pitch (AP) is the ability to label and/or reproduce a given pitch without external reference. There exists a close relationship between AP development and pitch memory skills. At the root of these skills are pitch perception mechanisms that are loosely understood. Prior research has probed these by modeling AP validation tests, which fail to effectively isolate, develop, and examine such mechanisms. Moreover, where recent research suggests that AP development diminishes quickly by the teen years, this study explores whether the contrary may be plausible by examining pitch perception skills in students around the critical developmental age. To do this, a computerized training method which included both visual and auditory stimuli, similar to the Simon ™ game, was developed. During the game, visual stimuli were removed, requiring participants to perceive and further label the supplied pitches. The method demonstrated that a simple computer program can be used to isolate and develop pitch perception mechanisms ($p < 0.01$). The research also suggests that pitch perception is still functional among those above the critical age range ($p < 0.001$). It is therefore suggested that non-musical paradigms, distinct from traditional validation tests, be used for the further investigation of pitch perception mechanisms and a better understanding of AP.

Introduction

Absolute pitch (AP) is the ability to label and/or reproduce a given pitch without external reference. It is a rare ability showing up in the general population in as few as one in 10,000 (Profita & Bidder, 1988), although it has been found to be more prevalent among music institutions (Levitin, 1996), and among the ethnic group of Asians, often attributed to the tonal nature of Asian languages (Deuscht, Henthorn, & Dolson, 1999). The skill is also more prevalent among those who have had formal music education at a young age (Sergent, 1969; Wellek, 1938), largely before the cognitive shift (ages 0~6) (Takeuchi & Hulse, 1993), after which development decreases rapidly afterwards (Brady, 1970; Cuddy, 1968, 1970; Meyer, 1899). By the age of 12, development has been found to be greatly diminished (Levitin, 1994). While some research (Profita & Bidder, 1988; Baharloo, Johnston, Service, Gitschier, & Freimer, 1998) suggests an underlying genetic basis, most researchers believe the acquisition of absolute pitch is affected by both genetics and early music training (Chin, 2003; Levitin, 1994), as well as the familial environment (Baharloo, Service, Risch, Gitschier, & Freimer, 2000).

Furthermore, several studies suggest that AP possessors perceive pitches much more categorically, analogous to other sensory stimuli perception, such as color (Peacock, 1984; Rogers, 1987) and phonemes (Siegel & Siegel, 1977), than do non-possessors. For example, previous research (Siegel, 1974) found that AP-possessors demonstrated superior pitch memory only when a categorical system was in place, which in the study's case was pitch names. Meanwhile non-possessors are thought to perceive pitch as a physical continuum, only identifiable from known reference pitches, the basis for relative pitch.

It follows then that both absolute and relative pitch are based in pitch memory with differences arising from the reference pitches: AP relies on pitch memory in that an external tone is matched against an internal sound bank, and the appropriate label can then be produced; whereas with relative pitch, a reference pitch is substituted for the internal sound bank, and the appropriate label is given by the distance from the reference pitch. This fundamental difference in reference pitches with respect to the commonality of pitch memory between the rarely-possessed skill of AP and the largely-held ability of relative pitch suggests then that pitch perception mechanisms, which are at the root of pitch memory, may be isolated to better understand the two skills. This is not a novel idea, either, as other AP studies have involved pitch memory tasks, such as those in Siegel's 1974 study. Most of these studies, however, have focused on the contrasting of AP possessors and non-possessors through pitch memory tasks that often parallel AP validation tests, in that participants are asked to identify single pitches or choose a correct pitch from a given set, in order to shed some light on the otherwise unclear ability. By modeling studies in this fashion, the pitch perception mechanisms are only being examined, not isolated and developed in a systematic, categorical manner.

Indeed, development and examination of truly isolated pitch perception mechanisms, coupled with a categorical labeling system, may very well simulate conditions similar to those of AP-possessors. Therefore, if these pitch perception mechanisms can be isolated in such a manner, then the mechanisms can be developed through a rigorous training method that will ultimately culminate in an ability not unlike AP, representing the primary hypothesis of this study. In this way, a better understanding of the cognitive functions of AP, and thereby its development, can be achieved. Moreover, if such a model can be developed, then a reassessment of the developmental differences around the critical ages can be conducted to shed further light on the issue, forming the secondary hypothesis.

Method

Model Development

In order to develop a model that both isolated and developed pitch perception mechanisms in a categorical manner, as opposed to simple examination, pitch memory tasks were disguised as a non-musical game involving both visual and auditory stimuli. Inspiration of such a model stemmed from the Simon™ game, which consists of following randomly generated sequential orders around a pie comprised of four sections of unique flashing colors and pitches. It was observed that memorization of the series of the pitches, rather than color or spatial position around the pie, often proved to be an effective gameplay strategy. This would then suggest that a game environment like that above may create a favorable setting for isolating pitch perception mechanisms, thereby providing a basis for the experimental paradigm.

The Simon™ concept was expanded to include 12 sections of unique colors and pitches to account for the 12 chromatic pitches in an octave. The initial presence of visual stimuli would aid memorization of the pitches by providing additional associations, analogous to flash cards for the pitches. Furthermore, there were no positional adjustments around the pie among levels as the game progressed. Therefore, the gradual removal of visual stimuli would increase dependence upon pitch perception and labeling. Colors and note names were chosen as the visual stimuli due to their use in a previous study (Rogers, 1987); their contributions were not evaluated, however, since the stimuli were ultimately removed by the final level. In this way, the game was characterized by three levels: (1) the dictated order was given by flashing colors, note names, and pitches, while colors remained on the pie, (2) the dictated order was given only by pitches, while colors remained on the pie, (3) the dictated order was only given by pitches, while the colors were removed and replaced with gray sections (Figure 1).

The game progressed through the following procession of levels: 3-1-2-3. The initial third level provided a controlled environment where players were naïve with respect to the relationship between the pitches and their corresponding positions. This provided a basis from which performance at the final instance of the third level could be accurately assessed. Pitch memory could then be evaluated in terms of game performance; that is, the maximum sequential length given by the application that was successfully matched by the user during the third levels.

Figure 1. *Representation of the first level (left), second level (middle), and third level (right).*

Participants

Participants consisted of 266 middle school students (Mage=10.8, SDage=2.6) from the School of the Osage campus located in Kaiser, Missouri. Age breakdown comprised two major groups: (a) 3rd and 4th graders (<12 years old) and (b) 6th and 8th graders (>12 years old). The sample space was predominantly Caucasian (n>260) and there were no significant gender variations observed. The institutional review board waived guardian consent due to (a) lack of psychological stress, (b) anonymous collection of data, and (c) the teachers' willingness to incorporate the program into their normal classroom settings. However, informational fliers were still sent to parents to make them aware of their child's participation in the program.

Production of the Computerized Training Program

The game environment described above was implemented by a local programmer for free using the programming languages of ASP.NET and Flash. This provided an internet version of the game that was easily accessible to anyone. The resultant data consisted of (a) a user number which was linked to the user's age and gender, (b) which pitch was given, and (c) whether the user's response was correct or not. Pitches were generated using sine waves produced from a Yamaha PSR 1100 electronic keyboard starting from middle C chromatically up to the next B pitch. Pitches were exactly one second in length with 50 ms decays. Pitches administered in sequence from the game had a 100 ms interval between each pitch. Each game instance had a specific seed number that randomly positioned the 12 pitches around the 12 positions of the pie; this seed and the resulting positions of the pitches on the pie remained constant throughout all levels. Sequences given by the computer ("Simon") were randomized, starting with a single pitch, and upon each successive round, the sequence was lengthened by one pitch. Upon failing a round, a new sequence was randomly generated at that current level starting with a sequence length of one.

Experimental Training and Evaluation

Experimental participants, after explanation of the game and study, created an anonymous user account, and were taken directly to the third level as a control test. Consistent with Figure 1, these participants had no exposure to the relationship among pitch, position, and color. Upon missing a note, the participants were taken to the first level where they remained until 10 correct pitches in a row had been achieved. Success in the first level brought them to the second level, whereupon 10 consecutive successful pitch identifications admitted participants to the third and final level. Exposure to the first two levels was to familiarize the participant with the pitches and their corresponding positions, and to strengthen those correlations, respectively. Upon completion of these training levels, the group was given one attempt at the last level. Performance was again measured and compared to their initial pre-evaluation.

Analysis

Game performance, in terms of maximum sequential length achieved during the third level (without vi-

sual stimuli) per individual and per group, formed the basis of all analyses. The baseline for sequential length was three pitches correctly identified in a row, determined by its corresponding low probability (0.058%) of incidence. It may be noted, however, that even one pitch being correctly identified results in an 8.3% probability. Despite this, three or more pitches in a row clearly indicated a developed pitch memory within the confines of the model.

The event of semitones, pitches one chromatic step away from the desired pitch (for example, C# and C), must also be addressed. It was observed that some participants (N=7) consistently chose the correct pitch or one of that pitch's two semitones. The consistent nature of these participants negated coincidences caused by the randomization of the positions around the pie. Previous research (Levitin, 1994) had also taken semitones in account in evaluating correct pitch identifications. Therefore, semitones were accepted as correct pitches for those participants who consistently chose semitones, but not for coincidental identifications.

Results

In all, 266 participants' data were recorded and included into the results. An additional 17 participants completed the computerized training method, but large variations in age (15-53) voided inclusion of their data in this study. Frequencies of performance (n>3, 4, 5, 6 consecutively correct answers) were recorded for each session. No more than six pitches in a row were identified except for a few individuals (N=10).

Pre-Evaluation vs. Post-Evaluation

Of the pre-evaluation attempts, there was not one instance of three pitches being correctly identified in a row. There were several accounts of single pitches identified, however. In comparison, the post-evaluation data afforded 90 incidents of three or more consecutive pitches correctly identified. This accounts for 37.1% of the sample size. At four or more pitches, the post-evaluation data yielded 76 incidents, or a 31.4% representation. Five or more pitches resulted in 50 incidents, or a 20.7% representation. Six or more identification finally comprised 38 individuals, or a 15.7% representation. Total correct identifications were used in a paired t-test to validate these results with $p<0.01$ (Table 1).

Table 1

Performance Comparisons Between Experimental and Control Groups

Performance (n>x)	Post-Eval Incidents	Post-Eval Representation	Pre-Eval Incidents	Pre-Eval Representation
3	90	37.1%	0	0.0%
4	76	31.4%	0	0.0%
5	50	20.7%	0	0.0%
6	38	15.7%	0	0.0%

Note. Eval = Evaluation. Performance is defined as the maximum sequential length achieved during respective evaluations. $p<0.01$

Age Groups

The age groups of 8 to 11 years old and 12 to 14 years old were also analyzed for comparison. The younger group (Mage=9.4) consisted of 162 participants, and the older group (Mage=13.2) consisted of 104 participants.

Performance evaluations at three or more correctly identified pitches resulted in 52 incidents (32.1% representation) for the younger group, and 38 incidents (36.5% representation) in the older group. Four or more pitches yielded 43 occurrences (26.5% representation) from the younger group and 33 occurrences (31.7% representation) from the older group. Five or more correct pitches afforded 31 incidents (19.1% representation) from the younger group and 19 incidents (18.3% representation) from the older group. Six or more pitches finally resulted in 25 occurrences (15.4% representation) from the younger group and 13 occurrences (12.5% representation) from the older group. A paired t-test for total correct identifications was also conducted for the two groups resulting in $p<0.001$ (Table 2).

Table 2

Performance Comparisons Between Age Groups

Performance (n>x)	Age 8-11 Incidents	Age 8-11 Representation	Age 12-14 Incidents	Age 12-14 Representation
3	52	32.1%	38	36.5%
4	43	26.5%	33	31.7%
5	31	19.1%	19	18.3%
6	25	15.4%	13	12.5%

Note. Age 8-11 size (N=162). Age 12-14 (N=104). Performance is defined as the maximum sequential length achieved. $p<0.001$

Discussion

Comparisons between the pre-evaluation and post-evaluation data clearly indicate a substantial difference in correct identifications and thereby pitch memory within the confines of the model. This seems valid as participants would not have any prior knowledge to the mapping of pitches to the positional elements of the pie during the pre-evaluation test. This strengthens the idea that by the time the post-evaluation test was reached, participants were able to effectively perceive and label the pitches. In this way, it may be surmised that through the instance of this model, pitch perception mechanisms were, indeed, isolated, and further developed to mimic AP-like conditions, supporting the primary hypothesis. That said, a further evaluation of the visual stimuli would provide a better understanding of their contributions.

To address the secondary hypothesis, comparisons between the two age groups afforded no dramatic differences. Indeed, identification densities (sample representations) were nearly identical for the two groups. This seems to suggest that both groups demonstrated

an equal capacity to effectively perceive and label pitches when necessitated. This is there supportive of the secondary hypothesis stating that an age barrier does not exist for pitch isolation and recall processes as predicted by earlier research.

Of further interest, it was found that a large representation of the sample (~75%) demonstrated absolute memory for at least one pitch. These pitches may result from a "home" or reference pitch possessed by the individual, which may be attributed to the individual's baseline pitch for speaking or the first exposed pitch of the game due to its highly repetitive frequency. Indeed, the latter seems to prevail, after assessing post-evaluation interviews with the classes.

In addition to these points of discussion, the most frequent identifications represented the pitches of C, D, and A#. This may be correlated to the pitches' occurrence in Western music. The keys of C and D are common for many children's songs, such as "Twinkle, Twinkle Little Star" and "Row, Row, Row Your Boat", and many Western bands and orchestras, such as the school's own, tune themselves to the key of A#. In this case, this would represent the formation of an experiential home pitch from which the students could easily identify, as illustrated by the data.

Conclusions

The study herein presented a non-musical paradigm to isolate and develop pitch perception mechanisms in an attempt to reproduce AP-like abilities within the confines of the model. By application of this model to individuals near the previously suggested critical age range for AP development, a further assessment of this age barrier for pitch perception was conducted. The deviation of this model, which was designed from a household game, from earlier paradigms that paralleled AP validation tests has been found to be effective in the isolation and development of inherent pitch perception mechanisms, supporting the initial hypothesis. Indeed, the game increased dependence on pitch perception by removing visual stimuli until only a pitch was given, finally requiring the individual to perceive and label the pitch by a positional element. A substantial increase in pitch memory was observed across the sample set when compared with the control, pre-evaluational runs, suggesting the development of the pitch perception mechanisms. Furthermore, both age groups, those above and below the critical age, were shown to perform nearly equally in their pitch perception skills, thereby contradicting previous studies, and supporting the secondary hypothesis that AP-like skills can be developed above and below the suggested critical development age. In this sense, the non-musical paradigm, distinct from AP validation tests, may therefore provide more accurate data on the functionality of pitch perception mechanisms and by consequence, the development of AP itself. While the AP-like ability was confined to the game, and individuals, when exposed to new timbres and octaves, failed to correctly identify pitches given to them, the model does offer an environment where further development may lead to a truer representation of AP at any age.

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References

Baharloo, S., Johnston, P., Service, S., Gitschier, J., Freimer, N. (1998). Absolute pitch: An approach for identification of genetic and non-genetic components. *American Journal of Human Genetics*, *62* (2), 224–231.

Baharloo, S., Service, S., Risch, N., Gitschier, J., & Freimer, N. (2000). Familial aggregation of absolute pitch. *American Journal of Human Genetics*, *67*, 755-758.

Brady, P. (1970). Fixed-scale mechanism of absolute pitch. *Journal of the Acoustic Society of America*, *48*, 883-887.

Chin, C. (2003). The development of absolute pitch. *Psychology of Music, 31*, 155–171.

Cuddy, L. (1968). Practice effects in the absolute judgement of pitch. *Journal of the Acoustic Society of America*, *43*, 1069-1076.

Cuddy, L. (1970). Training the absolute identification of pitch. *Perception and Psychophysics*, *8*, 265-269.

Deutsch, D., Henthorn, T. & Dolson, M. Absolute pitch is demonstrated in speakers of tone languages. *Journal of Acoustical Society of America*, 1999, 106, 2267.

Levitin, D. (1994). Absolute memory for musical pitch: evidence from production of learned melodies. *Perception and Psychophysics, 56* (4), 414–423.

Levitin, D. (1996). Memory for musical tempo: additional evidence that auditory memory is absolute. *Perception and Psychophysics*, *58*, 927-935.

Meyer, M. (1899). Is the memory of absolute pitch capable of development by training? *Psychological Review*, *6*, 514-516.

Profita, J. & Bidder, T. (1988). Perfect pitch. *American Journal of Medical Genetics*, *29* (4), 763–771.

Rogers, G. (1987). Four cases of pitch-specific chromesthesia in trained musicians with absolute pitch. *Psychology of Music*, *15*(2), 198-207.

Sergeant, D. (1969). Experimental investigation of absolute pitch. *Journal of Research in Music Education*, *17*(1), 135-143.

Siegel, J. (1974). Sensory and verbal coding strategies in subjects with absolute pitch. *Journal of Experimental Psychology*, 103, 37-44.

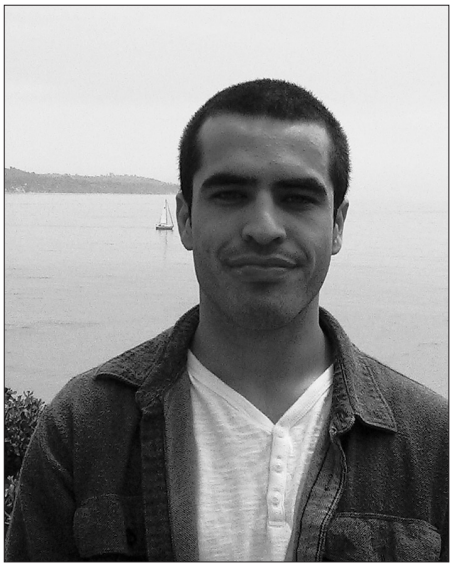
Siegel, J., Siegel, W. (1977). Absolute identification of notes and intervals by musicians. *Perception and Psychophysics*, *21*, 143-152.

Takeuchi, A. & Hulse, S. (1993). Absolute pitch. *Psychological Bulletin*, *113*(2), 345–361.

Wellek, A. (1938). Das absolute Gehor und seine typen. *Psychologie und Charakterkunde - Beihefte*, *83*, 1-368.

Getting to know: *David Baca*

Biography



David Baca graduated UC Santa Barbara in 2012 with a degree in Biopsychology and a minor in Chemistry. He currently works as a pharmacy technician and attends school part-time in Santa Barbara, California. David's academic interests reside primarily within neuropharmacology, in particular how different drugs are developed in order to treat various neurological disorders. In the future he plans on applying to pharmacy school for Fall 2014 in order to pursue a career in pharmacy. David would like to recognize Tod Kippin, and Sierra Webb for their help and guidance throughout the research process of his paper.

Q&A

What sparked your interest in psychology?

My interest in biopsychology was sparked in high school when I originally thought I wanted to pursue a career as a psychiatrist.

What led you to this topic?

My fascination with the endocrine system led me to this research topic.

How long have you been working on this paper? What has the process been like for you? What was it like to be an undergraduate student completing your own research project?

My paper took seven weeks of research and experimentation that I would describe as " laborious but rewarding."

Difference in Fos Immunoreactivity in the Medial Preoptic Area of Male Rats and in the Ventromedial Hypothalamus of Females Rats, Post Copulation: The Effect of Sexual Experience on Fos Immunoreactivity

David Baca

University of California, Santa Barbara

In the present study, the distribution of Fos immunoreactivity (IR) in the brain of female and male Sprague-Dawley rats, following one hour of copulation, was measured. The distribution of Fos-IR was induced by sexual behavior in the medial preoptic area (mPOA) of sexually experienced/inexperienced male rats. In, addition Fos-IR was also augmented in the ventromedial hypothalamus (VMH) of sexually experienced/inexperienced female rats post-sexual behavior. An increased number of Fos-IR neurons were reported in sexually experienced rats as opposed to sexually inexperienced rats.

Introduction

-Fos is a cellular proto-oncogene, a gene that codes for cell growth regulation and differentiation with the potential of causing cancer, that belongs to a gene family of transcription factors. c-Fos transcribes mRNA that encodes for the expression of a particular DNA binding protein, Fos, within the brain (Robertson, Pfaus, Matsumura, Phillips & Fibiger, 1991). The neuronal expression of c-fos is up-regulated or increased by a variety of physiological and pharmacological treatments (Morgan & Curran, 1989). For example, nociceptive stimulation (Hunt, Pini & Evan, 1987), light stimulation (Sager & Sharp, 1990), as well as caffeine stimulation (Nakajima, Daval, Morgan, Post & Marangos, 1989) have all been demonstrated to increase c-fos transcription within specific brain regions and are able to be detected by Fos immunocytochemistry, biochemical laboratory techniques where antibodies bind to specific protein sequences which then can be detected using various methods. c-Fos protein (Fos) has proven to be a valuable substrate in the role of investigative neuroscience, as it has been shown to be overly expressed in various regions of the brain when exposed to a range of stimuli. This research has led to the implication that Fos immunocytochemistry may be used in the mapping of metabolically functional pathways within the brain (Sager, Sharp & Curran, 1988).

The neural circuitry responsible for sexual behavior in both male and female rats appears to be similar in terms of the integration of sensory information. In male rats, the mPOA is suspected to be the brain region responsible for the integration of sensory and hormonal stimulation that proceed the onset of male sexual behavior, whereas the VMH appears to have a similar function within the female rat (Coolen, Peters, & Veening, 1996). Increases in Fos immunoreactivty, the measure of the reaction between an antigen and its antibody used for detection, have been reported in the mPOA after mating in male rats (Baum & Everitt, 1992). Bilateral lesions of the mPOA have been shown to severely disrupt the initiation of copulatory behavior in male rats (Everitt & Stacey, 1987). Similar studies in male rats have suggested that the lesion of the mPOA does not disrupt the motivational aspects of sexual behavior, whereas it actively inhibits the consummatory facets of sex in the form of copulatory apraxia, the inability to preform sex (Liu, Salamone & Sachs 1997). Investigators have also shown there to be an increase in Fos-IR following sexual behavior in female rodents within the VMH (Pfaus, Kleopoulos, Mobbs, Gibbs & Pfaff 1993). Bilateral lesions of the VMH eliminate the induction of sexual receptiveness by estrogenic based treatments but do not eliminate the ability for a female rat to show lordosis, a posture of sexual receptiveness characterized by the voluntary inward curvature of the spine (Mathews & Edwards, 1977). The VMN is suspected not to be directly essential for the expression of hormonally induced lordosis behavior, but most likely serve as a neural-structure critical for a lordosis-modulating mechanism within the central dopaminergic system (Okada, Watanabe, Yamanouchi & Arai, 1979). Similar studies indicate the female rat VMH is critical for the modulation of proceptivity and receptivity, as opposed to motivation underlying sexual behavior. Thus according to the literature, the mPOA and VMH, in male and female rats respectively, may serve as appropriate brain regions in a probe for Fos protein using Fos immunocytochemistry following copulation.

Central dopaminergic systems have been shown to play an important role in the regulation of sexual behavior in rats. Dopamine receptor agonists, such as 3,4-dihydroxy-L-phenylalanine (L-DOPA, the precursor of Dopamine), increase central dopaminergic neurotransmission and increase sexual behavior as well (Bitran & Hull, 1987). The pro-sexual nature of dopamine receptor agonist in humans was first suggested by the observation of increased sexual activity in patients with Parkinson's disease who were being treated with L-dopa (Utti, Tanner, Rajput, Goetz, Klawans & Thiessen, 1989). L-dopa also has been shown to facilitate erec-

tions within human male test subjects (Goodwin, 1971). To the contrary, dopamine receptor antagonists have been shown to eliminate or disrupt proper male sexual function within male rats (Pfaus & Phillips, 1989). Psychomotor stimulants that augment central dopamine neurotransmission increase the number of Fos-immunoreactive neurons in brain regions essential to the central dopaminergic systems, i.e. nucleus accumbens and striatum (Graybiel, Moratalla & Robertson, 1990). The literature suggests than an increase in dopamine neurotransmission in brain areas specific to the central dopaminergic system that underlie sexual behavior, particularly the mPOA (males) and VMH (females), experience an increase in the quantity of c-fos expressed after a period of copulation (Robertson et al., 1991).

The purpose of the present study was to determine the effects of sexual experience on the number Fos-IR neurons within the mPOA and VMH of male and female rats post-copulatory behavior. The literature indicates an increase in copulatory behavior will subsequently lead to an increase in the expression of c-fos in the brain-regions specific for the integration of sensory information underlying sexual conduct within a female and male rat brain. Various studies have demonstrated that classical conditioning can produce sexual arousal. It has been reported that placing male rats into a chamber in which sexual intercourse had previously occurred significantly decreases the time interval for males to display penile erections (Sachs and Garinello, 1978). Based on this knowledge, it seemed reasonable to expect that sexual experience would lead to an increase in the number of Fos immunoreactive neurons within the mPOA in males and in the VMH in females. It was predicted that trained rats would participate more frequently in sexual behavior within a given period of time, and as a result, would express greater amounts of c-fos post-copulatory behavior. The inexperienced rats were anticipated to spend more time investigating their sexual partners as well as their environment as opposed to actually participating in sexual behavior. This ultimately would result in less c-fos being expressed within the critical forebrain structures of the female and male rat.

Method

Animals

24 Sprague-Dawley rats (purchased from Charles River Laboratory) were used throughout the entire protocol of this experiment. The data that was analyzed from the present study involved a test using 16 of the 24 total rats. There were 12 male rats used in the current experiment, 8 of which were intact males, and 4 were castrated. The male rats, approximately 400-600 grams in weight, were all less than six months in age. All 12 females used throughout the procedure were ovariectomized (OVX), approximately 300-500 grams in weight and less than 6 months in age. Each rat was housed in an individual plastic tub, in a reversed light/dark cycle 12:12. The animal was housed in a vivarium at a temperature of 22° C, with food and water freely available. Sexual receptivity was induced using the standard regime in the female rats (OVX) via a hormone treatment that consisted of a subcutaneous injection of 2 μg estradiol benzoate 48 hours prior to each test, followed by a subcutaneous injection of progesterone (.5mg) 4-5 hours before each test.

Tests for Sexual Behavior

One week prior to the actual test day, sexually experienced intact male rats (n=4) had their sexual behavior compared to sexually inexperienced castrated male rats (n=4). In addition, the sexual behavior of sexually inexperienced non-hormonally treated OVX female rats (n=4) was compared to that of four sexually experienced hormonally treated OVX female rats (n=4). Both groups of males were given a 15-minute habituation period allowing them to adapt to the environment. Following this habituation period, a hormonally or non-hormonally treated OVX female rat was introduced to the environment. The hormonally treated female rats (OVX) were chosen to participate during the actual test, a week later, as the sexually experienced female group. The intact sexually experienced males were also used, as a sexually experienced group, in the following week's experiment from which data was obtained and analyzed. The male was allowed 10 mounts or 30 minutes with a female, while simultaneously both female and male had their sexual behavior graded based on their receptivity to copulatory behavior.

On the actual test day, males were assigned to one of two groups: intact males with previous sexual experience (n=4) and intact males with no previous exposure to females (n=4). Both groups were placed in an environment that was used in the previous week's comparison study for a habituation period of 15 minutes. The female rats were also divided into two groups: one consisting of OVX hormonally treated rats with previous sexual experience (n=4) and the other consisting of OVX non-hormonally treated rats with no previous exposure to males (n=4). Both groups of female rats were introduced into the environment following the male rat's habituation period. The female rat's sexual behavior was assessed based on receptivity for 10 mounts. The male rat's sexual behavior was monitored for 30 minutes. The 2 rats were left in this environment for a total of one hour, where the intact males were allowed full access to the female rat.

Perfusion

Immediately after the sexual behavior test the rats were anesthetized using pentobarbital (200 mg/kg i.p.), treated intracardially with 1mL of heparin to prevent blood clots, and perfused intracardially with 50 mL of saline followed by 200 mL of 4% paraformaldehyde. Brains were removed and stored in a refrigerated 20% succrose/.1M sodium phosphate buffer for a period of 1 week.

Sectioning and Histology

One week following the original test day coronal sections were cut at 40 μm using a cryostat and collected for both male and female rats. Subsequently the sections were prepared for measuring Fos immunoreactivity. (For procedure see: Robertson, G. S., Pfaus, J. G., Atkinson, L. J., Matsumura, H., Phillips, A. G., and Fibiger, H. C. 1991 Sexual behavior increases c-fos expression in the forebrain of the male rat. Brain Research, 564, 352-357)

Computer Analysis

Ensuing the staining procedure, the brain sections were analyzed using the computer software ImageJ and Mayachitra imago. Using this software, the quantity of Fos immunoreactive neurons was determined, the total area (in pixels) and density (count per pixel) were also reported.

Results

Following sexual behavior, the induction of Fos-IR was measured in the mPOA of the 2 male rat groups. The descriptive statistics for the sexually experienced male rats that participated in 1-hour of copulatory behavior prior to perfusion depicted a mean Fos-IR count (the number of Fos immunoreactive neurons) of 263.5000 ± 36.65492 (SEM). The mean Fos-IR count for the inexperienced male rats exposed to the same conditions was 28.7500 ± 15.98632. Fos-IR was also measured in the VMH for the 2 female rat groups. The mean for the sexually experienced female rats showed a mean Fos-IR count of 153.0000 ± 34.21257. Inexperienced female rats under the same conditions had a mean Fos-IR count of 38.2500 ± 22.79757.

A one-way ANOVA test was used to evaluate the effect of sexual experience on c-fos expression in the mPOA (males) and VMH (females). The present study showed there to be a significant main effect of sexual experience on Fos immunoreactivity within the mPOA of male rats postcopulatory behavior, $F_{1,6}=34.46062, p<0.05$. This study also revealed a significant main effect of sexual experience on Fos-IR in the VMH of female rats following sexual behavior, $F_{1,6}=7.79040$, $p<0.05$.

Discussion

The results of this study were consistent with the hypothesis presented. Sexual experience in male rats was found to have increased the number of Fos immunoreactivte neurons within the mPOA. In addition, sexual experience in female rats (OVX) was observed to augment the number of Fos immunoreactive neurons in the VMH. The literature relevant to this topic supports the finding presented within this paper.

Rats depict a pattern of sexual behavior that has been appropriately described as "opportunistic," as they will copulate under a variety of circumstances. Unlike the relative uninterrupted intervals of copulation that results in an orgasm in humans, rat copulation consists of bouts of intromissions coupled with a sequence of multiple ejaculations. The male rat's ability to gain intromission is completely dependent on the willingness of a sexually responsive female (Pfaus, Kippin& Centeno, 2001). Using a female rat for a sexual behavior study that was not primed with an estradiol/progesterone treatment has been reported to result in increased intromission and mount latencies on the part of the male (Pfaus, 1996). This evidence supports the data that was collected in the present study. Sexually experienced female rats (OVX), primed for copulatory behavior, participated more often in sexually related behavior as reflected by the Fos-IR data. The present study did not distinguish if the increased Fos-IR in the VMH of sexually experienced female rats was due to the estradiol/progesterone priming treatment or due to previous exposure to male rats. A future study may involve determining which condition, sexual experience or hormonal priming, more directly increases sexual activity based on the Fos-IR observed within the female rat VMH following copulation.

Previous studies suggest copulatory experience of having a pronounced effect on sexual behavior and reproductive processes within male rats. When compared to sexually inexperienced males, sexually experienced males have been shown to possess larger testes (Drori & Folman, 1964), heavier penises (Herz, Folman, & Drori, 1969), as well as increased secretions from auxiliary sex glands (Drori & Folman, 1964). Similar to its role in physiological change, sexual experience has been observed to alter behavior in the male rat that is specific for copulation. One such behavior displayed by intact sexually experienced males was the ability to preferably select odors specific to receptive female over those of sexually non-receptive females. This differed from sexually inexperienced males, as they do not display a significant bias based on olfactory cues for receptive or non-receptive females (Carr, Loeb & Dissinger, 1965; Carr, Loeb & Wylie, 1966). The literature suggests male rat copulation can be also affected by context. Sexually naïve males are more sensitive to the unfamiliarity of a testing situation and as a result will display longer mount and intromission latencies, whereas sexually experienced males are not susceptible to the same disruptive effects of novelty stress on copulation and will respond immediately to the presentation of a sexually receptive female with the initiation of copulation. Sexually inexperienced males, exposed to similar novelty conditions, will ignore a sexually receptive female for a long period of time (Pfaus & Wilkins, 1995). Lastly, male rats with sexual experience have been shown to respect female sexual resistance and will either actively search for another available female or cease copulation completely (Pfaus, 1996). These studies suggested that sexually experienced male rats would spend more time participating in copulation, as opposed to non-sexually experienced male rats in the presence of a sexually receptive female. The results of the present study, regarding the quantity of Fos-IR neurons in the mPOA of male rats, confirm the observations reported in the literature. Previous studies indicate that sexual experience in the male rat increase subsequent sexual

performance thus increasing the amount of sexual activity during a period of copulatory behavior has been shown to directly result in the escalation of the quantity of c-fos expressed within the mPOA of the male rat brain. A male rat's sexual experience not only induces change in physiological structures responsible for integrating sensory informational cues that proceeds sexual activity but in observable behavioral characteristics specific for sexual performance as well. Sexual experience in the male rat ultimately increases an individual's sexual performance during copulatory behavior, for it decreases mount and intromission latencies when compared to the copulatory activity of sexually naïve rats.

The current study indicates the male rat can learn when it is necessary to inhibit sexual advances when faced with a sexually nonresponsive female in an efficient manner based on prior experience. These results challenge the notion that rats cannot serve as a human model for sexual behavior because of a lack of advanced cognitive control of sexual behavior. In fact, rats that were sexually experienced displayed increased levels of sexual performance due to the fact they had acquired behavior specific for copulatory activity. In particular, behavior such as increased ability to differentiate between sexually receptive and non-sexually receptive females and the inability to be affected by the context of an experimental environment amongst the presence of a receptive female are examples of two behavioral traits observed in sexually experienced male rats that would increase their sexual performance and ultimately manifest in an increase in c-fos expression in the mPOA. Using rats as a model for sexual behavior, a future study may investigate administering increasing doses of alcohol to male rats to assess how coital performance is affected by alcohol as a central nervous system depressant. By using c-fos activation as a means of metabolically marking the poly-synaptic pathway involved in copulatory behavior, it would be possible to examine the difference in synaptic activation histologically as well as quantitatively between groups of rats treated with alcohol and those who are not and compare it to their sexual performance. A measurement of Fos IR cells, as such, may provide insight to the afferent and efferent connections of the mPOA and indicate their importance in the integration of sexual and hormonal cues in the male rat. The behavioral aspect of this study could investigate alcohol's effects on sexual performance within experienced male rats and determine if there exists a similar relationship between alcohol consumption and its behavioral effects on male human sexual function.

References

Baum, M. J., and Everitt, B. J. 1992. Increased expression of c-fos in the medial preoptic area after mating in male rates: Role of afferent inputs from the medial amygdala and midbrain central tegmental field. ***Neuroscience, 50***, 627-646.

Bitran, D., and Hull, E. M. 1987. Pharmacological analysis of male rat sexual behavior. ***Neuroscience Biobehavior Review, 11***, 365-389.

Carr, W. J., Loeb, L. S., and Dissinger, M. L. 1965. Responses of rats to sex odors. ***Journal of Comparative Physiological Psychology, 59***, 370-377.

Carr, W. J., Loeb, L. S., and Wylie, N. R. 1966. Responses to feminine odors in normal and castrated male rats. ***Journal of Comparative Physiological Pyschology, 62***, 336-338.

Coolen, M. L., Peters, H. J. P. W., and Veening, J. G. 1996. Fos immunoreactivity in the rat brain following consummatory elements of sexual behavior: a sex comparison. ***Brain Research, 738***, 67-82.

Drori, D. and Folman, Y. 1964. Effects of cohabitation on the reproductive system, kidneys, and body composition of male rats. ***Journal of Reproductive Fertilization, 8***, 351-359.

Everitt, B. J., and Stacey, P. 1987. Studies of instrumental behavior with sexual reinforcement in male rats (rattus norvegicus): II. Effects of preoptic area lesions, castration, and testosterone. ***Journal of Comparative Psychology, 101***, 407-419.

Goodwin, F. K. 1971. Psychiatric side effects of levodopa in man. ***The Journal of the American Medical Association, 218***, 1915-1920.

Graybiel, A. M., Moratalla, R., and Robertson, H. A. 1990. Amphetamine and cocaine induce drug-specific activation of the c-fos gene in striosome-matrix compartments and limbic subdivisions of the striatum. ***Proceedings of the National Academy of Sciences of the United States of America, 87***, 6912-6916.

Herz, Z. Y., Folman, Y., and Drori, D. 1969. The testosterone content of the testes of mated and unmated rats. ***Journal of Endocrinology, 44***, 127-128.

Hunt, S. F., Pini, A., and Evan, G. 1987. Induction of c-fos-like protein in spinal cord neurons following sensory stimulation. ***Nature, 328***, 632-634.

Liu, Y. C., Salamone, J. D., and Sachs, B. D. 1997. Lesions in medial preoptica area and bed nucleus of stria terminalis: differential effects on copulatory behavior and noncontact erection in male rats. ***The Journal of Neuroscience, 17***, 5245-5253.

Mathews, D., and Edwards, D. A. 1977. The ventromedial nucleus of the hypothalamus and the hormonal arousal of sexual behaviors in the female rat. ***Hormones and Behavior, 8***, 40-51.

Morgan, I., and Curran T. 1989. Stimulus-transcription coupling in neurons: role of cellular immediate-early genes. ***Trends in Neuroscience, 12***, 459-462.

Nakajima, T., Daval, J. L., Morgan, P. F., Post, P. M., and Murangos, P. L. 1989. Adenosinergic modulation of caffeine-induced c-fos mRNA expression in mouse brain. ***Brain Research, 501***, 307-314.

Okada, R., Watanabe, H., Yamanouchi, K., and Arai, Y. 1980. Recovery of sexual receptivity in female rats with lesions of the ventromedial hypothalamus. ***Experimental neurobiology, 68***, 595-600.

Pfaus, J. G. 1996. Homologies of animal and human sexual behavior. ***Hormones and Behavior, 30***, 187-200.

Pfaus, J. G., and Phillips, A. G. 1989. Differential effects of dopamine receptor antagonists on the sexual behavior in male rats. ***Psychopharmacology, 98***, 363-368.

Pfaus, J. G. and Wilkins, M. F. 1995. A novel environment disrupts copulation in sexually naïve but not experienced male rats: Reversal with naloxone. ***Physiological Behavior, 57***,1045-1049.

Pfaus, J. G., Kippin, T. E., and Centeno, S. 2001. Conditioning and sexual behavior: a review. ***Hormones and Behavior, 40***, 291-321.

Pfasus, J. G., Kleopoulos, C. V., Mobbs, C. V., Gibbs, R. B., and Pfaff, D. W. 1993. Sexual stimulation activates c-fos within estrogen-concentrating regions of the female rat forebrain. ***Brain Research, 624***, 253-267.

Robertson, G. S., Pfaus, J. G., Atkinson, L. J., Matsumura, H., Phillips, A. G., and Fibiger, H. C. 1991. Sexual behavior increases c-fos expression n the forebrain of the male rat. ***Brain Research, 564***, 352-357.

Sachs, B. D., and Garinello, L. D. 1978. Interaction between penile reflexes and copulation in male rats. ***The Journal of Comparative of Physiological Psychology, 92***, 759-767.

Sagar, S. M., and Sharp, F. R. 1990. Light induces a Fos-like nuclear antigen in retinal neurons. ***Molecular Brain Research, 7***, 17-21.

Sagar, S. M., Sharp, F. R., and Curran, T. 1988. Expression of c-fos protein in the brain: metabolic mapping at the cellular level. ***Science, 240***, 1328-1331.

Uitti, R. J., Tanner, C. M., Rajput, A. H., Goetz, G. C., Klawans, H. L., and Theissen, B. 1989. Hypersexuality with antiparkinsonian therapy. ***Clinical neuropharmacology, 12***, 37-383.

Getting to know: *Kristen Kim*

Biography

Kristen Kim is currently a senior at Princeton University working towards an A.B. degree in psychology and a certificate in East Asian Studies. She plans to pursue a career in psychiatry and hopes to attend medical school in the near future.

Q&A

What sparked your interest in psychology?
I wanted to explore the complexities of the human mind. I also wanted to learn more about mental health issues from the perspective of clinical psychology.

What led you to this topic?
I always found it impressive that so many students at Princeton University decide to study abroad, either as international students or students participating in semester or summer study abroad programs. I was curious to learn what qualities might enable them to thrive in settings outside their comfort zones.

Did you have a mentor and how did you get involved with him/her?
Yes, I worked closely with Professor Nicole Shelton on this project. I joined her "JP lab" to work with her and other students doing projects related to interpersonal attraction and rejection.

How long have you been working on this paper?
What has the process been like for you? I wrote this paper for my fall term junior paper so I worked on it for about a semester. I picked it up again when it was accepted to this journal and spent the last couple of months editing it in preparation for publication. This process has provided me with a valuable glimpse into the world of academia.

What was it like to be an undergraduate student completing your own research project?
It was a rewarding experience that deepened my appreciation for psychological research.

Distance from Home, Study Abroad Experience, and Rejection Sensitivity

Kristen Kim
Princeton University

The current study examines how college students' distance from home and study abroad experience relate to their sensitivity to social rejection. The hypothesis was that students who attend school farther from home or have experience studying abroad would have lower rejection sensitivity, and that these relationships could be explained by greater attachment security. The participants included 122 Princeton University undergraduates, twenty of whom had study abroad experience. While the distance between the students' homes and college did not predict rejection sensitivity, the results indicated that greater study abroad experience was related to lower rejection sensitivity. This correlation, however, could not be explained by attachment security. Further research is necessary to clarify the causal directionality and mechanisms behind this relationship.

For many emerging adults, college is a time of leaving home and venturing out into the world at large. College students often explore new social environments by attending schools far away from home or by participating in study abroad programs. At Princeton University, where the current study was conducted, eleven percent of the total undergraduate student body consists of international students attending college outside of their home countries (The Trustees of Princeton University, 2011). An additional approximate eighteen percent of students choose to participate in the school's diverse study abroad programs. Because emerging adulthood (ages 18 to 25) is a stage of life during which individuals learn to develop intimate relationships, both in friendship and love, it is important to study the implications of exploring new social settings during these years (Arnett, 2000).

According to attachment theory, children develop lasting mental models of themselves and of others based on early experiences with their caregivers (Bowlby, 1969, 1973, 1980, as cited in Downey & Feldman, 1996; Hazan & Shaver, 1987). Children who consistently experience acceptance from their caregivers develop a secure working model of relationships. Securely attached children are able to explore new social settings because they rely on their caregivers as a secure base (Ainsworth, Blehar, Waters, & Wall, 1978). If such an attachment style persists into adulthood, securely attached adults can continue to explore and thrive in new social settings. Thus, it is possible that secure attachment enables emerging adults to explore new environments during their college years.

Significant attention has been given to adult attachment styles and the ways in which they impact relationship tendencies (e.g., Ainsworth, 1989; Bartholomew & Horowitz, 1991; Feeney & Noller, 1990). Bartholomew and Horowitz (1991) developed a four-category model for attachment styles among young adults that include one secure style (comfortable with intimacy and autonomy) and three insecure styles: preoccupied (preoccupied with relationships), dismissing (dismissing of intimacy and counter-dependent), and fearful (fearful of intimacy and socially avoidant). Although individuals rarely fall perfectly into only one of these, the categories nonetheless are useful in describing how individuals are inclined to view themselves and others. For instance, secure individuals are those who have positive self-regard and do not avoid intimacy with others as a result of expectations of rejection or other negative consequences. They are more likely to see themselves as friendly and good-natured, and to view others as well-intentioned, reliable, and trustworthy, which in turn facilitates healthier relationships (Hazan & Shaver, 1987; Simpson, 1990). Individuals with high adult attachment security are also more likely to experience greater interdependence, commitment, trust, and satisfaction in romantic relationships (Simpson, 1990).

On the other hand, insecure individuals either require others' acceptance for positive self-regard or avoid close contact with others, which makes it difficult to develop and maintain healthy relationships (Bartholomew & Horowitz, 1991). These individuals have higher levels of rejection sensitivity, which is defined as generalized expectations and anxiety about whether significant others (i.e., family, friends, or lovers) will meet or reject one's needs for acceptance (Downey & Feldman, 1996). Rejection-sensitive individuals anxiously expect, readily perceive, and overreact to rejection. For example, they are more likely to incorrectly perceive others' ambiguous words or behaviors as rejecting because they are oriented to expect rejection instead of acceptance. This false perception of rejection can then lead to detrimental consequences such as hostility, dejection, emotional withdrawal, and jealousy, and can ultimately place relationships with significant others in jeopardy.

Based on this wealth of research, the current study examines how emerging adults' exploration of new social settings during college is related to their social development. The overarching hypothesis is that emerging adults who choose to attend college at greater distances from home or to study abroad tend to be less sensitive to rejection, and that this can be explained by their greater attachment security. Although this research is based on

correlations and thus will not provide the causal directionality of these hypothesized relationships, it serves as the first step in identifying the existence and nature of these associations.

Method

Participants

The participants were Princeton University undergraduate students of at least 18 years old. The participants consisted of 122 students (81 females and 41 males). Nearly half the participants were White/Caucasian (49.2%) and the remaining participants were Asian (30.3%), African American (8.2%), Hispanic (8.2%), or of another race or ethnicity (4.1%). The participants represented students from all classes: freshmen (39.3%), sophomores (21.3%), juniors (22.1%), and seniors (17.2%). Twenty of the students (16.7%) studied abroad (in a country other than the one they indicated as their "home") for at least one full semester (12 weeks). Study abroad students included both Princeton international students and those who participated in Princeton's study abroad programs. Participants received no compensation for their participation.

Materials

Distance from home rating: Actual and subjective. Participants completed a questionnaire regarding their distance from home. The questionnaire addressed both the participants' actual and subjective distance from the place that they consider their home. Actual distance from home was coded on a 4-point scale according to regions of the United States (1 = Northeast, 2 = Southeast and Middle West, 3 = West, Southwest, Alaska, and Hawaii, 4 = Outside US; See Figure 1). Two participants did not indicate a specific place they considered home and their data were excluded from all analyses involving the "actual distance from home" measure. The participants also rated their subjective distance from home, or how far they feel from home, on a 7-point scale (1 = Not far and 7 = Very far).

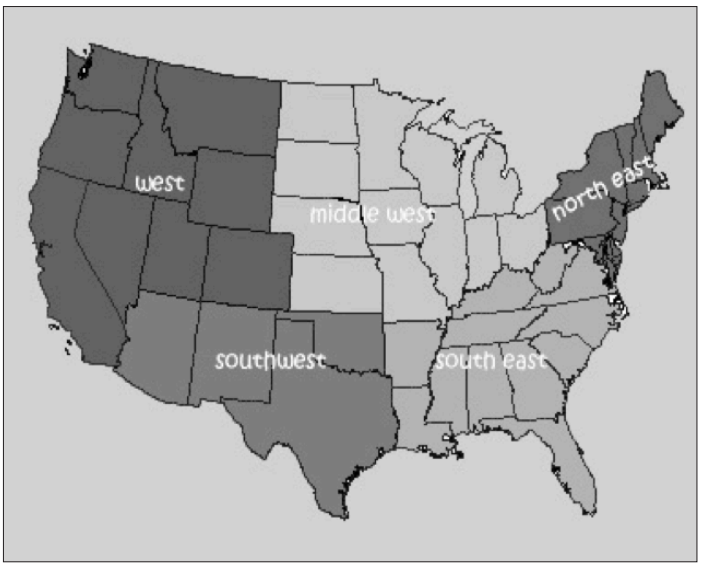


Figure 1. *Regions of the United States*
Retrieved from: http://teach.fcps.net/trt14/US%20Regions/usregions.htm

Study abroad experience rating. Participants also stated whether or not they have had experience studying abroad either in college or before, and if so, where and for how long their experience was. The participants who indicated that they studied abroad for at least one semester (12 weeks) and international students who are studying abroad by attending college away from their home country were coded as having study abroad experience; those who did not indicate they studied abroad, or studied abroad for less than one semester, were coded as not having study abroad experience.

Adult attachment security rating. The Relationship Questionnaire (RQ), which was originally developed by Bartholomew and Horowitz (1991), was used in the current study to determine participants' level of adult attachment security. Participants read the descriptions of four different attachment styles (security, preoccupation, dismissing-avoidance, and fearful-avoidance) and then ranked how much they agreed or disagreed with each of the descriptions on a 7-point scale (1 = disagree strongly and 7 = agree strongly). The participants' attachment security rating was their level of agreement with the description for attachment style A, or "security": "It is easy for me to become emotionally close to others. I am comfortable depending on them and having them depend on me. I don't worry about being alone or having others not accept me."

Rejection sensitivity rating. The Rejection Sensitivity Questionnaire (RSQ), which was originally developed by Downey and Feldman (1996), was used to determine the participants' sensitivity to rejection. The questionnaire contained eight items that asked for participants' imagined reactions to social situations common to college students. The Cronbach's alpha for internal consistency for the eight items was an acceptable value of .770. The scenarios involved the possibility that the participant would experience rejection from their boyfriend/girlfriend, peers, or parents. For example, one scenario involving a potential rejection from a boyfriend/girlfriend stated, "You call your boyfriend/girlfriend after a bitter argument and tell him/her you want to see him/her." One scenario involving a potential rejection from a friend stated, "You approach a close friend to talk after doing or saying something that seriously upset him/her." And one scenario involving a potential rejection from parents stated, "After graduation, you can't find a job and ask your parents if you can live at home for a while."

After reading the description of each situation, the participants answered the following questions: (1) How concerned or anxious would you be about how the other person would respond? (2) How do you think the other person would be likely to respond? The participants rated their level of concern on a 6-point scale (1 = not concerned and 6 = very concerned) and their expectancy of acceptance on a 6-point scale (1 = unlikely and 6 = likely). A score of rejection sensitivity for each situation

was calculated by multiplying the level of rejection concern (the response to question 1) by the reverse score of the level of acceptance expectancy (so, for example, a score of 6 reverses to 1, 5 reverses to 2, and so on) (the response to question 2). A composite rejection sensitivity score was obtained for each participant by computing the mean score for the eight situations.

Procedure

The current study examines the relationship between distance from home and rejection sensitivity as well as the relationship between study abroad experience and rejection sensitivity. Participants were recruited through emails sent to various student group email lists. The emails contained a link to an online questionnaire. When the participants responded to the invitation to participate in the study, they were presented with a consent form and a questionnaire regarding basic demographic information, actual and subjective distance from home, and study abroad experience. The students were then presented with the RQ and RSQ. The order that the RQ and RSQ were presented was randomized among participants. Finally, the participants were presented with a debriefing form including a more detailed explanation on the current study and an opportunity for them to withdraw their data from the study.

Results

Distance from home analysis

Pearson product-moment correlation coefficients were computed to assess the relationship between distance from home, both subjective and actual, and rejection sensitivity. There was neither a significant correlation between actual distance from home and rejection sensitivity ($r = -.078$, $n = 120$, $p = .397$), nor between students' subjective distance from home and rejection sensitivity, ($r = .119$, $n = 122$, $p = .190$). Because these data failed to support the primary relationship predicted about distance from home and rejection sensitivity, further analysis to determine the role of attachment security was not necessary.

It is worthy to note that the correlation between actual distance from home and subjective distance from home was not significant ($r = .468$, $n = 120$, $p = 1.66$). In other words, the students' objective distance from home did not necessarily correspond to their subjective perception of their distance from home.

Study abroad experience analysis

Pearson product-moment correlation coefficients were also computed to assess the relationship between study abroad experience and rejection sensitivity. Consistent with the hypothesis, there was a moderate negative correlation between study abroad experience and rejection sensitivity ($r = -.320$, $n = 122$, $p < .01$). This data indicated that students with study abroad experience tended to have lower rejection sensitivity scores. Students with greater attachment security scores tended to have lower rejection sensitivity ($r = -.322$, $n = 122$, $p < .01$), but there was no significant relationship between study abroad experience and attachment security ($r = .150$, $n = 122$, $p = 0.099$). Therefore, although study abroad experience and attachment security independently correlated with rejection sensitivity, the hypothesis that attachment security acts as the explanation for the relationship between study abroad experience and rejection sensitivity did not hold.

Discussion

The current study tested the hypothesis that distance from home and study abroad experience negatively correspond to rejection sensitivity among college students, and that this relationship can be explained by attachment security. However, neither students' actual distance nor subjective distance from home was significantly associated with rejection sensitivity, so the relationship between distance from home and rejection sensitivity was not supported. There also existed no significant relationship between actual and subjective distance, meaning that individual differences exist in the perception of distance from home. For example, two students from the same region may have disparate ratings for how far they feel from home because of differences between the individuals' personalities and previous experiences traveling away from home.

One potential reason that the predicted relationship between distance from home and rejection sensitivity was not confirmed may be that this relationship is rendered insignificant in the face of other more important considerations involved in college decisions. For example, individuals may place greater weight on qualities, such as the cost of tuition, academic resources, or athletics, than on location when determining which college to attend. Therefore, although there may exist a relationship between the distance one wishes to travel outside of one's comfort zone and one's level of rejection sensitivity, the distance that one actually ends up traveling to college may not reflect this relationship.

The results, however, supported the hypothesis regarding the relationship between study abroad experience and rejection sensitivity. The moderate negative correlation between the two measures indicates that students who study abroad during their college years tend to have lower rejection sensitivity. This suggests that students who study abroad are better at dealing with rejection from significant others and may consequently enjoy healthier and more satisfying relationships. However, contrary to the original hypothesis, there was no relationship found between study abroad experience and attachment security. Attachment security did not explain the relationship between study abroad experience and rejection sensitivity.

Further research on the potential causal relationship between study abroad experience and rejection sensitivity is warranted. The hypothesis assumed that people are willing to study abroad because they have secure attachment and low rejection sensitivity. However, it is possible that studying abroad serves as an experience that stimu-

lates social growth and contributes to students' ability to deal with rejection. For example, research has found that students who study abroad report increased levels of international political concern, cross-cultural interest, and cultural cosmopolitanism (Anderson, Lawton, Rexeisen, & Hubbard, 2006; Carlson & Widaman, 1988). Students who decide to travel abroad may not necessarily be better at dealing with rejection prior to their trip, but by experiencing new settings and meeting different people, they may gain new attitudes that help them become more capable of developing intimate bonds with others. A future study could compare questionnaires on rejection sensitivity before and after their study abroad experience to clarify the direction of the relationship.

On a broader scope, these findings can help schools and other organizations in designing better study abroad programs and also adjustment programs for international students. As colleges aim to build up competent leaders for a globalizing world, opportunities to travel abroad will become increasingly prevalent. Because emerging adulthood is a critical time for individuals' social development, it is important to understand the advantages and disadvantages of spending significant periods of time away from home during these years.

Acknowledgements

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References

Ainsworth, M. (1989). Attachments beyond infancy. *American Psychologist, 44*, 709-716.

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). Patterns of attachment: a psychological study of the strange situation. Hillsdale, NJ: Erlbaum.

Anderson, P. H., Lawton, L., Rexeisen, R. J. and Hubbard, A. C. (2006). Short-term study abroad and intercultural sensitivity: A pilot study. *International Journal of Intercultural Relations, 30*, 457-469.

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist, 55*, 469-480.

Bartholomew, K. and Horowitz, L. M. (1991). Attachment styles among young adults: A test of a four-category model. *Journal of Personality and Social Psychology, 61*, 226-244.

Carlson, J. S. & Wildaman, K. F. (1988). The effects of study abroad during college on attitudes towards other cultures. International *Journal of Intercultural Relations, 12*, 1-17.

Downey, G. and Feldman, S. I. (1996). Implications of rejection sensitivity for intimate relationships. *Journal of Personality and Social Psychology, 70*, 1327-1343.

Feeney, J.A. and Noller, P. (1990). Attachment style as a predictor of adult romantic relationships. *Journal of Personality and Social Psychology, 58*, 281-291.

Hazan, C. and Shaver, P. (1987). Conceptualizing romantic love as an attachment process. *Journal of Personality and Social Psychology, 52*, 511-524.

Simpson, J.A. (1990). Influence of attachment styles on romantic relationships. *Journal of Personality and Social Psychology, 59*, 971-980.

The Trustees of Princeton University (2011, September 7). Undergraduate Admission and Enrollment. Retrieved from http://www.princeton.edu/pub/profile/admission/undergraduate

Getting to know: *Thomas Schleicher*

Biography

Thomas Schleicher is an undergraduate research assistant for Dr. Berkley-Patton at the University of Missouri-Kansas City. He is expecting to graduate with honors in May of 2013 with a double major in Psychology and Philosophy. After graduation, he hopes to pursue a doctorate in Psychology.

Q&A

What sparked your interest in psychology?

Even as a child I have always been interested in psychology, but what truly sparked my interest was what I learned in the psychology course I took with Professor Steve Schuetz back at the University of Central Missouri.

What led you to this topic?

While entering data for Dr. Berley-Patton's survey, I wondered whether those who were giving wrong answers for the HIV knowledge questions were the same people that had high sigma towards those with HIV. I asked Erin Moore some of these questions, and she suggested that I write a paper about it.

Did you have a mentor and how did you get involved with him/her?

In addition to Dr. Berley-Patton's patronage, Erin has been a huge influence on me. Without her invaluable support and assistance with this project, I never could have completed it.

How long have you been working on this paper? What has the process been like for you?

I've been working on this paper for over a year now, and it's been quite the experience. I've certainly had to learn some patience in the intervening year.

What was it like to be an undergraduate student completing your own research project?

It was very exciting. Before I started working on this project, I had been dreading the research that would be involved with graduate school. Thanks to this project, I learned how much I enjoy working on research.

HIV Stigma and Knowledge in the African American Church Community

Thomas Schleicher
University of Missouri-Kansas City

HIV is a significant problem among African Americans, a population that represents 44% of new HIV cases each year. Previous research has shown the effectiveness of the African American church in implementing health interventions for African Americans. Yet, as more studies begin to address HIV in the African American church, there is limited research on exploring HIV stigma and knowledge in this setting. Previous studies have shown the relationship between HIV knowledge and stigma. The detrimental effects of HIV stigma and knowledge on prevention of HIV have also been shown. This paper used survey data from 538 African American church affiliates to study how HIV knowledge and HIV-related stigma variables (e.g., fear of HIV-positive people, belief that HIV-positive people are responsible for their illness) are related to demographic variables (e.g., sex, age, education), religiosity, and HIV testing. Males and older age were found to be associated with beliefs that people with HIV are responsible for their illness. Higher participation in formal practices of religiosity (e.g., church attendance, reading scripture, meditation) was correlated with not trusting scientists to be truthful about HIV and with lower confidence in being tested for HIV. Formal practices of religiosity and non-heterosexual orientation were found to be associated with lower levels of HIV knowledge. This study's findings can be used to develop comprehensive HIV stigma messages to enhance church-based HIV intervention components for the African American.

Human immunodeficiency virus (HIV) has been a significant health concern in the United States since the 1980s (Centers for Disease Control and Prevention [CDC], 2012). HIV impacts the immune system's ability to fight diseases in the body, and is primarily transmitted through sexual contact and contaminated needles. Advanced HIV infection leads to development of acquired immune deficiency syndrome (AIDS), diagnosed when the person's immune system has been severely compromised. Without early diagnosis and proper management with medication, HIV infection results in developing numerous other illnesses, such as cardiovascular disease, liver and kidney disease, and cancer. Those infected often show few to no symptoms early on, resulting in a lack of screening for those at risk.

Through 2010, it is estimated that 636,048 people with an AIDS diagnosis had died in the United States (CDC, 2013a). Prevalence data available up to 2009 noted that of those who had died with an AIDS diagnosis, more than 250,000 were African Americans (CDC, 2013b). According to the CDC (2013), in 2010 African Americans made up only 12-14% of the United States population but accounted for 44% of all new HIV infections in the United States. Because African Americans have been affected so disproportionately by HIV/AIDS, it is essential to increase efforts to reduce HIV transmission and promote HIV screening among African Americans.

Churches are an important aspect of African American culture. A national study by the Pew Forum on Religion and Public Life (2007) found that 59% of African Americans attend church once a week or more. African American churches have historically had a strong influence on the African American community concerning spiritual, social, and public health issues (Berkley-Patton et al., In Press). In particular, the church has addressed health issues through existing church activities, such as preaching, church education classes, and health promotion programs (Khosrovani, Poudeh, & Parks-Yancy, 2008; Muturi & Soontae, 2010). Studies have shown that the African American church is a practical setting for addressing health issues related to HIV (Berkley-Patton et al., 2010; Derose et al., 2010). Khosrovani et al. (2008) surveyed an African American church population in Texas, and 90% believed that the churches must get involved in educating the public about HIV/AIDS.

HIV-related stigma is considered one of the major barriers for developing effective HIV prevention and care programs in the general population (Herek, Capitanio, & Widaman, 2002; Reidpath & Chan, 2005) and in the African American church (Berkley-Patton et al., In Press; Fullilove & Fullilove, 1999). Deacon (2006) defined stigma as a complex social process involving blame placed on a specific group for having a preventable or controllable illness with a cause that is identified by society as being taboo. These groups then experience perceived status loss in society, which could lead to discrimination. Fear of being stigmatized has been found to prevent individuals from seeking HIV testing, disclosing their HIV status, and seeking treatment (Sengupta et al., 2011). Indeed, to expand HIV prevention and testing in the African American community, particularly in churches, HIV-related stigma will need to be better understood and addressed.

There are a number of personal demographic and belief factors that are related to HIV stigma. For example, Collani, Grumm, and Streicher (2010) found high levels of stigma to be associated with older age, negative attitudes towards homosexuality, and lower levels of contact with HIV positive persons. Herek et al. (2002) found that mistrust of HIV experts is related

to high HIV stigma. Muturi and Soontae (2010) found high religiosity and low levels of education to be predictors of HIV stigma in the African American community. One of the most consistent correlates of HIV stigma has been an inaccurate belief about HIV, especially about the transmission of HIV (Collani et al., 2010; Herek et al., 2002; Herek, Capitanio, & Widaman, 2005; Muturi & Soontae, 2010). Examples of inaccurate beliefs would include that HIV can be transmitted through casual contact such as sharing a drinking glass, through a cough or sneeze, (Herek et al., 2002) or that HIV could be transmitted between two individuals who do not have HIV (Herek et al., 2005).

Herek et al. (2005) found several predictors for correct and incorrect beliefs about HIV (HIV knowledge). They found that higher levels of education and higher income were predictors of accurate beliefs about HIV. They also found women to be more likely to have the false belief that HIV can be transferred between individuals without HIV. African Americans of both sexes were also more likely than non-African Americans to believe that HIV can be transmitted between two healthy individuals, even after controlling for income, mistrust of health experts, and education.

This study sought to explore the relationship between HIV stigma and HIV knowledge and the following personal factors: a) religiosity, b) HIV testing, c) perceptions about HIV, and d) demographics among African American church members and community members who used church outreach services (e.g., food pantries, social services).

Methods

Participants and Procedures

Participants aged 18 to 64 were recruited from four African American churches and their affiliated community outreach activities in the Kansas City metropolitan area. The original sample consisted of 542 participants; however, four participants were removed for not responding to any stigma items, resulting in a final sample of 538.

The majority of the sample was female (63.8%, n = 343), heterosexual (85.1%, n = 458), and had some form of insurance (72.5%, n = 390). The sample was more heterogeneous on education and income. A third 33.3% (n = 179) of the sample had only a high school education or lower, and (36.1%, n = 194) of participants had a college education or higher. In regards to income, 18.6% (n = 100) of the sample made less than $1,000 per month and 33.3% (n = 179) of the sample reported their monthly household income as greater than $3,000 per month. See Table 1 for a description of the sample and frequency values for all key variables.

Participants completed a survey after church services for the baseline stage of Taking It to the Pews (TIPS) project, an HIV education and screening intervention in African American churches. In order to ensure anonymity, no personal identifiers were collected during data collection. Participants received $10 upon completion of the survey, which took approximately twenty to thirty minutes. All study procedures were approved by the University of Missouri-Kansas City Institutional Review Board.

Measures

HIV-Related Stigma. Stigma was measured with five items adapted from national studies on HIV/AIDS stigma (Herek, 1999; et al., 2002). Stigma items included: "How comfortable would you be sharing a pew with an HIV positive person?" (labeled as "Comfortable"), "How strongly would you agree or disagree that HIV+ people are responsible for their illness?" (labeled as "Responsible"), "How strongly would you agree or disagree that scientists and doctors can be trusted to tell the truth about HIV?" (labeled as "Truth"), "How afraid are you of people who are infected with HIV?" (labeled as "Afraid"), and "If you were going to be tested for HIV, how concerned would you be that you might be treated differently or discriminated against if you test results were positive for HIV?" (labeled as "Concerned"). Participants responded using four-point Likert scales, with higher scores indicating higher stigma. These items had poor reliability as a scale (α = .36), so they were analyzed as separate items.

HIV Knowledge. Participants answered ten items regarding HIV knowledge (e.g., "A person can get HIV by using a cup or plate that has been used by a person with HIV/AIDS;" "It is possible to get HIV when a person gets a tattoo"), adapted from the HIV Knowledge Questionnaire, with response categories "true," "false," and "don't know" (Carey, Morrison-Beedy, & Johnson, 1997). Correct responses were coded as "1" and incorrect or do not know responses were coded as "0." All items were summed to create a sum score with higher scores indicating more knowledge.

Religiosity. Participants reported their church denomination. They then indicated whether they were a member of the church in which they completed the survey, and if yes, whether they had a leadership role in the church. Religious beliefs and behaviors were measured with a seven-item version of the Religious Background and Behavior (RBB; Connors, Tonigan, & Miller, 1996) scale on participants' engagement in church activities in the past year using an eight-point Likert scale (Never = 0 to More than once a day = 7) and one item regarding their description of their religiosity (atheist, agnostic, unsure, spiritual, religious). The RBB was examined by its subscales: God Consciousness (e.g., description, thought of God, prayed) and Formal Practices (e.g., meditation, attended a worship service, read scriptures or holy writings, had direct experiences with God).

HIV Testing. Participants were asked how many times they had been tested for HIV in their lifetime and how confident they were that they would be tested in the next 12 months on an 11-point Likert scale (0 = "Not confident I will get tested" to 10 = "Very confident I will get tested").

Perceptions About and Exposure to HIV Issues.

Participants completed an item that assessed their opinion of how serious HIV/AIDS was in their community, responding on a four-point Likert scale (0 = Not at all to 3 = Very serious). Participants also reported the number of people they knew who are infected with HIV. Finally, they reported whether their church had discussed the following five topics in the past six months: HIV/AIDS testing, how HIV/AIDS is transmitted, how to prevent HIV/AIDS, assessment of personal risk for HIV, and any other topics related to HIV/AIDS.

Demographics. Participants provided demographic information including age, sex, race, sexual orientation, relationship status, number of children, highest level of education, health insurance, and average monthly household income.

Data Analysis

Correlational analyses will be conducted with all continuous items (e.g., HIV stigma, HIV knowledge, age, religiosity, number of times tested for HIV, confidence in likelihood of future HIV testing, number of HIV positive people known) to identify the variables significantly correlated with stigma items and knowledge score. One-way analysis of variances (ANOVAs) and independent t-tests were conducted with categorical variables (e.g., sexual orientation, race, relationship status, education, health insurance, income, having children, church membership, opinion on seriousness of HIV, exposure to HIV topics in church) as the independent variables and stigma items and knowledge score as the dependent variables.

Results

Religiosity. There were two significant correlations: the stigma item Truth was positively correlated with Formal Practices and HIV knowledge was negatively correlated with Formal Practices, as shown in Table 2. There were no significant stigma or knowledge differences regarding the participants' religious denomination or whether the participant was a church member or a community member. There was a significant difference regarding church leadership and the stigma item Afraid, $t(351.07) = 2.79$, $p < .01$. Participants who had a leadership role in church were less afraid of those with HIV ($M = .44$, $SD = .72$) than those who did not have a leadership role ($M = .66$, $SD = .87$).

HIV testing. Confidence in likelihood of future testing was positively correlated with Knowledge, and the number of HIV positive people known was negatively correlated with the stigma item Responsible. See Table 2 for additional correlations.

Perceptions and exposure regarding HIV issues. There were no significant stigma or knowledge differences regarding whether one's church had talked about HIV/AIDS testing, how to prevent HIV/AIDS, or other topics related to HIV/AIDS. There was a significant difference regarding how serious one perceived HIV/AIDS to be and knowledge score, $F(3, 494) = 4.11$, $p < .01$. Participants who did not consider HIV/AIDS to be a serious issue at all had a lower knowledge score ($M = 5.82$, $SD = 2.52$) than those who perceived HIV/AIDS to be a somewhat serious issue ($M = 7.52$, $SD = 1.61$) or a very serious issue ($M = 7.59$, $SD = 1.66$).

There was a significant difference regarding whether one's church had talked about how to get HIV/AIDS and the stigma item Concerned, $t(491) = 2.55$, $p < .05$. Participants who reported their church had talked about HIV/AIDS transmission were less concerned that they would be treated differently or discriminated against ($M = 1.21$, $SD = 1.01$) than those whose church had not discussed HIV/AIDS transmission ($M = 1.52$, $SD = .99$). Additionally, there was a significant difference regarding whether one's church had talked about personal risk for HIV and the stigma item Comfortable, $t(515) = -2.14$, $p < .05$. Participants who reported their church had talked about personal risk for HIV were less comfortable sharing a pew with an HIV-positive person ($M = .91$, $SD = 1.15$) than those whose church had not discussed personal risk ($M = .65$, $SD = 1.03$).

Demographic factors. Age was negatively correlated with both the stigma item Responsible and with Knowledge and positively correlated with the stigma item Afraid. There was also a significant difference regarding one's sex and the stigma item Responsible, $t(526) = -2.50$, $p < .05$. More male participants ($M = 1.54$, $SD = .84$) strongly agreed that people with HIV were responsible for their illness than female participants ($M = 1.35$, $SD = .86$).). There were no significant stigma or knowledge differences found regarding race, relationship status, insurance, and parenthood.

There was a significant difference found in how much education one has attained and score on the stigma item Afraid, $F(4, 529) = 3.29$, $p < .05$. Participants who completed high school only were more afraid of people infected with HIV ($M = .79$, $SD = .90$) than those who had some graduate training or a graduate degree ($M = .43$, $SD = .71$). There was also a difference regarding how much education one attained and knowledge score, $F(4, 505) = 6.77$, $p < .001$. Those with only a high school degree had lower HIV knowledge ($M = 6.95$, $SD = 1.76$) than those who had some college or technical training ($M = 7.61$, $SD = 1.74$), had an associate's or bachelor's degree ($M = 7.74$, $SD = 1.59$), or had some graduate training or a graduate degree ($M = 8.01$, $SD = 1.25$).

There were significant findings regarding one's sexual orientation. There was a difference regarding sexual orientation and how comfortable a participant was with sharing a pew with an HIV-positive person, $F(4, 522) = 2.85$, $p < .05$; those who chose not to disclose their sexual orientation were less comfortable ($M = 1.26$, $SD = 1.21$) than those who identified as heterosexual ($M = .65$, $SD = 1.03$). There was also a difference with how afraid a participant was of people infected with HIV, $F(4, 520) = 4.52$, $p < .001$. Participants who chose not to disclose their sexual orientation were more afraid of HIV-positive individuals ($M = 1.00$, $SD = 1.10$) than those who identified as homosexual ($M = .70$, $SD = 1.25$) or bisexual ($M = .71$, $SD = 1.11$). Finally, there

was a difference in HIV knowledge and sexual orientation, $F(4, 496) = 8.99$, $p < .001$; those who identified as heterosexual had greater knowledge ($M = 7.65$, $SD = 1.65$) than those who identified as some other orientation ($M = 6.18$, $SD = 1.67$) or who chose not to disclose ($M = 6.16$, $SD = 1.74$).

There was a significant difference regarding one's income and the stigma item Afraid, $F(4, 469) = 4.34$, $p < .01$. Participants who made more than $3000 a month were less afraid of those with HIV ($M = .50$, $SD = .78$) than those who made $0-$1000 per month ($M = .81$, $SD = .99$) or $1001-$2000 per month ($M = .84$, $SD = .93$).

Discussion

In addressing religiosity, we determined that formal religious practices such as attending church and studying scripture were associated with low knowledge of HIV and with believing that scientists cannot be trusted to tell the truth about HIV. In order for HIV interventions to be more effective in the African American church setting, researchers should consider using a community-based participatory research approach, whereby African American church leaders and members are fully engaged in all phases of the intervention project (Israel, Eng, Schulz, & Parker, 2005). Their participation could greatly enhance delivery of accurate HIV information in church settings and receptivity of such information by church members and community members who use church outreach services (Berkley-Patton et al., In Press). Future research should further explore how church leaders and members can serve as interventionists in church-based intervention planning and implementation and the effectiveness of their participation assisting in reducing HIV stigma and increasing HIV knowledge.

This study's findings also indicated that HIV knowledge is positively correlated with confidence in being tested for HIV within the next 12 months. This finding suggests that future church-based interventions intending to promote HIV testing should include an HIV education component. In addition, we found that if church members had talked about HIV transmission, they were less concerned that they would be treated differently if they were diagnosed with HIV. Because studies have found that fear of stigmatization tends to be associated with decreased testing for HIV (Sengupta et al., 2011), it will be important for future church-based interventions that focus on increasing access to HIV testing explore strategies to reduce fear of stigmatization. Strategies from the Taking It to the Pews project suggested to reduce fear of stigma include having the pastor of the church model getting tested and encouraging all adults to be tested for HIV regardless of their personal risk (Berkley-Patton et al., 2012). Unexpectedly, we discovered that participants who had discussed how HIV is transmitted within church were less comfortable sharing a pew with an HIV-positive person. This may be due to church members potentially sharing inaccurate information, as actual content discussed was not assessed in this study. Future studies should further explore this topic.

We also found that heterosexuals had more knowledge about HIV than non-heterosexuals. It is especially important for interventions to address this issue with non-heterosexuals in the church, especially in light of the disproportionate prevalence of HIV among African American men who have sex with men (Black AIDS Institute, 2012; CDC, 2011). Again, the African American church could be an optimal setting to provide HIV transmission, prevention, and screening information to everyone. However, consideration should be given to how communication of this information could be conveyed in a non-judgmental, non-threatening manner. Further research is needed on how to best tailor this information to the general church population and to segmented populations, such as non-heterosexuals, in the church setting.

It was found that being male was associated with the stigma item Responsible. Older participants were less likely to believe that those who are HIV positive are responsible for their illness, but more likely to be afraid of individuals who were HIV positive. Furthermore, participants who had only completed a high school education were more afraid of HIV positive people. . We also found that those who chose not to disclose their sexual orientation were both less comfortable around and more afraid of those with HIV. Anecdotally, some participants reported unfamiliarity of terms related to sexual identification during survey completion. Clarifying these terms in future studies would likely increase accuracy of results.

For HIV-stigma reduction interventions to be effective in the African American church going community, it is important to target men, older church and community members, and those with less formal education.

Limitations

A primary limitation in this study was our ability to operationalize HIV stigma. The survey assessed stigma with five items, which is limited given the complexity of the concept. Also, the stigma items did not hold together as a scale, making it difficult to measure it as a single construct. Future studies could benefit from exploring use of a wider range of HIV stigma questions and determining whether the items hold together as a scale. . This might best be done by developing new items specifically for use with the African American church population.

Additionally, very few participants identified themselves as non-heterosexual. Recruiting larger numbers of non-heterosexual individuals would benefit future studies in accurately representing this population.

Furthermore, 6.3 % of participants selected "Choose not to answer" for sexual identification in this study. During data collection, some participants expressed confusion about what the terms "heterosexual" and "homosexual" meant. This unwillingness to disclose could be a reflection of low knowledge by participants who did not ask the researchers for clarification. An alternate

explanation is that these could be homosexual or bisexual individuals who were unwilling to disclose their orientation even on an anonymous survey, suggesting that they might have internalized stigma. Further research is needed to understand this finding.

Finally, in using a self-report survey format, the sensitive nature of some of the survey questions, such as the HIV stigma questions, may have resulted in limiting participants' comfort with being honest on their surveys.

Conclusions

African American communities continue to be disproportionately burdened by HIV. Given the influence and reach of the African American churches, a critical role that the African American church can play in addressing HIV could be promoting delivery of accurate information about the disease. Specifically, this study suggests that these roles could include reducing HIV stigma and enhancing HIV knowledge as strategic intervention components in church-based HIV intervention projects. Also, although overall church-based HIV interventions may need to target all church and community members, intervention components related to HIV stigma and knowledge may need to be tailored for specific church populations, such as males, non-heterosexuals, and older adults. Finally, communication of information regarding HIV stigma and knowledge by church leaders should be comprehensible for all church and community members.

Acknowledgments

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References

Berkley-Patton, J., Bowe-Thompson, C., Bradley-Ewing, A., Hawes, S., Moore, E., Williams, E., Martinez, D., & Goggin, K. (2010). Taking it to the pews: A cbpr guided HIV awareness and screening project within Black churches. *AIDS Education and Prevention*, *22*(3), 218-237.

Berkley-Patton, J., Bowe-Thompson, C., Martinez, D., Hawes, S., Moore, E., Williams, E., &Wainright, C., (In Press). Examining church capacity to develop and disseminate a religiously appropriate HIV toolkit with African American churches. *Journal of Urban Health*. doi: 10.1007/s11524-012-9740-4

Black AIDS Institute. (2012). *Back of the line: the state of AIDS among black gay men in America*. Accessed July 22, 2012 from http://www.blackaids.org/index.php?option=com_content&view=article&id=1284&Itemid=198

Carey, M. P., Morrison-Beedy, D., & Johnson, B. T. (1997). HIV Knowledge Questionnaire: Development and evaluation of a reliable, valid and practical self administered questionnaire. *AIDS and Behavior*, *1*, 61-74.

Centers of Disease Control and Prevention (CDC). (2012). *Basic information about HIV and AIDS*. Accessed March 1, 2013 from http://www.cdc.gov/hiv/topics/basic/index.htm

Centers of Disease Control and Prevention (CDC). (2013a). *Basic statistics*. Accessed March 1, 2013 from http://www.cdc.gov/hiv/topics/surveillance/basic.htm#ddaids

Centers of Disease Control and Prevention (CDC). (2013b). *HIV among African Americans*. Accessed March 1, 2013 from http://www.cdc.gov/hiv/topics/aa/index.htm

Collani, G., Grumm, M., & Streicher, K. (2010). An investigation of the determinants of stigmatization and prejudice toward people living with HIV/AIDS. *Journal of Applied Social Psychology, 40*, 1747-1768.

Connors, G. J., Tonigan, J. S., & Miller, M. R. (1996). A measure of religious background and behavior for use in behavior change research. *Psychology of Addictive Behaviors*, *10*(2), 90-96. doi: 10.1037/0893-164x.10.2.90

Deacon, H. (2006). Towards a Sustainable Theory of Health-Related Stigma: Lessons from the HIV/AIDS Literature. *Journal of Community & Applied Social Psychology, 16*, 418-425. doi: 10.1002/casp.900

Fullilove, M., & Fullilove, R. (1999). Stigma as an obstacle to AIDS action. *American Behavioral Scientist, 42*, 1117-1129.

Herek, G. M. (1999). AIDS and Stigma. *American Behavioral Scientist*, *42*(7), 1106-1116.

Herek, G., Capitanio, J., & Widaman, K. (2002). HIV-related stigma and knowledge in the United States: Prevalence and trends, 1991-1999. *American Journal of Public Health*, *92*(3), 371-377

Herek, G., Widaman, K., & Capatino, J. (2005). When sex equals AIDS: Symbolic stigma and heterosexual adults' inaccurate beliefs about sexual transmission of AIDS. *Social Problems*, 52, 15-37

Israel, B., Eng, E., Schulz, A., & Parker, E. (2005). Introduction to methods in community-based participatory research for health. In B. Israel, E. Eng, A. Schulz, & E. Parker (Eds.) *Methods in Community-Based Participatory Research for Health* (pp. 3-26). San Francisco: Jossey-Bass.

Khosrovani, M., Poudeh, R., & Parks-Yancy, R. (2008). How African-American ministers communicate HIV/AIDS-related health information to their congregants: A survey of selected Black churches in Houston, TX. *Mental Health, Religion & Culture, 11*, 661-670. doi: 10.1080/13674670801936798

Muturi, N., & Soontae, A. (2010). HIV/AIDS stigma and religiosity among African American women. *Journal of Health Communication, 15*, 388-401.

Reidpath, D.D., & Chan, K.Y. (2005). A method for the quantitative analysis of the layering of HIV-related stigma. *AIDS Care, 17*, 425-432. doi: 10.1080/09540120412331319769

Sengupta, S., Banks, B., Jonas, D., Miles, M., & Smith, G.C. (2011). HIV interventions to reduce HIV/AIDS stigma: A systematic review. AIDS Behavior, 15, 1075-1087. doi: 10.1007/s10461-010-9847-0

Pew Forum on Religion and Public Life. (2007) *The pew forum on religion and public life*. Pew Research Center, Washington, DC. Retrieved July 2012, from http://religions.pewforum.org/portraits

Table 1

Participant Characteristics

Variable	%[a] (n)
Sex	
Female	63.8% (n = 343)
Male	36.2% (n = 195)
Race	
African American	90.3% (n = 486)
Caucasian	6.1% (n = 33)
Other	3.0% (n = 16)
Sexual Orientation	
Heterosexual	85.1% (n = 458)
Homosexual	1.9% (n = 10)
Bisexual	1.3% (n = 7)
Other	3.3% (n = 18)
Choose Not to Answer	6.3% (n = 34)
Relationship Status	
Currently Have a Spouse or Main Relationship Partner	63.4% (n = 341)
Do Not have Spouse or Partner	35.1% (n = 189)
Have Children?	
Yes	74.7% (n = 402)
No	24.9% (n = 134)
Education	
Did not Complete High School	7.6% (n = 41)
High School Diploma or G.E.D.	25.7% (n = 138)
Some College or Post-Technical Training	30.5% (n = 164)
Associate's Degree or Bachelor's Degree	22.7% (n = 122)
Some Graduate School or Graduate Degree	13.4% (n = 72)
Health Insurance	
None	27.1% (n = 146)
Medicare/Medicaid	21.4% (n = 115)
Private Insurance	51.1% (n = 275)
Average Monthly Household Income	
$0-$1000	18.6% (n = 100)
$1001-$2000	16.2% (n = 87)
$2001-$2500	8.9% (n = 48)
$2501-$3000	11.3% (n = 61)
More than $3000	33.3% (n = 179)
Member of Church	
Yes	71.6% (n = 385)
No	28.1% (n = 151)
Have Leadership Role in Church	
Yes	27.5% (n = 148)
No	44.2% (n = 238)
Church Denomination	
Baptist	35.9% (n = 193)
Church of God	32.5% (n = 175)
Pentecostal	5.0% (n = 27)
Catholic	18.4% (n = 99)
Non-Denominational	3.7% (n = 20)
Other (Muslim, Lutheran, Jehovah's Witness, etc.)	3.7% (n = 20)
How Serious of an Issue is HIV/AIDS	
Not At All	2.2% (n = 12)
Not Too Serious	5.4% (n = 29)
Somewhat Serious	16.2% (n = 87)
Very Serious	73.2% (n = 394)
In the Past Six Months, Your Church Talked About…	
HIV/AIDS Testing	13.8% (n = 74)
HIV/AIDS Transmission	15.6% (n = 84)
How To Prevent HIV/AIDS	16.4% (n = 88)
Personal Risk for HIV	16.9% (n = 91)
Other Topics Related to HIV/AIDS	19.5% (n = 105)

[a]*Note*. All percentages will not equal 100% because of missing data from some participants

Table 1

Participant Characteristics

Variable	***M* (*SD*; Range)**
Stigma	
Comfortable	.69 (*SD* = 1.0; 0-3)
Responsible	1.4 (*SD* = .86; 0-3)
Truth	1.0 (*SD* = .88; 0-3)
Afraid	.63 (*SD* = .87; 0-3)
Concerned	1.5 (*SD* = 1.0; 0-3)
Age	42.3 (*SD* = 13.5; 18-65)
Religiosity	
God Consciousness	16.5 (*SD* = 2.1; 6-18)
Formal Practices	18.1 (*SD* = 6.9; 0-28)
HIV Knowledge	7.5 (*SD* = 1.7; 0-10)
Number of Times Tested for HIV in Lifetime	2.8 (*SD* = 4.3; 0-40)
Number of People Known Who Have HIV/AIDS	1.9 (*SD* = 6.4; 0-100)

Table 2

Correlations Between HIV Stigma Items, HIV Knowledge, RBB Subscales, HIV Testing, and HIV-positive persons known

	1	2	3	4	5	6	7	8	9	10	11
1. Comfortable	--										
2. Responsible	.02	--									
3. Truth	.07	-.20***	--								
4. Afraid	.29***	.03	.12**	--							
5. Concerned	.21***	-.05	.09*	.35***	--						
6. Knowledge	-.18***	-.02	-.11*	-.27***	-.06	--					
7. God Consciousness	-.05	-.06	.07	-.04	-.05	-.05	--				
8. Formal Practices	-.04	-.05	.10*	-.07	-.06	-.10*	.64***	--			
9. Times Tested for HIV	-.05	.02	-.04	-.05	-.03	.08	.03	-.04	--		
10. Confidence in Testing	.01	-.01	-.08	.01	-.06	.09*	-.01	-.11*	.27***	--	
11. Age	-.05	-.09*	.07	.09*	-.003	-.15***	.19***	.28***	-.04	-.212***	--
12. Positive People Known	.01	-.11*	.04	-.03	.04	.11	.02	.07	-.01	.10	.09

* p < .05, ** p < .01, *** p < .001

Getting to know: *Mindy Westlund*

Biography

Mindy Westlund is a May 2012 Psychology graduate from the University of Minnesota. Beginning in January 2011, she volunteered in the research lab of Drs. Bonnie Klimes-Dougan and Kathryn Cullen. During her senior year, she was awarded a grant through the Undergraduate Research Opportunities Program which funded her work on this publication. She was also a Psi Chi officer and Phi Beta Kappa inductee. After graduation, she began working full-time as a research coordinator for the same lab where she had been volunteering. This coming fall, Mindy will begin working toward her PhD in Clinical Science and Psychopathology Research at the University of Minnesota where she will focus on adolescent psychopathology and neuroimaging.

Q&A

What sparked your interest in psychology?

I have been interested in psychology since I was 11 years old when my cousin introduced me to personality tests. Afterward, my love of reading led me to novels depicting adolescents experiencing psychopathology, which I found extremely fascinating.

What led you to this topic?

I have been very fortunate to have found a place in a research lab that was perfectly aligned with my interests from the start. However, I would have to say that my involvement with putting together a self-harm grant for NIMH is what piqued my interest in neuroimaging and self-directed violence in particular.

Did you have a mentor and how did you get involved with him/her?

After taking Abnormal Psychology with Dr. Bonnie Klimes-Dougan, I began volunteering in her lab and we began forming a great research relationship. It was through this experience that I also met Dr. Katie Cullen, who has been a key figure in helping me understand the neuroimaging aspect. They have both provided me with a wealth of information regarding research.

How long have you been working on this paper? What has the process been like for you?

I started working on this paper around February or March 2012 and essentially had it completed by graduation in May 2012. The process has been very beneficial as it has been a great learning experience. In addition to going through the peer review process, I have been able to critique my own work and think of ways to better go about testing my hypotheses. I look forward to repeating my questions with a more theory driven approach, refined methods, and much larger sample.

What was it like to be an undergraduate student completing your own research project?

I am someone who loves to acquire knowledge and also work independently. This was a great opportunity to do both of those things under the guidance of very experienced researchers. My only regret was not taking advantage of this opportunity earlier in my undergraduate career.

A Pilot Study of Resting-State Functional Connectivity in Depressed Adolescents with and without Histories of Suicide Attempts

Mindy Westlund
University of Minnesota

Suicide is one of the leading causes of death among adolescents and is often associated with major depressive disorder (MDD). Research examining the underlying neurobiology of MDD has found abnormal connectivity within the fronto-limbic regions of the brain. Research on the neural circuitry of depression and suicide is warranted because of the high prevalence and incidence of these problems among young people and because of the ongoing brain development in adolescence. This pilot study used resting-state functional magnetic resonance imaging to compare brain connectivity between three groups: adolescents with MDD and a history of suicide attempts (MDD/SA) (n = 4), adolescents with MDD and no history of suicide attempts (NSA) (n = 8), and healthy controls (n = 9). Although the results were not significant, they did suggest that the MDD/SA group had lower connectivity among fronto-limbic regions than controls (lateral prefrontal cortex, subgenual anterior cingulate cortex (ACC), and supragenual ACC) and also lower connectivity than both the NSA group and controls among certain regions (subgenual ACC, rostral ACC, amygdala, and nucleus accumbens). Though only trending toward significance, the reduced connectivity in this group may suggest possible impairments in interpreting emotions and regulating emotional responses. Further research in this area can provide important information for the development of appropriate treatment strategies that can target these deficits and thus, provide more effective interventions.

Adolescence is a developmental period which is often associated with the onset of mental disorders. Major depressive disorder (MDD) has received considerable attention due to the prevalence and incidence of this disorder among this population (Lewinsohn, Rohde, & Seeley, 1998). According to the Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000), MDD is characterized by at least a two week period consisting of either depressed mood or loss of interest or pleasure. Additionally, individuals must also have at least 4 other symptoms such as insomnia/hypersomnia, fatigue, and feelings of worthlessness. Because of the association of MDD with suicide, research within this field is warranted as it is the third leading cause of death in adolescents (American Academy of Child and Adolescent Psychiatry, 2008). Such research can be used to further the advancement of intervention strategies so that they may be more effective. A way to study adolescent depression and suicide in terms of their neurobiology is through the use of neuroimaging techniques. Specifically, the purpose of this study is to use resting-state functional magnetic resonance imaging to explore the connectivity differences between adolescent MDD patients who have attempted suicide and MDD patients without suicide attempts and healthy controls.

Neuroimaging, including magnetic resonance imaging (MRI) and functional magnetic resonance imaging (fMRI), are research practices that have provided us with great discoveries such as the course of childhood and adolescent brain development (Giedd et al., 1999; Clare Kelly et al., 2009). MRI is a relatively new technique that uses a strong magnetic field and radio frequency fields to align and then alter the alignment of atomic nuclei to produce a change that can be detected by the scanner (Hendee & Morgan, 1984). Because it does not require exposure to radioactive materials, this procedure is used more routinely for more sustained periods of time and while children are still undergoing development. This neuroimaging method allows researchers and clinicians to acquire information regarding the structure of the brain. fMRI, the method used in this study, is similar to that of MRI except that it records neural activity in the brain by using the blood-oxygen-level-dependent (BOLD) response. Studies using these neuroimaging methods have begun to show structural and functional abnormalities within the brain of depressed adolescents as well as those who attempt suicide.

Evidence for Fronto-Limbic Abnormalities

Research has been conducted to reveal neurobiological differences between MDD patients and healthy controls. These studies assist in providing a base for the exploration of these differences in MDD patients with histories of suicide. In particular, abnormalities within the fronto-limbic region of the brain, including the anterior cingulate cortex (ACC), have been found to be implicated in MDD. Bush, Luu, and Posner (2000) illustrate the idea of a cognitive and affective division of the ACC. The cognitive division is believed to be responsible for various aspects of executive functioning including motivation, response selection, and error detection (Bush et al., 2000). This includes connections between the dorsal region of the ACC and other frontal and limbic regions of the brain such as the lateral prefrontal cortex (PFC). In contrast, Bush and colleagues (2000) explain the affective division as being involved in the regulation of emotional responses, and the appraisal of motivational and emotional information. The affective division includes connections between the ventral region of the

ACC and the amygdala, nucleus accumbens, insula, hippocampus, and orbitofrontal cortex (OFC)(Bush et al., 2000). Deficiencies in the connectivity among these regions may underlie the emotional and behavioral difficulties associated with MDD and suicide.

Indeed, post-mortem examinations of suicide victims provide support for fronto-limbic dysregulation. Honer et al. (1999) found decreased myelin basic protein immunoreactivity in the anterior frontal cortex of both MDD and schizophrenia patients who died by suicide, which may suggest impairment in neurotransmission. Furthermore, Torres-Platas and colleagues (2011) found white matter abnormalities in the ACC among depressed suicides compared to sudden-death controls, which also suggests a deficit in neural communication. Although these studies examine what could possibly be the effect of suicide, they provide direction in examining possible precursors to suicidal behaviors.

As reviewed by Lorenzetti et al. (2009), studies have found volumetric abnormalities among adults with MDD within regions involved in the experience of emotion and emotion regulation including decreased hippocampus, OFC, and subgenual ACC and dynamic volume changes of the amygdala. A recent study by Malykhin et al. (2012) also found decreased ACC volumes and increased amygdala among depressed adults. Furthermore, resting-state fMRI studies of adults with MDD have found abnormal connectivity within fronto-limbic brain regions including the dorsal ACC, thalamus, and amygdala (Grecius et al., 2008). Researchers have also examined connectivity differences in the context of visual stimuli. Delvecchio et al. (2012) conducted a meta-analysis of twenty studies which used facial processing paradigms and fMRI. MDD patients showed increased limbic activation in response to all stimuli, decreased sensorimotor activation in response to fearful stimuli, and decreased right pulvinar thalamus activity in response to happy stimuli, implicating these regions in the processing of emotional stimuli (Delvecchio et al., 2012).

Less research has been conducted using adolescent samples with MDD; however, Cullen and colleagues (2010) used diffusion tensor imaging (DTI) to find decreased white matter integrity within fronto-limbic regions of the brain including the subgenual ACC in particular. Using resting-state fMRI data from the same sample, Cullen et al. (2009) found decreased connectivity between the subgenual ACC and supragenual ACC, right medial frontal cortex, left superior and inferior frontal cortex, and insular cortex. Connectivity differences involving the subgenual-ACC network is believed to be related to the emotion dysregulation present among depressed adolescents (Cullen et al., 2009). During the administration of attention and cognitive control tasks, an fMRI study by Halari et al. (2009) found that adolescents with MDD had decreased connectivity in the right dorsolateral and inferior PFC and dorsal and ventral ACC. Taken together, these findings support that there are abnormalities in the connectivity of this region among MDD patients that may underlie cognitive and emotional deficits.

Fronto-limbic abnormalities in both structure and connectivity are also evident in studies examining suicidal and non-suicidal subjects and healthy controls. Although findings are conflicted between whether or not these structures are larger or smaller in suicidal patients compared to controls, studies have found structural abnormalities in the orbitofrontal cortex, amygdala, hippocampus, caudate, and regions of the ACC among suicidal patients and patients at high risk for suicide (Monkul et al., 2007; Spoletini et al., 2011; Wagner et al., 2011). Further research has found periventricular white matter hyperintensities among child, adolescent, young adult, and elderly MDD patients with histories of suicide attempts compared with MDD patients without such histories (Ehrlich et al., 2004; 2005; Ahearn et al., 2001). Using DTI, Jia et al. (2010) found decreased white matter microstructure among MDD patients with suicide attempts within the right frontal lobe compared to controls, right lentiform nucleus compared to depressed non-attempters, and left anterior limb of the internal capsule in contrast to both comparison groups. The above findings of such structural differences among suicidal individuals supports the hypothesis that dysregulation within the cognitive and affective divisions posited by Bush, Luu, and Posner (2000).

Evidence from positron emission tomography (PET) and fMRI studies demonstrates that suicidal patients may exhibit anomalous functional connectivity in key fronto-limbic brain circuitry. Oquendo et al. (2003) used PET and found lower prefrontal cortex activity among depressed patients who made high-lethality suicide attempts compared to those with low-lethality. Using fMRI, Marchand et al. (2012) found that those who had histories of self-harm behaviors, all but one of which being suicide attempts, had a different striatal network compared to depressed patients without self-harm behaviors and also patients with suicide ideation. This network includes the left temporal and inferior parietal lobule regions, motor/sensory cortical regions, and right posterior cortical midline structure (CMS), which includes the ACC. In contrast, an fMRI study by Pan et al. (2011) examined connectivity during a response inhibition task and found no differences between controls and depressed adolescents with histories of suicide. Other than these studies, research exploring the functional abnormalities that may underlie suicidal behaviors among adolescents is limited.

Hypotheses

The aim of this exploratory study is to expand the knowledge regarding the neural circuitry of suicide by examining the resting-state connectivity of depressed adolescents with histories of suicide attempts compared to depressed adolescents without histories of suicide attempts and healthy controls. Due to the support from previous research for populations diagnosed with MDD, this study will focus on possible fronto-limbic abnor-

malities. The subgenual ACC is of particular interest because of its apparent dysregulation in previous studies as well as its involvement in emotion regulation (see Bush, Luu, & Posner, 2000 for review). Taking together previous research on adolescent MDD and suicide and the theory reviewed by Bush, Luu, and Posner (2000), we hypothesized that the connectivity between ACC regions and other fronto-limbic structures within both the cognitive and affective divisions would be significantly decreased among depressed adolescents with histories of suicide. This is consistent with the roles this are has in executive function, response selection, and regulation of emotion (Bush et al., 2000).

Methods and Materials

Participants

This study was part of a broader study that was approved by the University of Minnesota institutional review board (Cullen et al., 2009; 2010). The original study aimed to use neuroimaging measures to examine the difference between depressed and healthy adolescents and in this secondary data analysis, 24 adolescent subjects between the ages of 15 and 19 were included in this study. This sample was comprised of 12 depressed participants (4 patients with histories of suicide attempts and 8 patients without histories of suicide attempts) and 9 healthy controls for comparison. Exclusion criteria for the original sample included an intelligence quotient (IQ) of less than 80 as determined by the Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999), conditions incompatible with MRI such as claustrophobia and metal implants, significant medical or neurological disorders, and a positive urine pregnancy test for females. Further exclusion criteria for the depressed group included the following psychiatric comorbidities: schizophrenia, a pervasive developmental disorder, bipolar disorder, a substance-related disorder with use within the past 60 days, and an eating disorder with active symptoms in the past 12 months. Other common comorbidities, such as anxiety, were permitted on the condition that major depressive disorder was the primary diagnosis. Exclusion criteria for healthy controls included a past or current DSM-IV diagnosis. Both healthy controls and depressed adolescents were recruited through the use of community postings. Additionally, depressed subjects were recruited from psychiatric programs at the University of Minnesota Medical Center-Fairview Hospital.

Informed consent was obtained for those 18 and over. For those younger than 18, a parent or guardian provided written consent and the participant provided assent. All participants were compensated for the portions of the study they completed.

Clinical Assessment

DSM-IV Axis I diagnoses were assessed using the Schedule of Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL) (Kaufman et al., 1997), in which separate semi-structured interviews are conducted with both parent and child. Additionally, subjects completed the Beck Depression Inventory-II (BDI-II) (Beck, Steer, & Brown, 1996) to assess symptom severity and type. The Global Assessment of Functioning (DSM-IV) was assessed for each patient as well. Those in the depressed group also reported, in months, the duration of current illness.

Scan Acquisition

Because this study utilized the same sample as Klimes-Dougan et al. (under review), the following procedures are the same as what was published previously. Neuroimaging was conducted at the Center for Magnetic Resonance Research at the University of Minnesota using a Siemens Trio 3 Tesla scanner (Erlangen, Germany). Each participant completed a 6 minute resting-state scan during which they were instructed to keep their eyes closed and rest. This consisted of 180 contiguous echo planar imaging (EPI) whole brain volumes (TR = 2000ms; TE = 30 ms; flip angle = 90 degrees, 34 contiguous AC-PC aligned axial slices; matrix = 64x64; FOV = 220mm; acquisition voxel size = 3.4 x 3.4 x 4mm, matrix=64). A 10 minute high-resolution T1-weighted anatomical image was also obtained using a magnetization prepared gradient echo sequence (MPRAGE), TR = 2530ms; TE = 3.63ms; TI = 1100ms; flip angle = 7 degrees; 1mm slices, FOV = 256mm, GRAPPA=2, 10 minutes. Further details of image acquisition can be found in Klimes-Dougan et al. (under review).

Data Analysis

Data Preprocessing

Data preprocessing was conducted using the following steps, which can be found in Klimes-Dougan et al. (under review). Data was visually inspected for motion-related artifacts which resulted in the exclusion of a depressed participant from additional analyses due to excessive motion. Preprocessing was conducted using the FSL software package (www.fmrib.ox.ac.uk). These steps included brain extraction from the skull, high-pass temporal filtration with Gaussian-weighted least squares straight line fitting, with sigma = 100s, motion correction using MCFLIRT, B0 unwarping using a fieldmap, registration of the resting state scan to the T1 structural image using 6 degrees of freedom affine transformation, spatial smoothing (using a Gaussian kernel of FWHM 6mm), and registration to the MNI152 standard space brain using 23w degree of freedom affine transformation. Denoising was conducted using a combination of FSL and AFNI (Cox, 1996) software. AFNI was also used to identify BOLD signal outliers. Refer to Klimes-Dougan et al. (under review) for further information regarding neuroimaging preprocessing and analyses.

Statistics

A series of ANOVAs was performed to compare the fMRI means among the three groups, healthy controls,

MDD subjects without histories of suicide attempts, and MDD subjects with histories of suicide attempts. Analyses were conducted on regions of interest that included connections involving the ACC. Due to the preliminary nature of this study and small sample size, significant findings of $p \leq .05$ and findings trending toward significance of $p \leq .150$ were considered. Levene statistics were conducted to assess homogeneity of variance. Post-hoc analyses were performed on significant or trending ANOVAs. Due to unequal sample sizes, we used Tukey-Kramer when equal variances could be assumed and Games-Howell for unequal variances as determined by the Levene statistic. Analyses revealing trending or significant differences between the suicidal MDD group and both the control and non-suicidal MDD groups were included in the results and discussion. Connections revealing a significant difference between the suicidal MDD group and the control group were also considered, provided that the non-suicidal MDD group failed to reach significance when compared to controls.

Results

Participants

All three groups were comparable in age (M = 16.48; SD = 1.19) and there was no significant difference between the non-suicidal and suicidal MDD groups in BDI scores. Overall, the sample was primarily white (76%) and female (71%). Differences in IQ among the groups were not significant (M = 109.10; SD = 10.76). Further demographic information can be found in Table 1.

The non-suicidal and suicidal MDD groups had significantly different mean GAF scores ($p = .017$). Interestingly, the non-suicidal MDD group had a lower mean GAF score (M = 41) compared to the suicidal group (M = 54.25). Mean BDI scores for the non-suicidal MDD group (M = 29.14) and the suicidal group (M = 25.25) were not significantly different. Duration of illness was also not significant, although the suicidal group had a longer mean duration of illness (M = 6.75 months) than the non-suicidal MDD group (M = 5.56 months).

Resting State Connectivity

In addition to performing ANOVAs on connectivity data, one was also calculated to determine any group differences in brain volume (for information regarding volumetric measurements of this sample, refer to Klimes-Dougan et al. (under review)). Results determined that brain volume differences were not significant. Regarding connections, four were deemed to have trending significance through analyses. All of which included at least one region within the ACC. One-way ANOVAs showed trending significant differences in connectivity between the subgenual ACC and left lateral prefrontal cortex ($F(2,18) = 2.77$, $p = .089$), the subgenual and supragenual ACC ($F(2,18) = 2.63$, $p = .099$), the subgenual ACC and left nucleus accumbens ($F(2,18) = 3.08$, $p = .071$), and right amygdala and right rostral ACC ($F(2,18) = 2.35$, $p = .124$). Compared to controls (M = .261, SD = .144), the suicide group had reduced connectivity between the left lateral prefrontal cortex and subgenual ACC, which trended toward significance (M = -.054, SD = .246, $p = .091$). Such reduced activity trending toward significance was also found between the subgenual and supragenual ACC among the suicide group (M = .072, SD = .226) compared to controls (M = .365, SD = .152, $p = .122$). In these cases, differences between non-suicidal and suicidal MDD patients were not significant, although it should be noted that there were also no significant differences between the non-suicidal MDD group and controls.

The suicide group (M = .203, SD = .273) showed decreased connectivity between the subgenual ACC and left nucleus accumbens compared to both controls (M = .500, SD = .151, $p = .151$) and the non-suicidal MDD group (M = .582, SD = .325, $p = .061$), which trended toward significance. This was also found for the connection between the right amygdala and right rostral ACC as suicidal patients had lower mean connectivity (M = -.060, SD = .020) compared to controls (M = .040, SD = .094, $p = .034$) and non-suicidal patients (M = .038, SD = .083, $p = .031$) using Games-Howell post-hoc due to unequal variances.

Discussion

As hypothesized, these findings suggest the possibility of abnormal fronto-limbic neural circuitry among depressed adolescents who attempt suicide. Indeed, some of our findings are consistent with the assumption that MDD patients with suicidal histories would have similar, but more severe, neurobiological abnormalities as MDD patients without suicidal histories. This is illustrated by the reduced connectivity between the left lateral prefrontal cortex and the subgenual ACC and also the subgenual to supragenual ACC. These findings are supported by the more robust findings between the MDD patients with histories of suicide attempts and controls than the depressed non-suicide attempters and controls, which are depicted in Figure 1. Previous findings of Marchand et al. (2012) also support the idea of suicidality as being on the severe end of a continuum of MDD symptoms.

The reduced activity involving the left lateral prefrontal cortex to the subgenual ACC, though only trending toward significance, suggests that MDD patients with histories of suicide may have difficulty utilizing executive function in the regulation of their emotions. This may lead to problems in successfully delegating the appropriate emotional response even in resting-state conditions. Furthermore, the prefrontal cortex has been implicated in emotion asymmetry, in which the right hemisphere is associated with negative affect while the left hemisphere is associated with positive affect (Davidson, 1995). An early neuroimaging study by Jones and Fox (1992) found greater activation of the right hemisphere in the presence of negative affect and greater activation of the left hemisphere in the presence of positive affect. The findings of the present study suggest that adolescents with MDD and previous

suicide attempts may have more of an absence of positive emotion compared to controls. However, it should be noted that there has been criticism directed toward the hypothesis of affective asymmetry (for review, see Alves, Fukusima, & Aznar-Casanova, 2008).

Although the above findings suggest that those with suicidal behaviors have similar, but possibly more severe, neurobiological differences as depressed patients without suicidal histories, we did find possible support for connections that highlight a distinction between these two groups. This is demonstrated through the findings of decreased connectivity between (1) the subgenual ACC and nucleus accumbens and (2) the right amygdala and the right rostral ACC among the MDD patients who have attempted suicide, which trended toward significance. These findings are consistent with the suggestion presented by Wagner et al. (2011) for suicidality having a distinct neurobiology compared to non-suicidal MDD patients. Furthermore, one of the regions implicated in the study by Wagner and colleagues is the rostral ACC. According to a review by Pizzagalli (2011), increased activation of the rostral ACC has been found to be a predictor of treatment success. Pizzagalli also suggested that reduced resting-state activity in the rostral ACC may be linked to an inability to use adaptive self-focused processing, which may contribute to poor treatment outcome. This may suggest that our sample of suicidal MDD patients may be more treatment resistant than their non-suicidal counterparts and therefore, may require more intensive therapeutic techniques. Additionally, our finding of decreased connectivity between the right amygdala and right rostral ACC is somewhat consistent with the findings of Carballedo et al. (2011). However, the finding of Caballedo and colleagues was among a depressed sample in which suicidality was neither excluded nor examined as a separate entity. By examining MDD patients without histories of suicide, the present study did not replicate these findings.

Although only trending toward significance, the decreased connectivity among the suicidal MDD patients between the right amygdala and right rostral ACC as well as the subgenual ACC and left nucleus accumbens provides potential support for the dysregulation of the affective division of the ACC (Bush, Luu, & Posner, 2000). This division, as stated in the review by Bush and colleagues, is responsible for regulating emotional responses as well as determining the importance of motivational and emotional information. The decreased activity in this area among patients who have attempted suicide may suggest that these individuals may have difficulty interpreting the salience of emotional cues and may be emotionally volatile due to an inability to successfully manage their feelings. Further research using a larger sample size as well as stimuli to evoke emotionality, such as those used by Anand et al. (2005) and Carballedo et al. (2011) should be conducted to provide more support for this conclusion.

Limitations and Future Directions

A limitation of the present study is the small sample size due to its preliminary nature. Analyses should be replicated on a much larger sample of adolescents before further conclusions may be drawn. Furthermore, despite one's assumptions, depressed adolescents with suicidal histories did not differ in symptom severity as measured by the BDI-II. GAF scores also did not differ among the two groups. A larger sample size may reveal a much different pattern as one would expect those who resort to suicidal behaviors to have a more severe symptom pathology and difficulty in functioning.

Another direction for future research would be to explore suicidal thoughts and behaviors on a continuum to discover possible correlations in connectivity. A categorical approach can also be utilized, such as in the PET study by Oquendo et al. (2003), to examine the differences between individuals who have a history of high or low lethality suicide attempts. Suicide ideation combined with a desire for death can be an additional category to add to these analyses as this combination has been found to be the best predictor for lifetime suicide attempts compared to the presence of either of these alone (Baca-Garcia et al., 2011). This will be helpful in identifying what patterns are neurobiological predictors to suicide attempts rather than a possible result of the behavior. Furthermore, as mentioned previously, future fMRI research can also examine connectivity differences among these groups using emotional stimuli.

It should also be noted that although approximately 98% of those who die by suicide suffer from at least one mental illness, only 30.2% suffered from mood disorders (Bertolote, Fleischmann, De Leo, & Wasserman, 2004). Bertolote and colleagues further report that other diagnoses include substance-use disorders (17.6%), schizophrenia (14.1%), and personality disorders (13%). Because only a relatively small percentage of those who die by suicide suffer from depression, research should also examine this phenomenon independent of a particular diagnosis. Information gathered from these studies may assist in providing clinicians with distinct biomarkers that can possibly precede suicidal behaviors.

Because of the prevalence of attempted and completed suicides among adolescents (American Academy of Child and Adolescent Psychiatry, 2008), information directed toward the prevention of such behavior is of high value and importance. Current research on MDD and suicide has outlined the implications of the functional dysregulation of the brain as it relates to emotion regulation and processing. By furthering this research, we will be able to elaborate on the existing literature by exploring the differences between adolescents who exhibit arguably a more severe MDD pathology that involves suicidal thoughts and behaviors and adolescents who experience MDD who engage in less severe behavior. Because adolescence marks an important period of brain development (Giedd et al., 1999), this is an important age for intervention strategies as the plasticity of the brain may increase treatment effectiveness and lon-

gevity. Connection deficits shown may help direct appropriate treatment strategies that can target these deficiencies and thus, provide more effective interventions.

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References

Alves, N.T., Fukusima, S.S., & Aznar-Casanova, J.A. (2008). Models of brain asymmetry in emotional processing. ***Psychology and Neuroscience, 1***, 63-66. doi: 10.3922/j.psns.2008.1.010

American Academy of Child and Adolescent Psychiatry (2008). Teen suicide. In Facts for Families (10). Retrieved from http://www.aacap.org/galleries/FactsForFamilies/10_teen_suicide.pdf

American Psychiatric Association. (2000). Diagnostic and statistical manual of mental disorders (4th ed., text rev.). Washington, DC: Author

Anand, A., Li, Y., Wang, Y., Wu, J., Gao, S., Bukhari, L., Mathews, V.P., Kalnin, A., & Lowe, M.J. (2005). Activity and connectivity of brain mood regulating circuit in depression: A functional magnetic resonance study. ***Biol Psychiatry, 57***, 1079-1088. doi: 10.1016/j.biopsych.2005.02.021

Baca-Garcia, E., Perez-Rodriguez, M.M., Oquendo, M.A., Keyes, K.M., Hasin, D.S., Grant, B.F., & Blanco, C. (2011). Estimating risk for suicide attempt: Are we asking the right questions? Passive suicidal ideation as a marker for suicidal behavior. ***Journal of Affective Disorders, 134***, 327-332. doi: 10.1016/j.jad.2011.06.026

Beck, A.T., Steer, R.A., & Brown, K.B. (1996). Beck Depression Inventory-Revised. San Antonio, TX: Harcourt Brace.

Bertolote, J.M., Fleischmann, A., De Leo, D., & Wasserman, D. (2004). Psychiatric diagnoses and suicide: Revisiting the evidence. ***Crisis, 25***, 147-155. doi: 10.1027/0227-5910.25.4.147

Bush, G., Luu, P., & Posner, M.I. (2000). Cognitive and emotional influences in anterior cingulate cortex. ***Trends in Cognitive Science, 4***, 215-222. doi: 10.1016/S1364-6613(00)01483-2

Carballedo, A., Scheuerecker, J., Meisenzahl, E., Schoepf, V., Bokde, A., Möller, H.J., Doyle, M., Wiesmann, M., & Frodl, T. (2011). Functional connectivity of emotional processing in depression. ***Journal of Affective Disorders, 134***, 272-279. doi: 10.1016/j.jad.2011.06.021

Clare Kelly, A.M., Di Martino, A., Uddin, L.Q., Shehzad, Z., Gee, D.G., Reiss, P.T., Marquiles, D.S., Castellanos, F.X., & Milham, M.P. (2009). Development of anterior cingulate functional connectivity from late childhood to early adulthood. ***Cerebral Cortex, 19***, 640-657. doi: 10.1093/cercor/bhn117

Cox, R.W. (1996). AFNI: Software for analysis and visualization of functional magnetic resonance neuroimages. ***Computers and Biomedical Research, 29***, 162-173. doi: 10.1006/cbmr.1996.0014

Cullen, K.R., Gee, D.G., Klimes-Dougan, B., Gabbay, V., Hulvershorn, L., Mueller, B.A., Camchong, J., Bell, C.J., Houri, A., Kumra, S., Lim, K.O., Castellanos, F.X., & Milham, M.P. (2009). A preliminary study of functional connectivity in comorbid adolescent depression. ***Neuroscience Letters, 460***, 227-231. doi: 10.1016/j.neulet.2009.05.022

Cullen, K.R., Klimes-Dougan, B., Muetzel, R., Mueller, B., Camchong, J., Houri, A., Kumra, S., & Lim, K.O. (2010). Altered white matter microstructure in adolescents with major depression: A preliminary study. ***J Am Acad Child Adolesc Psychiatry, 49***, 173-183. doi: 10.1016/j.jaac.2009.11.005

Davidson, R.J. (1995). Cerebral asymmetry, emotion, and affective style. In R.J. Davidson & K. Hughdahl (Eds.), Brain Asymmetry (pp. 361-387). Massachusetts: MIT Press.

Delvecchio, G., Fossati, P., Boyer, P., Brambilla, P., Falkai, P., Gruber, O., Hietala, J., Lawrie, S.M., Martinot, J.L., McIntosh, A.M., Meisenzahl, E., & Frangou, S. (2012). Common and distinct neural correlates of emotional processing in bipolar disorder and major depressive disorder: A voxel-based meta-analysis of functional magnetic resonance imaging studies. ***European Neuropsychopharmacology, 22***, 100-113. doi: 10.1016/j.euroneuro.2011.07.003

Ehrlich, S., Breeze, J.L., Hesdorffer, D.C., Noam, G.G., Hong, X., Alban, A.L., Davis, S.E., & Renshaw, P.F. (2005). White matter hyperintensities and their association with suicidality in depressed young adults. ***Journal of Affective Disorders, 86***, 281-287. doi: 10.1016/j.jad.2005.01.007

Ehrlich, S., Noam, G.G., Lyoo, I.K., Kwon, B.J., Clark, M.A., & Renshaw, P.F. (2004). White matter hyperintensities and their associations with suicidality in psychiatrically hospitalized children and adolescents. ***J Am Acad Child Adolesc Psych, 42***, 386-405. doi: 10.1097/01.chi.0000120020.48166.93

Giedd, J.N., Blumenthal, J., Jeffries, N.O., Castellanos, F.X., Liu, H., Zijdenbos, A., Paus, T., Evans, A.C., & Rapoport, J.L. (1999). Brain development during childhood and adolescence: A longitudinal MRI study. ***Nature Neuroscience, 2***, 861-863. Retrieved from http://www.nature.com/neuro/index.html

Grecius, M.D. (2008). Resting-state functional connectivity in neuropsychiatric disorders. ***Current Opinion in Neurology, 21***, 414-430. doi: 10.1097/WCO.0b013e328306f2c5

Halari, R., Simic, M., Pariante, C.M., Papadopoulos, A., Cleare, A., Brammer, M., Fombonne, E., & Rubia, K. (2009). Reduced activation in lateral prefrontal cortex and anterior cingulate during attention and cognitive control functions in medication-naïve adolescents with depression compared to controls. ***Journal of Child Psychology and Psychiatry, 50***, 307-316. doi: 10.1111/j.1469-7610.2008.01972.x

Hendee, W.R., & Morgan, C.J. (1984). Magnetic resonance imaging part 1—Physical principles [Medical Progress]. ***West J Med, 141***, 491-500.

Honer, W.G., Falkai, P., Chen, C., Arango, V., Mann, J.J., & Dwork, A.J. (1999). Synaptic and plasticity-associated proteins in anterior frontal cortex in severe mental illness. ***Neuroscience, 91***, 1247-1255.

Jia, Z., Huang, X., Wu, Q., Zhang, T., Lui, S., Zhang, J., Amatya, N., Kuang, W., Chan, R.C., Kemp, G.J., Mechelli, A., & Gong, Q. (2010). High-field magnetic resonance imaging of suicidality in patients with major depressive disorder. ***Am J Psychiatry, 167***, 1381-1390. doi: 10.1176/appi.ajp.2010.09101513

Jones, N.A. & Fox, N. (1992). Electroencephalogram asymmetry during emotionally evocative films and its relation to positive and negative affectivity. ***Brain Cognition, 20***, 280-299.

Kaufman, J., Birmaher, B., Brent, D., Rao, U., Flynn, C., Moreci, P., Williamson, D., & Ryan, N. (1997). Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL): Initial reliability and validity data. ***J Am Acad Child Adolesc Psychiatry, 36***, 980-988. Retrieved from http://www.jaacap.com/

Klimes-Dougan, B., et al. (under review). Interplay between key fronto-limbic structures and the HPA axis: A pilot study of depressed and well adolescents.

Lewinsohn, P.M., Rohde, P., & Seeley, J.R. (1998). Major depressive disorder in older adolescents: Prevalence, risk factors, and clinical implications. ***Clinical Psychology Review, 18***, 765-794. Retrieved from http://www.elsevier.com/wps/find/journaldescription.cws_home/652/description

Lorenzetti, V., Allen, N.B., Fornito, A., & Yücel, M. (2009). Structural brain abnormalities in major depressive disorder: A selective review of recent MRI studies. ***Journal of Affective Disorders, 117***, 1-17. doi: 10.1016/j.jad.2008.11.021

Malykhin, N.V., Carter, R., Hegadoren, K.M., Seres, P., & Coupland, N.J. (2012). Fronto-limbic volumetric changes in major depressive disorder. ***Journal of Affective Disorders, 136***, 1104-1113. doi: 10.1016/j.jad.2011.10.038

Marchand, W.R., Lee, J.N., Johnson, S., Thatcher, J., Gale, P., Wood, N., & Jeong, E.K. (2012). Striatal and cortical midline cicuits in major depression: Implications for suicide and symptom expression. ***Progress in Neuro-Psychopharmacology & Biological Psychiatry, 36***, 290-299. doi: 10.1016/j.pnpbh.2011.10.016

Monkul, E.S., Hatch, J.P., Nicoletti, M.A., Spence, S., Brambilla, P., La-

cerda, A.L.T., Sassi, R.B., Mallinger, A.G., Keshavan, M.S., & Soares, J.C. (2007). Fronto-limbic brain structures in suicidal and non-suicidal female patients with major depressive disorder. ***Molecular Psychiatry, 12***, 360-366. doi: 10.1038/sj.mp.4001919

Oquendo, M.A., Placidi, G.P.A., Malone, K.M., Campbell, C., Keilp, J., Brodsky, B., Kegeles, L.S., Cooper, T.B., Parsey, R.V., van Heertum, R.L., & Mann, J.J. (2003). Positron emission tomography of regional brain metabolic responses to a sertonergic challenge and lethality of suicide attempts in major depression. ***Arch Gen Psychiatry, 60***, 14-22. doi: 10.1001/archpsyc.60.1.14

Pan, L.A., Batezati-Alves, S.C., Almeida, J.R.C., Segreti, A.M., Akkal, D., Hassel, S., Lakdawala, S., Brent, D.A., & Phillips, M.L. (2011). Dissociable patterns of neural activity during response inhibition in depressed adolescents with and without suicidal behavior. ***J Am Acad Child Adolesc Psychiatry, 50***, 602-611. doi: 10.1016/j.jaac.2011.03.018

Pizzagalli, D.A. (2011). Frontocingulate dysfunction in depression: Toward biomarkers of treatment response. ***Neuropsychopharmacology, 36***, 183-206. doi: 10.1038/npp.2010.166

Spoletini, I., Piras, F., Fagioli, S., Rubino, I.A., Martinotti, G., Siracusano, A., Caltagirone, C., & Spalletta, G. (2011). Suicidal attempts and increased right amygdala volume in schizophrenia. ***Schizophrenia Research, 125***, 30-40. doi: 10.1016/j.schres.2010.08.023

Torres-Platas, S.G., Hercher, C., Davoli, M.A., Maussion, G., Labonté, B., Turecki, G., & Mechawar, N. (2011). Astrocytic hypertrophy in anterior cingulate white matter of depressed suicides. ***Neuropsychopharmacology, 36***, 2650-2658. doi: 10.1038/npp.2011.154

Wagner, G., Koch, K., Schachtzabel, C., Schultz, C.C., Sauer, H., & Schlösser, R.G. (2011). Structural brain alterations in patients with major depressive disorder and high risk for suicide: Evidence for a distinct neurobiological entity? ***Neuroimage, 54***, 1607-1614. doi: 10.1016/j.neuroimage.2010.08.082

Wechsler, D. (1999). Wechsler Abbreviated Scale of Intelligence (WASI). San Antonio, TX: American Psychological Association.

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