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of the University of
North Carolina at Charlotte**



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Signs of Anxiety in Interaction with the Physically Disabled

Hannah Martin, Guy Brooks, Kamaris A. Jefferson, Kelly C. Heaton and Lee C. Vang

University of North Carolina at Charlotte

Abstract— While politically correct behavior is commended, many people attempt to withhold the fact that they are uncomfortable around physically disabled individuals. The goal of this study is to see if there are nonverbal indicators of anxiety expressed during interactions with a physically disabled interviewer, as opposed to interaction with a non-disabled interviewer. Eighty-Eight student participants from the UNC Charlotte population were randomly assigned an interviewer, either disabled or non-disabled. The participants were given a consent form with incomplete disclosure that informed of everything except the two-way mirror and the true nature of the study in order to avoid biased answers or deliberate changes in their physical anxiety signs. The participant was asked open-ended questions on “values”. Their body language was recorded by two observers on the other side of a two-way mirror. Once the interview was completed, they were debriefed on the true nature of the study and given the “follow up” questionnaire regarding their feelings on interacting with disabled individuals. The findings supported the hypothesis, $T(86) = -3.02$ $p < .05$, that the disabled interviewer participants ($M = 88.49$, $SD = 11.20$) displayed more nonverbal cues of anxiety than non-disabled interviewer participants ($M = 81.25$, $SD = 11.28$). The effect size estimated with Cohen’s d was 0.64. It is our hope that this research will lead to a new open dialogue on the subject of social anxieties when dealing with disabled and non-disabled people.

Often the presence of a disabled person can cause a nondisabled person to experience anxiety (Meyer, L., Gouvier, W., Duke, M., & Advokat, C. 2001). Research has shown that interactions with the physically disabled cause anxiety. However, some results of the emotional responses towards the disabled were recorded through hypothetical situations (Berry and Jones 1991). Our group decided to take a closer look at these presumptions through an observational study. The research observers were less interested in what was said, but rather how it was communicated through the participant’s body language. “Body language can include any non-reflexive or reflexive movement of a part, or all of the body, used by a person to communicate an emotional message to the outside world.” (Fast, 1971, pg 2)

Prior research indicates that students who have had previous contact with those who are physically disabled were more comfortable during interaction with their disabled peers than students who had no previous contact (Amsel and Fichten 1988). We collected feedback that may provide alternate theories and contribute to lowering the anxiety felt in social interactions with disabled individuals. Due to the lack of research and education on this subject, we feel this information is necessary to better educate society. For the purposes of this study, anxiety was defined by the physical manifestation of the sense of uneasiness and apprehension, such as decreased eye contact,

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constant movement, and physical distance placed between interviewer and participant, and inconsistent speech patterns.

Our interest stemmed from a member of our research team who deals with a physical disability on a daily basis. Our objective was to see if there are nonverbal indicators of anxiety expressed during interactions with a physically disabled interviewer, as opposed to interactions with a non-disabled interviewer. We anticipated a significant difference in the participants' reactions around the two interviewers. We expected that the participants paired with the physically disabled interviewer would exemplify more nonverbal anxiety signs than the participants paired with the non-disabled interviewer.

Method

Participants

Data were collected from 88 randomly selected undergraduates (37 men, 51 women) at the University of North Carolina at Charlotte. The only factor in determining which interviewer the participants were assigned was the time slot chosen at the research (SONA) sign up. Participants were 18 years old and older. The demographics of the participants reflected the student population at UNC Charlotte. At the time of data collection, UNC Charlotte demographics on gender percentages were 47% male/53% female, and for the study the percentages were 42% male/ 58% female. No data was omitted from the study.

Testing instruments

Several different instruments were used, including interview questions, a free answer questionnaire, physical anxiety rating scale, and two rooms with a two-way mirror in-between. The interview questions used were open ended questions on values as used by Comer (1972), see Appendix A, and included ten questions total. Some examples of these questions are

“What is the importance of friends to a person?” and “What is the importance of money?” We chose questions on values in the hopes they would create more verbal interaction in the interview. The anxiety scale used, please see Appendix B, was developed by V.P. Richmond, J.C. McCroskey, and A.E. Johnson, titled: "Development of the Nonverbal Immediacy Scale (NIS): Measures of self- and other-perceived nonverbal immediacy". There are twenty-six items on the scale and each participant was rated between 1 and 5 on every item. A score of 1 counted as “never” and a score of 5 meant “very often”. Some examples of the items on the list are “He/she uses her/his hands and arms to gesture while talking to people” and “He/she touches others on the shoulder or arm while talking to them”. There was no formal training for the observers, other than studying the guideline in detail and using their personal judgment for each participant. Prior to beginning the interviews the observers became acquainted with the survey, and discussed the meaning of each question as it pertained to the participants of the study. A guideline was included to obtain a “total” score for each participant from each observer. The two totals were averaged to get the ultimate score for each participant. There was no quantifiable indicator of the reliability of the codes from the two observers, which justified averaging their results. However, the use of two observers provided two points of view, of the same interview. As the same observers were used, the variances between the scores were typically within 10 points, or less, of each other. The average difference between the two interviewers is 7.24 points. The higher the scores on the NIS, based on average, the more anxiety was attributed to the participant's behavior. A free answer questionnaire was created by the group with questions asking about the participant's self perceived level of comfort when interacting with physically disabled people. The questionnaire, please see Appendix C, included questions such as “How much interaction have you had with a

physically handicapped person?”, “Do you feel comfortable interacting with a physically handicapped person?” and “Is there anything that could make you feel more comfortable?” The last testing instruments used were the two rooms with a two-way mirror in-between. The interview room had a desk and numerous chairs so the participant was free to sit wherever he/she was most comfortable. There were always two observers for each interview to ensure inter-rater reliability.

Design

The design was observational with a face-to-face interview and questionnaire included. The independent variables were the two interviewers: one quadriplegic interviewer, and one non-disabled interviewer. The dependent variable was the final anxiety score. A basic two group design was used, which randomly assigned the participants into the control group and experimental group, and between-subjects comparisons were made upon data analysis.

Procedure

Participants were recruited through the SONA system provided by UNC Charlotte. Half of the participants had the physically disabled interviewer, and the other half had the non-physically disabled interviewer. Participants were interviewed alone and never in a group setting. Once a participant arrived, one of the observers greeted the participant and asked him to read and sign the informed consent form. Each participant was informed of everything except the true nature of the study and the two way mirror in order to avoid biased answers and to prevent deliberate alterations in physical anxiety signs. The observer then returned to the observing room. An interviewer entered the room and took a seat across from the observer to begin the verbal interview. After introducing herself, the interviewer asked the participant to hand her the informed consent and interview questions to provide more physical interaction for the ob-

servers to examine. Each interview lasted an average of thirty minutes. After the interview, the interviewer left and an observer entered the room to debrief the participant on the true nature of the study. During debriefing, there was an opportunity for participants to withdraw from the study and have their data destroyed. UNC Charlotte counseling information was also given. The final step was the follow up questionnaire. The questionnaire was given after the interview to avoid priming the students, thereby increasing reactance or inauthentic behavior. Participants received one research credit upon completion of the interview and questionnaire. The above mentioned procedure was based on the UNCC IRB protocol approval obtained by the research group, prior to the commencement of the research project.

Results

The hypothesis that there would be more nonverbal indicators of anxiety expressed during interactions with a physically disabled interviewer was supported, $T(86) = -3.02$ $p < .05$. All data was analyzed with the use of an independent sample t- test. The participants with a disabled interviewer ($M = 88.49$, $SD = 11.20$) displayed more nonverbal cues of anxiety than participants with a non-disabled interviewer ($M = 81.25$, $SD = 11.28$). The effect size estimated with Cohen’s d was 0.64. The scores ranged from 55.5 points to 104.5 points for the participants paired with a disabled interviewer, and 58.5 points to 103.5 points for the participants paired with a non-disabled interviewer. (Table 1)

Table 1
Descriptive Statistics based on Interviewer

Interviewer	Mean	S.D	High	Low
Disabled	88.49	11.20	104.5	55.5
Non-Disabled	81.28	11.28	103.5	58.5

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The type of interviewer made a significant difference in levels of comfort. Ex post facto data analysis did not illustrate any statistical significance between male ($M = 85.07$, $SD = 12.37$) and female ($M = 91.08$, $SD = 9.67$) participants during interaction with the disabled interviewer, $T(33.23) = -1.746$ $p > .05$. The effect size, estimated with Cohen's d was 0.54. The scores ranged from 58.5 points to 100 points for the Male participants and 67 points to 103.5 points for the female participants. (Table 2)

Table 2

Descriptive Statistics Based on Sex

Gender	Mean	S.D	High	Low
Male	85.08	12.38	100	58.5
Female	91.08	9.68	103.5	67

Participants who scored higher on the anxiety scale also tended to report self-known anxiety when interacting with disabled individuals. Others who did not report feeling anxious at all usually had some sort of background involving disabled individuals, whether it was through experience with family, friends or interactions at the workplace.

Discussion

These results show reliable differences in the interaction with both disabled and non-disabled individuals. Results indicated that interactions with disabled individuals caused more anxious behavior than interactions with a non-disabled individual, supporting our hypothesis. The means for each group are depicted in Table 1. When comparing the two interviewers, the non-disabled interviewer averaged 7.24 points lower than the physically disabled interviewer, showing a significant difference between the two.

Upon comparison of the mean scores from the combined Norms, as cited from the study performed by Richmond, McCroskey, and Johnson, (2003) to the mean scores of our sample it was noticed that our means were lower. (Table 3) The means ranged from being 5.71 points lower when comparing interaction with the disabled interviewer, to being 12.05 points lower when comparing interaction with the non-disabled interviewer.

Further data analysis found there to be no statistical significance between male and female participants during interactions with the disabled interviewer, $T(33.23) = -1.746$ $p > .05$. The main factor in this lack of significance can be contributed to the fact that there were not enough participants of each gender class in order to result in statistical significance. During initial review of the data results, it appeared to be trending in such a manner that if enough participants, greater than forty for each gender class, were obtained a statistical significance could have been reached. However, upon further review of the Norms for the Nonverbal scale used (see Table 3), there is an indication that the male and female means have a difference of approximately 5.1 points in means. The findings were showing that females ($M = 91.08$, $SD = 9.67$) exhibited more non-verbal cues of anxiety than male participants ($M = 85.07$, $SD = 12.37$) during interactions with the disabled interviewer. While taking the norms into consideration, the significance could have only been marginal at best.

A variety of anxiety levels were observed through the two-way mirror. The observers noticed that the initial reaction, approximately the initial 3-5 minutes, to the presence of the disabled interviewer caused the most anxious behavior. Initial anxiety disappeared as the interview progressed and the participant interacted more with the disabled interviewer. Exposure to a stimulus often makes one desensitized.

The main strength of our study was the ability to use interviewers of similar backgrounds. The interviewers were two white females, ages 22 and 23. The use of interviewers with similar backgrounds was necessary in order to reduce extraneous variables, such as any anxieties stemming from participants regarding other races, genders, and/or ethnicities. However, a variable not accounted for was the natural personality traits of the interviewers coming out during a scripted interview. Since our physically disabled interviewer is a quadriplegic, she spends a lot of time trying to make others more comfortable around her and has learned to do so over time. Though our findings were statistically significant, it can be inferred that greater significance could have been found if the interviewers were the same person, interviewing as physically disabled person in one session and as a non-disabled person in the other, asking the same questions, and in the same voice.

Future research can be explored by having the disabled individual do two new sets of interviews where the interview is more formal in nature. The interviewer could use the same questions but he/she would be less animated and less engaging while interviewing each participant. Then during the next set of interviews he/she would show more personality, being more engaging by smiling and being more personable. Observers would be able to observe if more anxiety was associated with the differences in approachability in the interactions with the disabled individual. Results can be beneficial tools for observing what helps make people more comfortable when interacting with disabled persons.

The two-way mirror proved to be both a strength and weakness during our research. Though the two way mirror made it easier to directly observe the participant being interviewed, it was also a setting for reactance to occur. As stated by Smith and Davis (2010, pg 62), "the reactivity effect causes participants to

respond differently when they know they are being observed." The two-way mirrors seemed to affect some participants, giving them the sense that they were potentially being observed. Due to the fact that there were two mirrors on each side of the room, it seemed to spark some curiosity about the mirrors, even though they were being observed through only one mirror. The research could have been done differently by using a closed circuit camera in order to obtain a more naturalistic setting for conducting the interview.

Another suggestion for future research is a change in the observation location to a more naturalistic observational situation. Having interactions with a physically disabled person in a more public setting would probably show even more promising results. An open public setting, like a library, would be a great place to observe interactions between non-disabled persons and disabled persons, as it is common for numerous people to be in close proximity to each other without raising suspicion. It sets up an area for observers to be close, eliminating reactance from the research by eliminating the feeling that the participant is being observed.

The questionnaire given after each interview proved to be very informative upon examining the root cause of the anxiety exhibited with the physically disabled interviewer. The questionnaires provided a look into each participant's thoughts on interactions with physically disabled people. Participants with "none to moderate" previous interaction with disabled persons felt their uneasiness and anxiety came from the fact that they wanted to avoid accidentally offending the disabled individual. In general, these participants felt they would benefit by spending more time with disabled individuals and through additional education. Voeltz found that increased interaction with disabled individuals facilitated social acceptance over time (Voeltz, 1982).

Many people attempt to withhold the fact

that they are uncomfortable around physically disabled individuals. It was not surprising that many of the responses to the questionnaire did not match the level of physical anxiety displayed. Due to the fact that the questionnaire was given to participants after the interview, their answers may have been biased to avoid offending our disabled interviewer. One step that could be done differently for future research is the timing of the distribution of the questionnaire. Giving it before the interview may have shown different outlooks on how they truly felt about their anxiety in interactions with disabled individuals. By giving the questionnaire after the interview, we were able to avoid priming the participants. However, by giving a questionnaire/survey a month or two prior to the interview, via mail or online survey, will provide the participant a sense of freedom to answer honestly due to its anonymous nature, while at the same time reducing the reactance effect, due to the length of time between questionnaire and interview.

Often people are unwilling to tell the truth about their level of anxiety in social situations, due to social stigmas such as being labeled a bigot or being perceived as unkind. Our research was done to open up dialogue on how a significant number of people still feel uncomfortable around those who are physically disabled. It is only through the realization that there is a problem that one can begin to change.

Author Note

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Appendix A

Open ended Questions on Values as used by Comer (1972)

- (a) What is the importance of friends to a person?
- (b) What is the importance of females in a man's life?
- (c) What is the importance of sports in one's life?
- (d) What is the importance of academic and intellectual achievement in one's life?
- (e) What is the importance of physical appearance in judging others?
- (f) What is the importance of being religious?
- (g) What is the importance of money?
- (h) What is the importance of good health in one's life?
- (i) What is the importance of a good personality?
- (j) What is the importance of being aggressive in the world today?

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Appendix B

Nonverbal Immediacy Scale-Observer Report (NIS-O)

1 = Never; 2 = Rarely; 3 = Occasionally; 4 = Often; 5 = Very Often

- _____ 1. He/she uses her/his hands and arms to gesture while talking to people.
- _____ 2. He/she touches others on the shoulder or arm while talking to them.
- _____ 3. He/she uses a monotone or dull voice while talking to people.
- _____ 4. He/she looks over or away from others while talking to them.
- _____ 5. He/she moves away from others when they touch her/him while they are talking.
- _____ 6. He/she has a relaxed body position when he/she talks to people.
- _____ 7. He/she frowns while talking to people.
- _____ 8. He/she avoids eye contact while talking to people.
- _____ 9. He/she has a tense body position while talking to people.
- _____ 10. He/she sits close or stands close to people while talking with them.
- _____ 11. Her/his voice is monotonous or dull when he/she talks to people.
- _____ 12. He/she uses a variety of vocal expressions when he/she talks to people.
- _____ 13. He/she gestures when he/she talks to people.
- _____ 14. He/she is animated when he/she talk to people.
- _____ 15. He/she has a bland facial expression when he/she talks to people.
- _____ 16. He/she moves closer to people when he/she talks to them.
- _____ 17. He/she looks directly at people while talking to them.
- _____ 18. He/she is stiff when he/she talks to people.
- _____ 19. He/she has a lot of vocal variety when he/she talks to people.
- _____ 20. He/she avoids gesturing while he/she is talking to people.
- _____ 21. He/she leans toward people when he/she talks to them.
- _____ 22. He/she maintains eye contact with people when he/she talks to them.
- _____ 23. He/she tries not to sit or stand close to people when he/she talks with them.
- _____ 24. He/she leans away from people when he/she talks to them.
- _____ 25. He/she smiles when he/she talks to people.
- _____ 26. He/she avoids touching people when he/she talks to them.

Scoring:

Step 1. Add the scores from the following items: 1, 2, 6, 10, 12, 13, 14, 16, 17, 19, 21, 22, and 25.

Step 2. Add the scores from the following items: 3, 4, 5, 7, 8, 9, 11, 15, 18, 20, 23, 24, and 26.

Total Score = 78 plus Step 1 minus Step 2.

Appendix C

The Questionnaire used after debriefing.



Participant ID : _____

Age: _____

Male / Female (Circle One)

How much interaction have you had with a physically handicapped person?

Do you feel comfortable interacting with a physically handicapped person?

Why or why not?

Is there anything that could make you feel more comfortable?

Psychology Students' Perceptions of Mental Health Services: Differential Effects of Gender and Cultural Values

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Abstract—Understanding what affects people's perceptions toward mental health services has implications for increasing overall acceptance and usage of those services. The current study examined the influences of gender and cultural values as well as the interaction effects of gender and culture on individuals' perceptions toward mental health services. Based on previous studies, hypotheses were made that women would have more positive perceptions of mental health services than men and cultural values (individualism or collectivism) would be negatively correlated with favorable perceptions of mental health services. Two surveys were administered to undergraduate psychology students (n = 199) to test the hypothesis. No significant gender differences were observed. Individualistic and collectivistic values were both negatively correlated with people's favorable attitudes of mental health services. Gender was found to moderate the correlation between individualistic values and perceptions of mental health services. Implications for clinicians and future directions are discussed.

Various stigmas and negative attitudes tend to co-exist with mental illnesses and its related services. Avoidance of mental health services due to stigmas has been found in 24 percent of adults who reported unmet needs for mental health care while 20 percent expressed negative attitudes toward treatment and 9 percent expressed mistrust or fear of the system (Ojeda & Bergstresser, 2008). The im-

portance of stigma and attitudes toward mental health service utilization is further exemplified by research findings indicating that people's perceptions of mental health tend to correlate with the probability of them seeking mental health services (Jackson et al., 2007; Smith, Peck, & McGovern, 2004). Understanding what affects people's attitudes toward mental health services is important to encourage more acceptance of these services. As such, numerous studies have found cultural differences in attitudes toward mental health services (Mojtabai, 2007; Ojeda & Bergstresser, 2008). However, little is known about the association between cultural values and people's attitudes toward mental health services; most of the studies assume that cultural values are the reason for the observed group differences. In addition, previous studies have not explored the interaction effect of gender and cultural values on perceptions toward mental health care. Therefore, the purpose of the current study is to examine the effects of gender and cultural values on individuals' perceptions of mental health services.

Influence of Gender

A number of studies have explored gender influences on perceptions toward mental health services in the past. In general, women tend to have more positive treatment seeking attitudes and behaviors than men (Mojtabai, 2007; Parslow & Jorm, 2000; Thurston & Phares, 2008; Vasiliadis, Lesage, Adair, Wang, & Kessler, 2007). Studies have shown that this tends to be the case regardless of their race or

ethnicity; European-American, Canadian, Taiwanese, and Australian women have expressed more positive attitudes toward mental health services than men of the same nationality (Jagdeo, Cox, Stein, & Sareen, 2009; Ojeda & Bergstresser, 2008; Yeh, 2002). Even women who reported unmet needs for mental health care reported less avoidance of mental health services due to stigma, negative attitudes toward treatment and mistrust or fear of mental health services compared to men (Judd, Komiti, & Jackson, 2008; Ojeda & Bergstresser, 2008). In short, women have better perceptions toward mental health services than men, which can correspond with their behavior.

Women also have a higher probability of utilizing mental health services. European-American, Canadian, and Australian women have been reported to have a greater likelihood of seeking help from mental health professionals than men of the same nationality (Parslow & Jorm, 2000; Vasiliadis, Tempier, Lesage, & Kates, 2009). Southeast Asian (Cambodia, Indonesia, Laos, Vietnam) immigrant women living in Canada also had a higher likelihood of utilizing mental health services than men (Tiwari & Wang, 2008). Thus, women are more likely to have positive attitudes toward mental health care, which likely explains their tendency to use those services. Thus, the present study hypothesize that women will report more positive perceptions toward mental health services than men.

Influence of Cultural Values

Culture has been found to have diverse influences on people such as on their compliance and cognition (Zou et al., 2009), and it has been offered as an explanation for the apparent underutilization of mental health services by the minority groups (as shown in Chen, Kazanjian, & Wong, 2009; Ojeda & Bergstresser, 2008; Tata & Leong, 1994; Tiwari & Wang, 2008). In Canada, minority

groups including Chinese immigrants, South Asian immigrants (India, Pakistan, Sri Lanka), and Southeast Asian immigrants (Cambodia, Indonesia, Laos, Vietnam) are less likely to utilize mental health services compared to Whites or White immigrants (Tiwari & Wang, 2008). In addition, immigrant Chinese and Canadian-born Chinese had contacted fewer mental health professionals in past year (2.9% and 3.4%) compared to Canadian-born Non-Chinese (11%) (Chen et al., 2009).

Most generally, cultures can be classified as either individualistic or collectivistic by the characteristics that are valued within a group or groups of people. Individualistic cultures place a high value on independence and self-reliance (Atkinson, 2004). Western countries, including the United States, Canada, and Australia, are usually considered as having individualistic cultures (Hofstede, 2001). On the contrary, collectivistic cultures value cohesiveness, conformity, and group harmony (Kim, Atkinson, & Yang, 1999). Collectivism is usually found in countries such as China, India, Indonesia, Taiwan, and Mexico (Hofstede, 2001). However, both individualistic values and collectivistic values are found to exist within cultures. Minority groups living in ethnically diverse countries often belong to subcultures that tend to influence their perceptions differently from the country's main culture (Omizo, Kim, & Abel, 2008; Rayle & Myers, 2004). For example, although individualism is the main culture in the United States, the culture that a particular minority group holds may be collectivistic. Some African-, Latin-, and Asian-Americans are found to embody more collectivistic views, thus, differing somewhat from the mainstream American culture (Rayle & Myers, 2004).

Several findings contribute to understanding the underutilization of mental health services by minority groups. For example, Chen and colleagues (2009) found that Chinese generally report a low tolerance toward

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mental illnesses, and they show less acceptance of the use of mental health services. Similarly for Asian-Americans, the concern of bringing shame and disgrace of their family name have been found to contribute to a lower likelihood of using mental health care (Kim, 2007; Kim & Omizo, 2003; Liao, Rounds, & Klein, 2005). These findings provide support that collectivistic cultures tend to value how others view them or how their in-group appears to others, which could cause collectivistic people to have negative perceptions on mental health services.

The influences of collectivism have been examined in greater depth than the cultural influences of individualism. Although the mental health service usage rates are found to be higher for individualistic populations in comparison to collectivistic populations, studies have not thoroughly examined how individualistic values are associated to perceptions of mental health services. Considering the characteristics of individualism, which places a high value on independence and self-reliance, people may try to avoid using mental health services as this may be interpreted as a form of dependence. For example, Asian-Americans have more negative attitudes toward seeking mental health care when they adhere to European-American cultural values (Omizo et al., 2008). Potentially, highly individualistic people could believe that relying on mental health services goes against being independent, with a belief that they can take care of their psychological issues themselves. The present study attempts to investigate how individualistic values and collectivistic values influence people's perceptions toward mental services. Based on previous studies, the current study hypothesizes that both self-reported levels of individualism and collectivism will be negatively correlated with favorable perceptions of mental health counseling

Moderation Effects of Gender and Cultural

Values on Mental Health Services

Various studies suggest that gender differences in perception of mental health services may be due to cultural influences. One reason could be the gender roles determined by the culture, which men subsequently internalize. Men across cultures are more likely than women to embody masculine qualities, such as high independence, emotional restrictiveness, and self-reliance (Cross & Madson, 1997; Good & Wood, 1995). Likewise, Australian men score higher on stoicism and had lower openness to experience compared to women (Judd et al., 2008). Similarly, Asian-Americans are more accepting of Asian-American women seeking help from mental health professionals than they are of men seeking help (Tata & Leong, 1994). However, cultures differ in their emphasis on gender roles, much in the same way they differ in the emphasis on other cultural values, which may enhance or reduce the sex differences noted above.

The present study will investigate the interaction effects of gender and cultural values on individuals' perception toward mental health care. In this study, the interaction effect refers to how gender and cultural values combined influence one's perceptions of mental health services. Due to the general lack of studies done on this interaction of interest, the current study seeks to investigate how gender and cultural values interact to influence individuals' perception toward mental health services.

Method

Participants

Participants were 199 undergraduates attending Eastern Kentucky University who were enrolled in undergraduate psychology courses. Within the 199 participants, 167 were females and 32 were males. Forty-five percent of the participants were White, 24% were African American, 14% were Latino, 13% were Asian, 5% were Middle Eastern, and 1% was

American Indian. The participants participated for course completion credit and were recruited by the examiner from their respective classes.

Materials

Gender. The participants' gender was obtained with self-report on a question that inquired their gender as male or female.

Individualism/Collectivism Scale. Brewer and Chen (2007) originally designed their Individualism/Collectivism scale by selecting items from various existing scales that assessed people's levels of individualism and collectivism (Singelis, 1994; Singelis, Triandis, Bhawuk, & Gelfand, 1995; Triandis et al., 1986; Luhtanen & Crocker, 1992). The selected items were divided into two subscales: Individual Self-Representation and Individual Agency Beliefs subscales for the individualism assessment and Group Values and Group Self-Representation subscales for the collectivism assessment. The scale consisted of seven items: five for individualism and two for collectivism (Cronbach's alpha = .56 for Individualism, and .52 for Collectivism). Example items were, "One should live one's life independent of others as much as possible" (Individualism) and "People should sacrifice their self-interests for the benefit of the groups they are in" (Collectivism). Participants responded to the items with a five-point scale varying from 1 (*strongly disagree*) to 5 (*strongly agree*).

Attitudes toward Seeking Professional Psychological Help Scale. This self-report measure contained 29 items that assesses general attitudes and beliefs toward seeking professional psychological counseling (Fischer & Turner, 1970). The score for overall perceptions toward mental health services come from a combination of scores from four different scales: *Recognition of Need* (8 items), *Stigma Tolerance* (5 items), *Interpersonal Openness* (7 items), and *Confidence in Practitioners* (9 items). Sample items include "I would want to get psychiatric attention if I was worried or up-

set for a long period of time" and "A person with an emotional problem is not likely to solve it alone; he is likely to solve it with professional help". Responses are made on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Originally, the standardized internal reliability was reported to be .86 with stable test-retest reliability. However, in the current study, the Cronbach's alpha overall for this scale was .59, which indicates low reliability. Although the overall Cronbach's alpha was low, the Cronbach's alpha for the Recognition of Need's scale was .78, Stigma Tolerance's scale had .68, Interpersonal Openness' scale had .64, and Confidence in Mental Health Practitioner's scale had .81.

Procedure

The participants were recruited via an online research database. The online questionnaire was administered to the participants after obtaining their informed consent. All participants were identified by a five-digit code that was randomly generated by the online research database to protect their personal identities. After completing the study, the participants were given a debriefing statement.

Results

To determine the effect of gender on perceptions of mental health services, an independent samples *t*-test was conducted with gender as the independent variable and attitudes toward mental health services (Overall Attitudes, Recognition of Need, Stigma Tolerance, Interpersonal Openness, and Confidence in Practitioners) as the dependent variable, no significant differences were found (see Table 1). Therefore, the hypothesis that women will have more positive perceptions toward mental health services than men was not supported by the results.

Two bivariate correlation analyses

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were conducted to test whether both individualism and collectivism will be negatively associated with perceptions of mental health services. The results showed that individualism was negatively correlated with Overall Atti-

tion analyses were conducted to see whether gender moderates the correlation between cultural values (individualism or collectivism) and perceptions toward mental health services. The first analysis had gender and the

Table 1
Independent Samples t-tests for Gender and Attitudes toward Mental Health Services.

Variables	Men		Women		t
	M	SD	M	SD	
Overall Attitude	3.28	0.54	3.38	0.55	-0.88
Recognition of Need	3.31	0.83	3.32	0.70	-0.06
Stigma Tolerance	3.36	0.73	3.57	0.75	-1.50
Interpersonal Openness	3.21	0.55	3.37	0.68	-1.30
Confidence in Practitioners	3.31	0.64	3.38	0.70	-0.49

Note. $n = 199$.

tudes, Recognition of Need, and Interpersonal Openness (see Table 2). Collectivism was negatively correlated with Overall Attitudes, Recognition of Need, Stigma Tolerance, and Interpersonal Openness (see Table 2). Therefore, the results supported the hypothesis that both individualistic and collectivistic values are negatively associated with perceptions of mental health services.

To test the research question, which was how gender and cultural values interact to influence individuals' perception toward mental health services, two hierarchical linear regres-

s were conducted to see whether gender moderates the correlation between cultural values (individualism or collectivism) and perceptions toward mental health services. The first analysis had gender and the centered individualism scores and their interaction term as the independent variables and all five types of attitudes toward mental health services as the dependent variables. The results revealed that gender and individualism each had significant main effects on Overall Attitude and Stigma Tolerance. A Gender X Individualism interaction effect was found on all five attitude measures (see Table 3). Simple slope analyses indicated the correlations between Individualism and Overall Attitudes, Stigma Tolerance, and Confidence in Practitioners were positive for men and negative for women (see Table 4 and Figure 1-5).

Table 2 *Bivariate Correlations for Culture and Attitudes toward Mental Health Services.*

Variables	1.	2.	3.	4.	5.	6.	7.
1. Individualism	---	.01	-.14*	-.17*	.01	-.17*	-.10
2. Collectivism		---	-.27**	-.26**	-.17*	-.27**	-.14*
3. Overall Attitudes			---	.86**	.67**	.71**	.87**
4. Recognition of Need				---	.39**	.45**	.73**
5. Stigma Tolerance					---	.40**	.49**
6. Interpersonal Openness						---	.43**
7. Confidence in Practitioners							---

Note. $n = 199$. * $p < .05$, ** $p < .01$

Table 3
Hierarchical Regression Analysis for Gender and Individualism.

Variables	Overall Attitude			Recognition of Need			Stigma Tolerance			Interpersonal Openness			Confidence in Practitioners		
	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β
Step 1															
Gender	0.09	0.11	.06	0.00	0.14	.00	0.22	0.14	.11	0.16	0.13	.09	0.06	0.13	.03
Individualism	-0.12	0.06	-.14*	-0.19	0.08	-.17*	0.02	0.08	.01	-0.18	0.07	-.17*	-0.10	0.08	-.10
Step 2															
Gender	0.10	0.10	.07	0.02	0.14	.01	0.23	0.14	.11	0.17	0.13	.10	0.08	0.13	.04
Individualism	0.41	0.19	.47*	0.39	0.24	.47*	0.51	0.26	.43*	0.25	0.23	.02	0.43	0.24	.44*
Gender X Individualism	-0.58	0.20	-.65**	-0.64	0.26	-.54*	-0.54	0.27	-.44*	-0.47	0.24	-.43*	-0.59	0.25	-.52*

Note. n = 199. *p < .05, **p < .01. B = unstandardized beta weight; β = standardized beta weight. For Overall Attitude, R = .153, R² = .023 for Step 1, R = .256, R² = .066 for Step 2. For Recognition of Need, R = .167, R² = .028 for Step 1, R = .240, R² = .058 for Step 2. For Stigma Tolerance, R = .107, R² = .011 for Step 1, R = .177, R² = .031 for Step 2. For Interpersonal Openness, R = .194, R² = .037 for Step 1, R = .237, R² = .056 for Step 2. For Confidence in Practitioners, R = .102, R² = .010 for Step 1, R = .194, R² = .038 for Step 2.

The second analysis had gender and the centered collectivism scores, and their interaction term as the independent variables and attitudes toward mental health services as the dependent variable. A main effect of Collectivism was found on Overall Attitudes, Recognition of Need, and Interpersonal Openness. No significant interaction effects of gen-

der and collectivism on attitudes toward mental health services were found in these analyses.

Discussion

The first hypothesis, which stated that women have more positive perceptions toward mental health services than men, was not supported in this study. Rather, gender

Table 4
Bivariate Correlations for Gender, Culture, and Attitudes toward Mental Health Services.

Variables	1.	2.	3.	4.	5.	6.	7.
1. Individualism	---	.01	.39*	.24	.36*	.23	.34*
2. Collectivism	.04	---	-.33	-.38*	-.06	-.37*	-.18
3. Overall Attitudes	-.22**	-.26**	---	.92**	.49**	.72**	.87**
4. Recognition of Need	-.24**	-.23**	.85**	---	.23	.54**	.85**
5. Stigma Tolerance	-.03	-.19*	.71**	.42**	---	.32	.47**
6. Interpersonal Openness	-.22**	-.25**	.70**	.44**	.41**	---	.47**
7. Confidence in Practitioners	-.15*	-.13	.87**	.71**	.54**	.42**	---

Note. n = 199. *p < .05, **p < .01. Coefficients for men are above the diagonal and coefficients for women are below the diagonal.

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differences on perceptions of mental health services were not observed in the present study, with men and women having similar positive attitudes toward mental health services. Although the hypothesized difference has been supported by past research, the present study failed to replicate the finding.

The second hypothesis, which stated that individualism and collectivism would be negatively correlated with perceptions toward mental health services, was supported in this study. The results indicated that highly individualistic people tend to have negative attitudes toward mental health care and recognition of need for professional psychological help as well as more reluctance towards opening up to others. Highly collectivistic people also tended to have negative attitudes toward mental health services, recognition of need for professional psychological help, stigma tolerance against mental health care, and the willingness to open up to others.

The results supported an interaction of gender and cultural values on individuals' attitudes toward mental health services. Overall, the results indicated that highly individualistic women have less positive attitudes toward mental health services than women low in individualism. However, gender and collectivism did not show any significant interaction on people's attitudes toward mental health care.

Implications

Over the years, researchers have examined the influence of gender and culture on people's perceptions toward mental health services, but the effects of cultural values and the interaction effects of gender and cultural values have not been thoroughly investigated with a racially diverse sample. The results in the current study provide support to previous studies' findings that individuals' culture (Chen et al., 2009) and cultural values have a significant effect on people's attitudes toward mental health services (Kim, 2007; Kim & Omizo, 2003; Liao et al., 2005; Omizo et al., 2008). These past studies were focused on a specific ethnic population

while the present study examined variations in cultural values in a racially diverse sample. The diversity of the participants in this study increases the generalizability of the effect of cultural values on people's perceptions of mental health services.

The effects of cultural values have been indirectly examined in the past but our results offer more direct evidence of the influence that cultural values have on perceptions toward mental health care. For example, the underutilization of mental health services by minority groups (as shown by Chen, Kazanjian, & Wong, 2009; Ojeda & Bergstresser, 2008; Tata & Leong, 1994; Tiwari & Wang, 2008) may be due in part to their tendency to emphasize collectivistic values. The present study contributed in finding support that individuals' cultural values influence attitudes toward mental health services. Consequently, the results of this study highlight the importance of considering cultural factors when offering mental health services to minority populations.

One possible explanation for the lack of gender differences on attitudes toward mental health services observed in this study may be due to transforming gender roles in the United States. Some women are beginning to hold similar beliefs as men as they enter areas that are formerly considered as "male-jobs", such as the field of engineering (Powell, Bagilhole, & Dainty, 2009). These women reported that they try to be similar to men, such as becoming more independent, in order to be accepted and to survive in the field that is still primarily composed of men (Powell et al., 2009). Furthermore, these women report that they attempt to achieve a high reputation and adopt an "anti-woman" approach held by many men in the field, putting less value on femininity (Powell et al., 2009). As women become increasingly independ-

ent and similar to men, they may believe that relying on mental health professionals goes against their values to be independent. Moreover, independent women may grow to believe that relying on mental health services is a sign of dependency and weakness, which may cause a threat to their image of a strong, self-managed woman who can compete with men in the field that is male-majority.

As mentioned earlier, the interaction effects of gender and cultural values have not been examined in great detail. The results obtained in this research support previous studies that stated that one of the foremost reasons for men to avoid seeking help comes from societal expectations for men to be masculine (Good & Wood, 1995). However, the gender differences on perceptions toward mental health services involved the association between individualistic values and attitudes rather than simply differences in attitudes. In particular, women who emphasized individualistic values tended to show significantly less favorable views of mental health counseling than their less individualistic counterparts.

Those scoring high on collectivism did not show gender differences on perceptions toward mental health services, which may be explained by the common characteristics of collectivism. The value of cohesion, conformity, and group harmony is likely to lead collectivistic individuals to fear causing disruption to these factors within their relevant group (Chen et al., 2009; Kim, 2007; Kim & Omizo, 2003; Liao et al., 2005). As such, collectivistic people, regardless of their gender, tend to be concerned with how others view them. Deviance from the norm is not well tolerated in collectivistic cultures, and individuals are likely to believe that the group defines who they are (Triandis, 2001). A speculation can be made that, even though social cues on approval or rejection of mental health care were not primed in this study, the participants may have considered their group members'

expectations while completing the questionnaires. The findings that favorable perceptions toward mental health services were negatively associated with collectivistic values for both men and women suggest that people with collectivistic values may have tried to conform to that particular norm.

These results further stress the need for professionals to generate methods of making mental health services more acceptable. Considering the existence of stigmas of mental health services, providing education that addresses the true nature of mental health services will most likely lead to better perceptions on mental health services for people in both individualistic and collectivistic cultures. Lack of accurate knowledge leads to stigmas and distorted perceptions of mental health care (Tanaka, Inadomi, Kikuchi, & Ohta, 2004) because people formulate their perceptions based on their existing schemas. For example, practitioners may arrange a free program or a lecture open to the public to educate people about mental health services. Teaching that mental health services are not for "crazy" people, and that it may in fact be beneficial to many people, will give individuals an opportunity to consider mental health service as one of their options for receiving psychological help. For highly individualistic people, education efforts that present mental health services as an effective means of self-care, rather than a symbol of dependency or weakness, may make mental health services more acceptable. In addition, practitioners can ensure that individualistic people feel they have control over certain aspects of a session or treatment procedures to prevent them from feeling overly dependent. Addressing this stigma may especially be imperative for individualistic women, as they have been found in this study to have a tendency to have more negative perceptions toward mental health services compared to their less individualistic counterparts. Individualistic women may feel more in control by being

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control over certain aspects of a session or treatment procedures to prevent them from feeling overly dependent. Addressing this stigma may especially be imperative for individualistic women, as they have been found in this study to have a tendency to have more negative perceptions toward mental health services compared to their less individualistic counterparts. Individualistic women may feel more in control by being able to actively discuss and contribute ideas as to how they would like to go about the sessions and treatments. Another way is to for practitioners to prepare two or three plans and let the individualistic women choose which one they would prefer. Although the ultimate decision will be made by the practitioner, allowing some input and choice may provide more perceived control of the situation.

For highly collectivistic people, practitioners may offer mock group sessions that can include family members or friends in addition to previously mentioned public lectures. This allows those individuals to become accustomed to the atmosphere and provides an opportunity for people to see how mental health services can possibly be beneficial to them. Furthermore, they will most likely feel more comfortable coming in as a group so that they are not risking a possible disruption in their group harmony by coming in alone. Collectivistic people may be attracted to group sessions as getting to know each other better can strengthen their bond to the group.

The main goal of any outreach program should be to portray utilization of mental health services as “normal” or “a part of life” in both individualistic and collectivistic populations. Providing an opportunity to let individuals understand that taking care of their mental health is as important as taking care of their physical health will be an important factor. If people begin to consider the utilization of mental health services as similarly as the

utilization of a hospital (i.e., people are accustomed to go to hospitals for illness, physical injuries, and health check-ups), mental health practitioners will be able to provide their services to more people.

Limitations and Future Directions

The current study had several limitations. Although the participants were racially diverse, they were all psychology students attending a university, and there were significantly more women than men. As all participants were psychology students, possibility arise that the sample was biased in viewing mental health professionals and its related services more favorably than the general population due to an interest in psychology. Another limitation was that the data were gathered through self-report questionnaires and responses may have been impacted by social desirability. In addition, the Individualism/Collectivism Scale had low Cronbach's alpha coefficient, which suggest a low reliability of the scales in measuring the variables of interest. Finally, as the present study is a correlational study, causation between the independent variables and the dependent variables cannot be established. A possibility always remains that the outcome may have been caused by other extraneous variables due to lack of experimental control of the independent variables, as the current study was a correlational study.

Future studies would benefit by addressing the limitations of this study. In particular, subsequent studies would benefit from increased sample diversity and reliability of scales. Additionally, efforts to replicate the significant results found in this current study using different methods and techniques will increase the validity and reliability of the reported correlations and interactions. If possible, conducting an experiment based on the findings will ensure causation between the variables.

An area that warrants further investigation is the lack of gender differences in attitudes toward mental health services found in this study. In addition, exploration of the influence of cultural values on perceptions of mental health services also warrants further investigation. One possible direction is to examine different cultural values related to gender roles, such as being assertive or submissive, and observe the influence of those cultural values on perceptions toward mental health services. Even within individualistic or collectivistic cultures, some differences in beliefs and values exist that could easily influence people's attitudes. Investigating which cultural values affect individuals' perceptions toward mental health services the most would be an important path to consider. Expanding on the idea of the moderation effects of gender and cultural values on perceptions toward mental health services will increase its contribution to understand the effect of stigmas on the utilization of mental health services. Moreover, why individualism, but not collectivism, showed interactions with gender requires further investigation. One possibility is to consider whether collectivistic men and women have more attitudinal similarity compared to individualistic men and women.

Conclusions

Understanding what affects people's perceptions toward mental health services is useful in making mental health services more accessible to diverse populations. The results obtained in the current study indicate the importance of culture and the interaction effects of gender and culture on people's attitudes toward mental health services. These findings can be investigated in the future to add further knowledge on the factors that influence people's perceptions of mental health services to improve service usage rates for all populations. In the practical field, the first step is to attempt to reduce

stigmas associated with mental health services and to consider the basic cultural influences on people's perceptions toward mental health services. These results are a first step in formulating multiple ways to make mental health services more acceptable to various people based on gender and cultural values.

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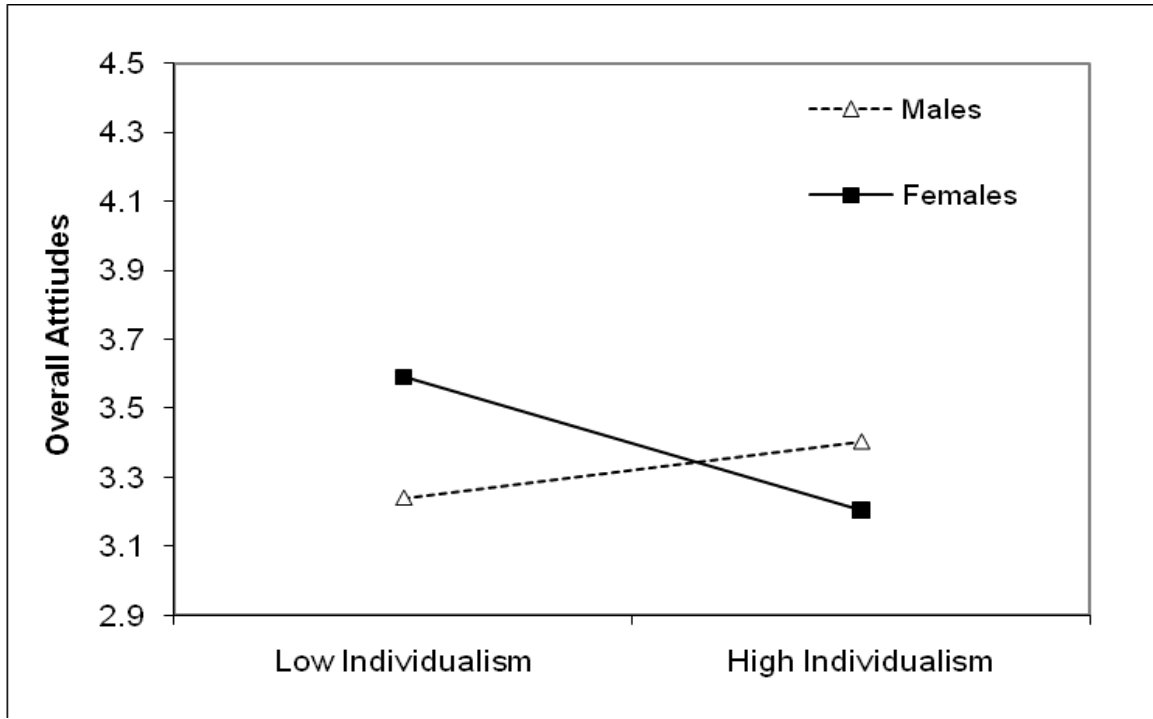


Figure 1. Gender X Individualism Interaction on Overall Attitudes. * $p < .05$, ** $p < .01$

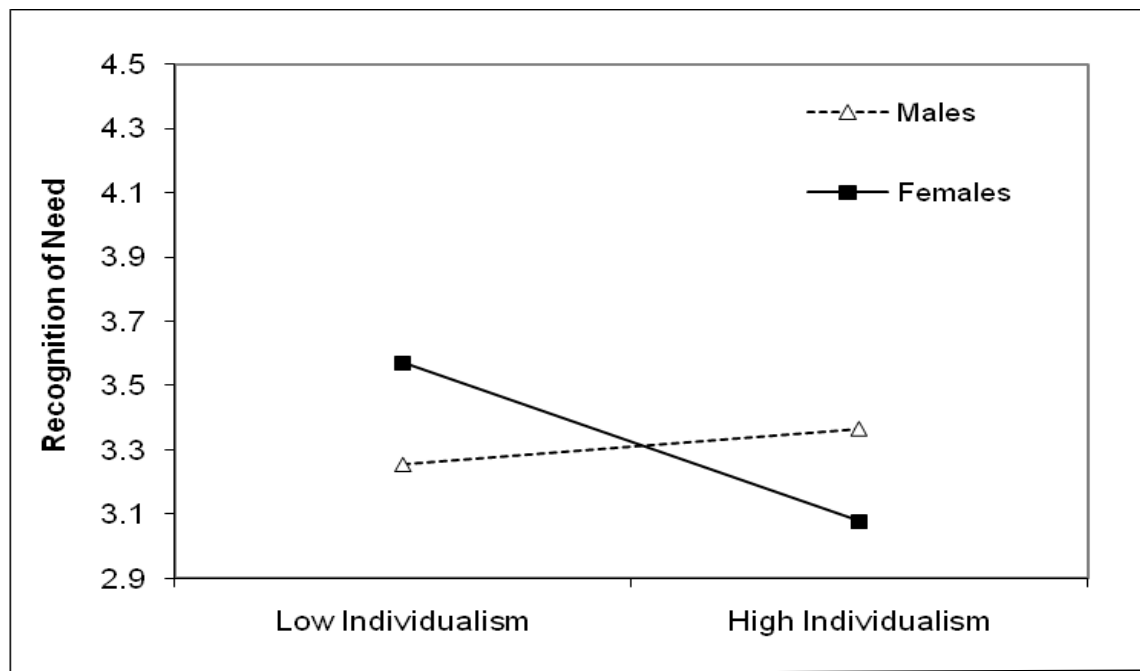


Figure 2. Gender X Individualism Interaction on Recognition of Need. * $p < .05$, ** $p < .01$

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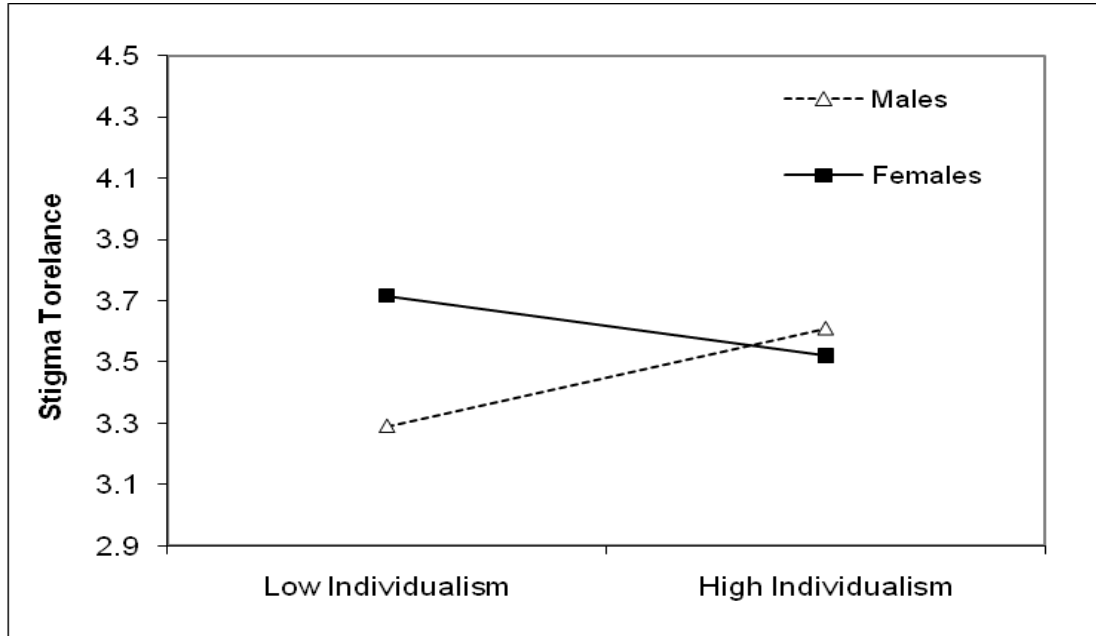


Figure 3. Gender X Individualism Interaction on Stigma Tolerance. * $p < .05$, ** $p < .01$

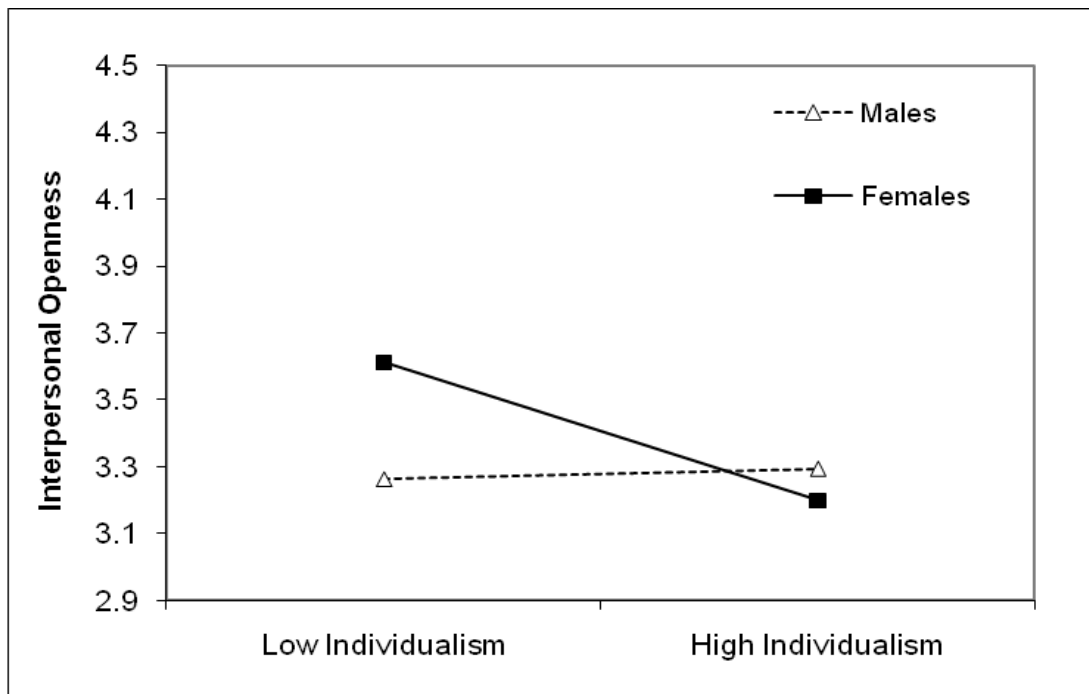


Figure 4. Gender X Individualism Interaction on Interpersonal Openness. * $p < .05$, ** $p < .01$

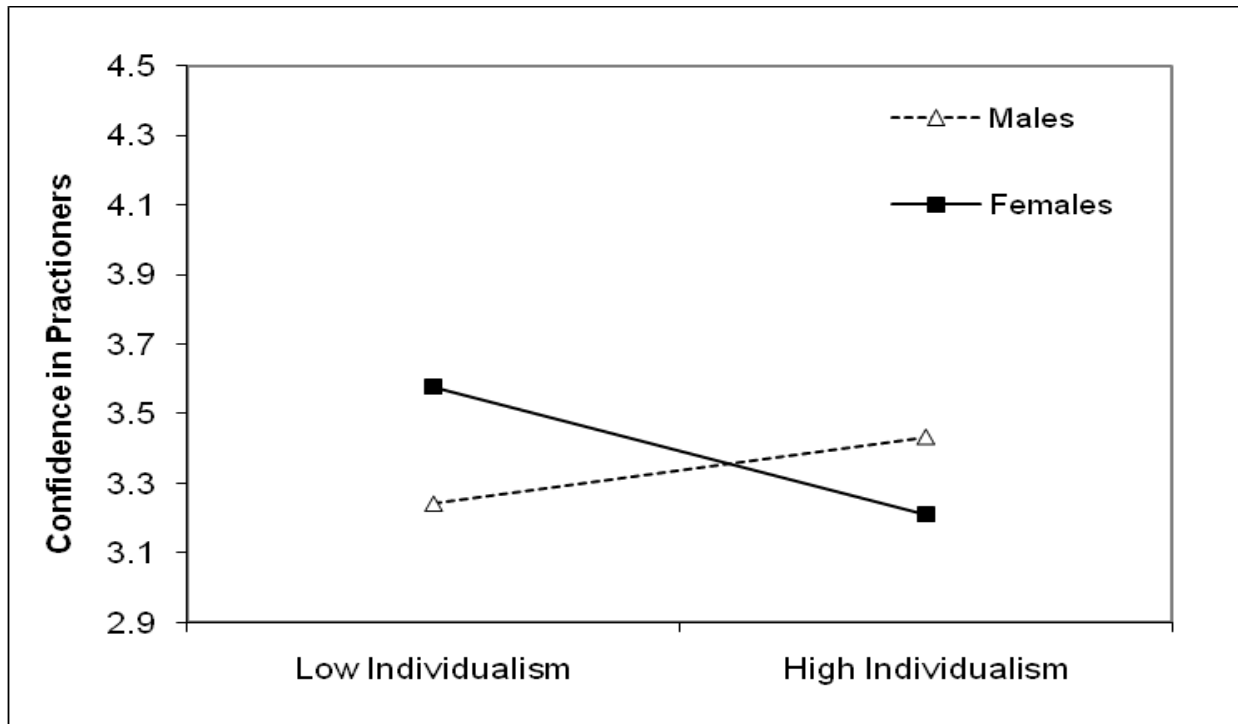


Figure 5. Gender X Individualism Interaction on Confidence in Mental Health Practitioners.
 $*p < .05$, $**p < .01$

The Undergraduate Journal of Psychology

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The Effects of Stress on Eating Behaviors

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Abstract--Many researchers have been studying the link between stress and eating behaviors. Everyone responds differently to stress, some eat more and others eat less, but there is no clear definition as to why such differences occur. The hypothalamic-pituitary-adrenal (HPA) axis and the release of stress hormones are thought to play a major role in the relationship between stress and eating behaviors. Research on the HPA axis have found that as cortisol is released there is an increased hunger and desire for food, particularly those high in fat and/or sugar. The brain's reward system may also play a role in stress-eating behaviors. Food can stimulate the reward system and induce pleasurable feelings, which can cause some people to rely on food as a comfort during times of stress. Some researchers suggest that certain types of stress, such as food restriction (physical stress) or gender role stress (mental stress), can have a greater impact on eating behaviors than other types of stress. The research discussed in this paper concludes that stress does have a negative impact on eating behaviors and that it should be considered when treating individuals struggling with obesity or other types of eating disorders.

HPA Axis and Eating Behaviors

Stress can have dramatic impacts on a person's overall health. It can have negative effects on normal physiological functions, such as sleep, heart rate, blood pressure, and immune response. It can also affect appetite and eating-related behaviors.

Over the past few decades, as the rates obesity and other eating disorders have increased, researchers have been looking at the effects that stress has on eating behaviors to try to provide a possible explanation. During times of stress people have been found to alter their eating habits, by either overeating or restricting, as a way to cope. Research suggests that the hypothalamic-pituitary-adrenal (HPA) axis is a key mediator between stress and abnormal eating behaviors. The HPA axis is part of the body's neuroendocrine system, which regulates the stress response and signals the release of cortisol. Cortisol is a glucocorticoid that is linked to the physiological effects that people experience when they are stressed. Excess levels of cortisol not only increase heart rate and blood pressure, but it can also affect appetite. When the body goes into fight-or-flight mode, due to a threat or high stress situation, more energy flows to the brain and muscles. This happens so that the brain can quickly respond to the stressor and so that the muscles are fueled well enough that they can work efficiently. As a result of this, the body does not spend much energy on other functions, such as digestion and food intake (Adam & Epel, 2007). This causes many people to under eat since their bodies are unable to expend energy on the digestion of food. In other cases, this causes people to overeat, despite the fact that this seems counterintuitive. Why such differences occur between individuals still remains unknown.

A study conducted by George, Khan, Briggs, and Abelson (2009) looked at the effects of cortisol on eating behavior in humans. They hypothesized that the release of cortisol,

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in the absence of a stressor, would cause people to eat more. The researchers tested this hypothesis by injecting participants with corticotrophin-releasing hormone (CRH). CRH is released from the hypothalamus when a threat is present. It then triggers the release of adrenocorticotrophic hormone (ACTH) from the pituitary, which signals the release of cortisol from the adrenal cortex. George et al. (2009) predicted that by injecting participants with CRH high levels of cortisol would be released into the bloodstream. The 14 subjects in the study were randomly selected to receive either a CRH injection or a saline (placebo) injection. The participants were blind as to what type of injection they received. Following the injection, blood samples were taken multiple times (5, 10, 15, 30, 60, and 120 minutes after the injection) to measure the amounts of cortisol in the body. At the end of the session each subject was given a basket of snacks and was encouraged to eat something. Afterwards, a dietician calculated the amount of food and calories that each person consumed. The participants were not aware that their food intake was being measured. Results of the study showed that those who received CRH injections had higher levels of cortisol in their bloodstream than those who received the saline injections. Participants who received CRH also consumed more food and calories than the placebo group. The researchers' hypothesis was supported.

Another study on nurses in Hong Kong reported similar behaviors between shift-work and abnormal eating patterns (Wong, Wong, Wong, & Lee; 2010). Doing overnight shift-work in a hospital is considered to be a stressful occupation because decreases time spent with one's family, interrupts normal sleep patterns, and interrupts regular meal schedules. The researchers hypothesized that overnight shift-work would be correlated with abnormal eating behaviors. The Dutch Eating Behavior Questionnaire was used for the purposes of the study. The questionnaires contained questions regarding demographics, work schedule, and

food habits. The Perceived Organizational Scale (POS) was also included. The POS measures to what degree an employee feels that the organization they work for cares about them, values their opinion, and provides support. Results of the study showed that a high proportion of nurses working overnight shifts had abnormal eating patterns. Nurses who worked 4 or more overnight shifts per month were more likely to develop abnormal eating behaviors than nurses who worked fewer shift duties. Abnormal eating patterns were also associated with high stress faced at work, as indicated by POS scores.

The HPA not only influences appetite, but it may also influence what types of foods people eat when they are under stress. In George et al.'s (2009) study the snack baskets provided to each subject contained 4 types of snacks: high fat sweet (cookies), high fat salty (potato chips), low fat sweet (flavored rice cakes), and low fat salty (pretzels). The participants who received CRH injections ate more of the high fat sweet and high fat salty foods than the participants who received placebo injections. The nurses in Wong et al.'s (2010) study who worked more overnight shifts also had a preference for sweets, high fat snacks, and fast food meals.

replenishment. People may crave calorie dense snacks when they are under stress because they provide more energy and can be processed more quickly than an entire meal (Oliver & Wardle; 1999).

The CRH released at the beginning of the stress response induces an anorectic effect, inhibiting appetite during the initial flight-or-flight response. The cortisol that is later released is thought to produce an orexi-genic effect, causing an increase in appetite (Nieuwenhuizen & Rutters, 2007). Cortisol may increase appetite in order to recover

from the earlier anorectic response. It may be the body's natural way of making up for the loss of energy. Foods that are high in fat or sugar are very calorie dense, which would be the body's ideal source for quick replenishment. People may crave calorie dense snacks when they are under stress because they provide more energy and can be processed more quickly than an entire meal (Oliver & Wardle; 1999).

A study conducted by Zellner et al. (2006) studied the effects of stress on food choice. The researchers used 2 groups of college females (high stress group and no stress group) and monitored what types of snack foods they preferred to eat. Each participant was seated at a table in an empty room, where they had to work on solving anagram puzzles. The high stress group was given anagrams that were unsolvable and the no stress group was given simple anagrams. Four bowls of snacks were placed at the participant's table. The snacks offered were M&Ms chocolate candies, Lays potato chips, Planter's peanuts, and grapes. The researchers predicted that the stressed females would eat more of the unhealthy snacks (M&Ms and potato chips) and the unstressed females would eat more of the healthy snacks (grapes and peanuts). The results indicated that the researchers' hypothesis was partially supported. Participants in the stressed group ate more M&Ms, while participants in the unstressed group ate more grapes. No significant differences were found for either the potato chips or the peanuts.

Food and the Reward System

Stress eating has not only been linked to the HPA axis, but it has also been linked to the brain's reward system. The reward center in the brain stimulates feelings of pleasure in response to a particular behavior, which serves as reinforcement for that behavior. Like drugs and other addictive substances, food can trigger such pleasurable feelings.

Food reward can be separated into 2 components: "liking" and "wanting." "Liking" is a person's reaction to a pleasurable stimulus (food, in this case). "Wanting," sometimes referred to as *incentive salience*, is the motivation to obtain a certain stimulus that we associate with pleasure or reward (Berridge, 2009). Although we typically "want" foods that we "like," both components can operate independently of each other (Pecina & Smith, 2010). Some researchers suggest that food "wanting" is the cause of eating when under stress. Foods that are high in fat and/or calories stimulate greater feelings of pleasure than other types of food, which may explain why people crave these foods (Lemmens, Rutters, Born, & Westerberp-Plantenga; 2011).

Lemmens, Rutters, Born, and Westerberp-Plantenga (2011) studied the differences in "liking" and "wanting," and food intake in 2 groups of subjects (overweight and normal weight). The participants arrived at the study in a fasted state. They were then asked to complete a math test and a computer test, which was followed by a meal. After the meal, the participants were asked to repeat the math test and the computer test, which was followed by a second meal. Two versions of the test were created: an unsolvable test with loud music playing in the background (stress condition) and a solvable test with no music in the background (rest condition). The researchers hypothesized that in the stress condition overweight participants would have higher food intake than the normal weight participants and those in the rest condition. Questionnaires were given to participants multiple times throughout the study to assess their level of stress and appetite. The Profile of Mood State (POMS), State Trait Anxiety Inventory (STAI), and heart rate were used to measure stress. Visual analogue scales (VAS) were used to measure level of appetite. The computer test was designed to measure "liking" and "wanting" in

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terms of different food categories (bread, filling, drinks, desserts, snacks) and non-food control category (stationery). Results from the questionnaires indicated that all of the participants were satiated after eating their first meal. This allowed researchers to observe whether stress affected food intake when hunger was absent. Scores for “liking” were not affected in either the stress or rest condition, although after the first meal “liking” for the stationery category increased. In the normal weight group, the stress condition did not affect “wanting” scores. After the first meal, “wanting” and food intake decreased. In the overweight group, stress increased the “wanting” scores. Both “wanting” and food intake increased for this group, even after the first meal.

The results of Lemmens et al.'s (2011) study support the idea that “liking” and “wanting” are separate factors. In this case, “liking” does not seem to be affected by stress, whereas “wanting” does. The researchers suggest that “wanting” and the presence of stress may be causing obesity and overeating in some people.

The reward system plays a major role in addictive behavior. Since food and drugs share the same mechanisms for addictive behavior, some researchers believe that overeating is actually a type of addiction (Avena, 2010). Foods that are high in fat and/or sugar in particular activate the brain's reward system and signals the release of dopamine. People who overeat when they are under stress may be trying to increase their levels of dopamine, which would increase pleasure and reduce negative affect. According to Hepworth, Mogg, Brignell, and Bradley (2010) negative affect increases motivation for eating palatable foods. They studied the effects of negative affect on participants' response to food cues. They predicted that negative affect would increase the reward value of certain foods and increase participants' response to food cues. They induced a negative mood in participants and had them complete a

visual-probe task and a picture rating task. Even though the participants were in a satiated state, when presented with pictures of food their subjective appetite increased.

Food addiction may develop in some individuals due to high levels of stress and the copious amount of food cues in the environment. When a person is under stress and a food cue is present the brain's reward system activates, signaling the desire to eat. Even when the person is satiated, the pleasurable feelings produced by the reward system can override the feeling of satiety and cause an impulsive urge to eat (Liu, von Deneen, Kobiessy, & Gold; 2010).

Addiction can be separated into 3 phases: binging, withdrawal, and craving. In the binging stage a person will take in high amounts of a particular stimulus (food, in this case). Withdrawal behaviors occur when the stimulus is no longer available. Craving is the motivation and to obtain that particular stimulus again after a period of withdrawal. Several studies on food addiction in rats found that binging, withdrawal, and craving stages can be seen in rats with an addiction to sugar. Rats that were exposed to a high sugar diet for a month began expressing behaviors similar to those associated with drug addiction. After binging on sugar for a month the rats began increasing the amount of sugar they ate, each time they consumed it. When all food was removed the rats showed behaviors similar to opiate withdrawal (teeth chattering, tremors, head shakes, and decreased body temperature). When the rats were given sugar again after a 2 week abstinence they consumed even more than they had previously, indicating that cravings for sugar occurred during those 2 weeks (Avena, 2010). Not all stress-eaters will develop an addiction to food, but the more an individual binges or overeats when stressed, the more likely they are to become dependent on food make them feel better.

Much of the research on stress and eating behaviors focuses on the physiological mechanisms involved. It is possible that there is also a learned component in the stress-eating response. As children, we may be learning to associate food with pleasure, especially in relation to dealing with stressful experiences. Food is often portrayed in the media as an object of pleasure, not simply an object used to satiate hunger. For example, it is common to see female characters on television eating large quantities of junk food to cope with a problem, such as a break-up with a significant other. The women will turn to chocolate, ice cream, and other types of junk food to comfort themselves (Nguyen-Rodriguez, Unger, and Spiruijt-Metz; 2009). This portrayal of food suggests that eating is the solution to dealing with one's problems. Page and Brewster (2009) analyzed food commercials that appeared during children's programming to determine whether advertisements geared towards children also illustrate food as a pleasure-inducing stimulus. They conducted an analysis of 147 different food commercials that were broadcast during Saturday morning cartoon programming. Of these commercials, the majority of the items being advertised were high-sugar cereals and fast food items. The researchers found that one in 12 of the commercials associated the food item with an exaggerated sense of pleasure. The characters in the commercials were often portrayed as experiencing euphoric highs, hallucinations, and going to extreme measures to obtain the food item. Such behaviors are similar to those exhibited by drug addicts. Advertising food to children in this manner can be dangerous. Young children are very easily influenced by what they see on television and seeing these types of commercials may cause them to develop disordered thoughts about food or inappropriate food-seeking behaviors.

Stress in Restrained vs. Unrestrained Eaters

Everyone reacts differently to stress. Some

people respond by eating in the absence of hunger and others respond by decreasing their food intake. Researchers have discovered that there may be certain underlying factors that make some people more likely to overeat when stressed. One such factor is the person's dietary habits (Woods, Racine, & Klump; 2010; Rutters et al.; 2008; Zellner et al.; 2006). People who practice dietary restraint on a regular basis are more likely to eat in response to stress than non-restrainers. Restrained eating is the act of dieting or restricting one's food intake, often for the purpose of losing weight or to alleviate a health problem. In the face of stress restrained eaters tend to experience disinhibition, which is a temporary lack of restraint. Disinhibition occurs when the restrained eater no longer feels that they can no longer maintain their strict dietary habits. When this occurs the person often feels like they have lost control and they may overeat the foods that they would typically avoid, like sweets and high-fat snacks (Zellner et al., 2006).

In Zellner et al.'s (2006) study on stress and food preferences the researchers found a relationship between stress and disinhibition in restrained eaters. One hundred and sixty nine college undergraduates were given the Eating-When-Stressed Questionnaire. The questionnaire asked about the participants' regular dietary habits, whether those habits change under stress, what types of foods they eat when stressed, and whether or not they typically eat those foods. The results showed a significant difference between men and women's scores. Both sexes reported overeating during times of stress, but the rate was significantly higher for women. Most of the participants who reported being stress-eaters had high dietary restraint scores. The stress-eaters were much more likely to be restrained eaters than the non-stress-eaters. Seventy three percent of the stress-eaters reported that the

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foods they eat when they are under stress are foods that they would normally avoid. Sixty four percent indicated that they eat sweet foods when stressed (most commonly, chocolate) and the rest reported eating high fat snack foods.

Rutters, Nieuwenhuizen, Lemmens, Born, and Westterterp-Plantenga (2008) attempted to figure out why disinhibition occurs in restrained eaters more than it occurs in unrestrained eaters. The goal of their study was to investigate the relationship between dietary restraint and functioning of the HPA axis. Participants in the study were in the normal weight range (BMI between 20 and 25) and were not currently dieting. Blood samples were taken at baseline and at multiple points throughout the 5-hour study (while fasting, after breakfast, and after lunch). Six blood samples were taken in total from each participant and cortisol levels were measured each time. Each participant also had to undergo a stress task: a maximal cycling test using a stationary bicycle. The Three Factor Eating Questionnaire (TFEQ) measured dietary restraint, disinhibition, and feelings of hunger. The results indicated that no relationship was found between dietary restraint and HPA axis functioning in men, although a significant correlation was found for women. Women with high dietary restraint scores had higher levels of cortisol, higher BMI, and higher body fat percentage than women with low dietary restraint scores. There was also a relationship between high cortisol levels, dietary restraint, and high disinhibition scores. Both Zellner et al. (2006) and Rutters et al.'s (2008) studies show that people who practice restrained eating have high rates of disinhibition and overeating. The act of restricting food may itself be the cause. Dieting is a conscious decision and sticking to that decision can be challenging. This challenge may cause dieters to think about food more than is necessary. Constantly thinking about food while trying to avoid certain foods may be putting the body in a constant state of stress. The HPA axis may become hyperactive and release excess amounts of cortisol into the

bloodstream. As discussed earlier, the excess cortisol may cause dieters to experience disinhibition and eat foods that are unhealthy.

Opposing results have been found for people who are not restrained eaters. Unrestrained eaters tend to decrease their food intake when they are under stress (Stone and Brownell, 1994). Rutledge and Linden (1997) looked at the differences between changes in eating habits in unrestrained vs. restrained eaters. It was predicted that unrestrained eaters would consume less food than restrained eaters when put in a stressful situation. The researchers also observed whether the consumption of food would decrease the physiological stress response in restrained eaters. They took physiological and cognitive measures from 77 female college students, using self-report surveys and cardiovascular instruments. Participants began the study in a fasted state. They were then asked to complete a short (12 minute) cognitive test, comprised of 3 separate cognitive exercises. The cognitive task was followed by a recovery period, during which the participants were provided with food. The participants filled out the self-report surveys 3 times during the study: during the fasted state (baseline), after the cognitive test, and during recovery. Throughout the study the participants were also hooked up to blood pressure and heart rate monitors so the researchers could determine if the participants were actually under stress. Blood pressure and heart rate were taken during each of the 3 phases of the study. The self-report surveys included Herman & Polivy's Restraint Scale, the Three Factor Eating Questionnaire (TFEQ), and the Positive and Negative Affect Scales (PANAS). During the cognitive test the unrestrained eaters ate less than they did during baseline and recovery. The restrained eaters ate more during the cognitive test than the unrestrained eaters, which is congruent with current research on the topic. The cardiovascular measures also indicated that for the re-

strained eaters the consumption of food did not enhance the rate of recovery.

Similar findings have been found in studies on rats and their eating behaviors (Dess, Choe, & Minor; 1998). The diet of the rats appeared to determine what type of eating behaviors they would exhibit under stress. Rats on lower calorie diets were more likely to utilize their bodies' energy (fat) storage, rather than eat to obtain more energy. The rats on higher calorie diets were less likely to use their stored energy and were more likely to seek food.

Eating Behaviors and Gender Role Stress

Most of the research on stress and eating behaviors suggests that women are more likely to increase food consumption, whereas men are more likely to decrease food consumption. In both Zellner et al. (2006) and Rutter et al.'s (2008) studies the correlation between stress and overeating in restrained eaters was higher for women than men. The differences in male and female eating behaviors may be related to gender role. Gender role expectancies differ for males and females, although they can induce stress for both sexes. For females, gender role stress is associated with fear of being unattractive, having poor interpersonal relationships, and fear of being assertive (Mussap, 2007). These stressors may cause women to have lowered self-esteem, negative body image, and feelings of inadequacy.

Fear of being unattractive has been found to cause high levels of stress for females (Mussap, 2007). Western society places a lot of emphasis on the ideal of being thin. Constantly seeing images of thin bodies and feeling pressure to conform to this ideal causes many women to experience body dissatisfaction. Body dissatisfaction, low self-esteem, and negative body image have been shown to cause eating disorders and other abnormal eat-

ing behaviors.

Women with eating disorders report experiencing high levels of stress in their lives. Bekker and Boselie (2007) studied the relationship between eating disorders, gender role stress, and other types of stress. Their goal was to determine whether gender role stress or other types of stress were more significant to the development of eating disorders. Their hypothesis was that women with eating disorders (bulimia nervosa) would report more stress than women without eating disorders. They predicted that women with eating disorders would report higher levels of all types of stress, not just gender role stress. Participants in the study were 36 females diagnosed with bulimia nervosa and 53 college females without an eating disorder (control). Both groups completed questionnaires pertaining to eating disorders and stress. The Eating Disorder Inventory (EDI) was used to assess psychological characteristics that are associated with eating disorders. The EDI contained subscales for Drive for Thinness, Perfectionism, Bulimia, Body Dissatisfaction, Ineffectiveness, Interpersonal Distrust, Interoceptive Awareness, and Maturity. The Gender Role Stress Scale (GRS) and Perceived Stress Scale (PSS) were used to measure type and frequency of stress. The Coping Inventory for Stressful Situations (CISS) was used to determine the participants' method of coping with stress. The women with bulimia nervosa scored significantly higher on the GRS and PSS when compared to the control group. They also scored significantly higher on certain subscales of the GRS. Not only did they have higher scores for female gender role stress, but they also had higher scores for masculine gender role stress as well. The women with eating disorders reported higher levels of all types of stress than the control group. The CISS indicated that the participants with eating disorders were used more emotion-focused meth-

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ods of coping than other types of coping mechanisms. Emotion-focused coping focuses more on dealing with the emotions that a person is feeling rather than the actual problem. Eating/binging is an emotion-focused coping mechanism most often associated with eating disorders.

Studies on men and disordered eating behaviors show that men respond differently to gender role stress than women. For males, gender role stress is associated with feeling physically inadequate, emotional expression, feeling inferior to women, being intellectually inferior, and fear of failure in work and/or sexual performance (Mussap, 2008). Although body dissatisfaction is a problem that is more common among women, men also experience body dissatisfaction due to gender role expectations. Western society depicts the ideal male body as being lean and muscular. When men experience high levels of gender role stress they are more likely to decrease their food intake, rather than increase. Men eat less when they are stressed in an attempt to lose fat and build more muscle so they can achieve the ideal body that they are expected to have.

All types of stress can influence changes in eating behaviors, not just gender role stress. It appears, though, that gender role is a common source of stress for both men and women and is inadvertently affecting eating behaviors. Both sexes turn to different methods of emotion-focused coping (increased food intake or decreased food intake) in response to stress, which can cause them to gain or lose weight.

Discussion

As the rates of obesity and eating disorders continue to increase researchers are spending more time trying to discern the causal factors. Over the past few decades it has become clear that stress may be a key causal factor in eating-related issues. The HPA axis is thought to play a major role in the

relationship between stress and eating. Living in such a high-stress environment and constantly being surrounded by food cues, it is likely that people are turning towards food to cope with the stress in their lives. The hormones released during the stress response may trigger increased feelings of hunger, causing people to seek out calorie dense foods. Foods that are high in fat and/or sugar are sought because they can provide a quick release of energy and help the body recover from the stress response faster. In regards to treating obesity and overeating, therapists and doctors should consider looking at stress as a possible cause of the problem. Helping a patient to manage stress can decrease the levels of cortisol being produced in their body, which would make them less likely to feel hungry when they are stressed.

The reward system in the brain should also been considered when treating obesity and overeating. Food can stimulate the reward system and induce feelings of pleasure, similar to drugs and other stimulants. When food becomes associated with pleasure people may seek out food to comfort themselves during times of distress rather than find a productive way to deal with the problem. The media may also shape the way a person perceives food. Often, food is advertised as a reward or a symbol of happiness. This portrayal of food can cause both children and adults to form a disordered relationship with food. For patients who use food to cope with negative emotions therapists need to help the patient form new ideas and relationships with food. Cognitive-behavioral therapy can be used to help patients form a new perspective of food: that it is a form of nourishment, not a coping mechanism. It can also help stress-eaters form new problem-focused methods of coping so that they no longer feel the need to eat when they are stressed.

Another factor for therapists to consider when treating obesity and eating disorders is

the type of stress the person is experiencing. While all types of stress can cause a person to alter their eating behaviors, gender role stress seems to cause a significant amount of stress for both males and females. Physical appearance is an aspect of gender role stress that can cause serious distress for both sexes, which may directly influence one's eating habits. Males tend to respond to gender role stress by decreasing their food intake, while females tend to increase their food intake. A therapist would need to take different approaches to treating gender role stress in males and females since they respond to stress differently.

While researchers have discovered a great deal of information about the relationship between stress and eating, there are still some limitations in the overall research. Most of the research on eating behaviors uses college females as participants. Many researchers may choose female participants for their studies due to the fact that disordered eating behaviors are more common among females. Even though there is higher prevalence in women, men also suffer from disordered eating behaviors as well. In only using females as participants, the research findings cannot be generalized to the entire population. The small amount of research that uses men as participants conclude that changes in men and women's eating behavior differ, which is another reason that men should also be included in eating behavior studies. Another limitation that is common among eating behavior studies is the use of self-reports. Often, researchers rely on self-reports to determine changes in eating behaviors, food preferences, amount of food eaten, etc. While self-reports are an easy tool to conduct research, it can be difficult to get accurate results this way. Some people may report eating more or less than the actual amount eaten or may give false answers if they are unable to remember specific details of their eating habits.

Another common limitation amongst re-

search on eating behaviors is the lack of baseline measurements. In several of the studies I read, in which the researchers were measuring how much food the participant consumed, the researchers did not observe the participants' food consumption prior to inducing stress. In situations where the researchers concluded that the participants in the stress condition ate more than the unstressed group this may not be entirely true. The researchers should have established a baseline amount of food consumed to see how much food intake increased and whether or not there was an increase in the unstressed group as well.

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Attitudes Affecting Disparities in College Achievement: How Much Can We Blame on Our Parents?

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Abstract--This study considered the affect of two important factors, attribution style and the quality of parent-child relationships on college success during emerging adulthood. It specifically considered how the quality of parent-child relationships influenced the development of attribution styles towards academic achievement. The purpose of this research was to determine if participants with strong parent-child relationship would be more likely to develop an external attribution style towards academic success as a result of the many resources available to them outside of their own capabilities. In addition, the purpose was to determine if participants with poor parent-child relationships were more likely to develop an internal attribution towards academic success because of the level of determination and independence required for them to be able to attend college. Twenty-two face-to-face interviews were completed with college students from a Northwestern University in which questions about family background and academic attitudes were asked. Findings indicated that students with the poorest quality parent-child relationships exhibited the highest levels of internalization of their ability to achieve academic success on their own without outside influences.

ademic motivation and attribution of academic success to internal or external factors referred to by Weiner as "locus of responsibility." (Weiner, Heckhausen, Meyer, & Cook, 1972). An internal attribution showed that students associated their success or failure to factors within themselves, for instance, work ethic or intelligence. An external attribution was present when students associated their success or failure to factors outside of themselves, for example, hard tests or mean teachers. Both internal and external attributions were identified as either stable, remaining static throughout life changes, or unstable, shifting from external to internal attribution as life situations varied (Weiner, 1972). Stable attributions had a greater effect on confidence levels than unstable attributions because they are perceived as constant. For example, if a student has an internal stable attribution that his grades are a result of his hours of long study, then every time he gets a good grade on a test his level of confidence will increase because he believes that study and grades will always provide the same outcome (Weiner, 1976).

Weiner (1972) applied these theories to academic success concluding that development of attribution styles played a crucial role in levels of learning and performance in the classroom. In his continued research, Weiner (1996) identified an internal, stable attribution as a characteristic possessed by the most successful students, with success being identified by high grades and levels of achievement (Feshbach & Weiner, 1996). If an internal attribution is the most indicative of academic success then it is useful to consider what factors play foundational roles in its construction. The present study

Bernard Weiner, a cognitive psychologist, has done extensive research into attitudes and motivations of college students that affect academic success. Through his studies, Weiner (1972) identified a correlation between aca-

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looked specifically at the development of attribution styles with the goal of understanding how family backgrounds, specifically parent-child relationships, have the ability to perpetuate educational success or failure through their affect on attribution development.

It is evident that family relationships effect more than just what goes on within the home. Research has established the affect of parent-child relationships on academic achievement. Some of the many characteristics of strong parent-child relationships that have been found to increase academic achievement for young adults are: high levels of family discussion (Nurmi & Pulliainen, 1991), maternal warmth (Repinski & Shonk, 2002), and supportive parenting (Melby, Conger, Fang, Wickrama, & Conger, 2008). Research has also shown that characteristics of strong parent-child relationships such as parental emotional support (Bronte-Tinkew, Moore, & Carrano, 2006), parental warmth and positive father-child relationships (Doyle & Markiewicz, 2005) resulted in higher levels of self esteem, which in turn has been shown to result in higher levels of academic achievement (Weiner, 2000).

For this study it was important to consider parent-child relationships within the context of participants' transitional state from adolescence to adulthood, commonly referred to as emerging adulthood (Arnett, 2000). At this stage emerging adults are developing autonomy while maintaining ongoing relationships with their parents. According to individuation theory this transition occurs as relationships between adolescents and their parents are renegotiated into more peer-like, reciprocal relationships (Hofer, 2003). During the years of emerging adulthood conflict between parents and their children decreases (Wittman, Buhl, & Noack, 2000) and the subject of disagreements becomes more relative to their newly-conflicting adult roles (Fingerman, 1996). Masche (2008) suggested that life transitions, such as going to school or leaving the parental home, coupled with new experiences, new resources, and new social roles encourages the

continued development of parent-child relationship.

An important aspect of this developmental stage is the shift that occurs within parent-child relationships as emerging adults choose to begin their college education. Lefkowitz (2005) reported that over 80% of emerging adult college students stated that their relationships with their parents had changed for the better since they started college. Despite a decrease in frequency of contact with their parents, the majority of emerging adult college students felt their level of open communication with their parents had increased, they had a closer relationship with their parents, and the relationship had become more mature, respectful, and friend-like (Lefkowitz, 2005). The quality of parent-child relationships during this academic stage was distinct for emerging adults who choose to live at home while studying versus living away from home. Whiteman, McHale, and Crouter (2010) found that young adults who lived away from home while attending college had better quality relationships with their parents due to the freedom provided by distance for emerging adults to act more independently. These findings supported that college students would report higher levels of satisfaction with their relationship with their parents which may also be an indicator of higher levels of parental support.

A critical factor in the quality of parent-child relationships from birth to adulthood is socioeconomic status (SES). Research has shown that parents with higher SES had lower levels of parental depression, higher levels of parental warmth, and were less likely to use physical discipline. These characteristics resulted in higher math and reading scores as well as better approaches to learning (Bodovski & Youn, 2010). Parents with lower SES often lacked knowledge, parenting skills, and resources that allowed them to be more involved in their children's education, which not only negatively impacted educational achievement, but also the quality of their relationships with their children (Casanova, Garcia-Linares, de la Torre, & de la Villa Carpio, 2005). Melby et al. (2008) found that household SES, not only had

a direct impact on adolescent academic achievement that was carried into young adulthood, but also impacted the parents ability to be a supportive and engaged, both of which are considered conducive to a strong parent-child relationship. This evidences not only that SES, academic achievement, and parent-child relationships are intertwined, but also shows that youth who come from higher SES households are more likely to have both benefits of a stronger parent-child relationship and a higher likelihood of academic success.

The previous research discussed might lead to a logical conclusion that college students who come from higher SES households would have stronger relationships with their parents, both of which would result in higher academic achievement. Relating this to Weiner's (1996) finding that an internal attribution was found among the most successful college students we could conclude that these students would be more likely to display an internal attribution. However, this research posited that other factors must be considered in predicting attribution tendencies. College students from higher SES households who have stronger parent-child relationships have received more emotional and financial support from their environment than have students who come from low SES homes and/or have poor relationships with their parents (Swartz, Kim, Uno, Mortimer, and Bengston O'Brien, 2011). It is possible that students from supportive households grow accustomed to outside support and may often take it for granted. We must take these factors into account when considering their expected attribution development and consider that they may have a weaker tendency to attribute their success to being based solely on their own hard work and efforts.

Conversely, college students from lower SES households, who may also have weaker relationships with their parents, have to overcome great obstacles to even attend college. Indeed more than half of them are likely to drop out before graduation (Haycock, 2006). For the individuals who make it to college they continue to face funding and performance disad-

vantages in academia that their parents may not have the ability to help them overcome (Kolkhorst, Yazedijan, and Toews, 2010). Due to lack of knowledge of how to navigate the higher education system, find funding sources, and limited access to others who have this knowledge it takes a great deal of determination and independent action for college students from low SES households to enroll and be successful in higher education. Due to the determination and level of independent initiative required for them to enter college and face the academic challenges that follow it was necessary to consider if they were more likely to develop an internal attribution style regarding academic success. This allowed us to consider if, despite the stated common disadvantages for students from low SES households, the hurdles they had to overcome resulted in the development of an internal attribution style associated with increased academic success.

It is important to examine how the quality of parent-child relationships effect the development of attribution types that will be carried into adulthood and the pursuit of higher education. Addressing this question can provide insight into possible disadvantages between family backgrounds and attitude development that can determine academic success.

Present Study

The purpose of the present study was to explore if students with poor parent-child relationships were more likely to develop attitudes that worked against their success and how students at this developmental stage defined their relationships with their parents. This research also considered if students believed their relationship with their parents had an effect on their educational goals and ability to attain them. This information was obtained via face-to-face interviews and questionnaires with college students between the ages of 18 and 25. This demographic was chosen because this is the developmental stage in which the greatest shift in parent-child relationships occurs (Lefkowitz, 2005). The advantage of using an interview technique for this study was that it allowed par-

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ticipants to self-define academic success and ideal parent-child relationships and rate them based on their own expectations of these concepts.

The first research question addressed how participants defined college success. Hypotheses 1 was that participant's from higher socio-economic households would have had more external support and family involvement than participants from lower SES households and that this would result in them relating academic success to more external attributes as opposed to internal factors that Weiner (1996) identifies among the most successful students. The second research question addressed if participants believed they could achieve their definition of academic success if they did not have their current relationship with their parents. Hypotheses 2 was that participants with strong parent-child relationships would display less confidence in their ability to achieve academic success on their own than participants with weak parent-child relationships due to relating their success to their outside sources of support. The third research question addressed what participants believed the role and responsibilities of parents with a child in college should be. Hypotheses 3 was that the expectations of participant's with good parent-child relationships would be higher and more demanding than participants with weak parent-child relationships, based on their life experiences and what they have come to expect. The fourth research question addressed if participants believed that relationships with their parents could affect college success. Hypotheses 4 was that, despite college students feeling closer to their parents, their new found autonomy and independent decision making abilities would result in participants not relating their college success to the quality of their relationship with their parents.

Method

Participants

Participants consisted of 22 undergraduate students between the ages of 18-25, (M=22.9) at a Northwestern University. Participants included 11 males and 11 females and

consisted of two freshman, eight sophomores, five juniors, and seven seniors representing a diversity of majors across the university. The ethnic diversity consisted of one Romanian, one Sudanese, one Korean, one Bosnian, three Filipinos, four Latinos, and 11 Caucasians. All Caucasian and three Latino participants were born in the United States with all remaining participants born in their native countries. Out of the 22 participants, eight were first generation college students, five had one parent who obtained a bachelor's degree or higher, and nine reported that both parents have received a bachelor's degree or higher.

Materials and Procedure

This study was approved by IRB at the institution where the research took place. Participants were recruited via fliers hung up and handed out around high-traffic areas on the university campus as well as emailed to acquaintances to be passed onto interested parties. Willing participants contacted the interviewer via the university email address supplied on the fliers and upon receipt of an email, a response was sent from the interviewer requesting age, gender, and ethnicity to assure compliance to demographic guidelines after which an interview date and time was set.

Participants reported to the Psychology Research Center on campus for their interview and consent forms were completed indicating voluntary participation and permission to audio record interviews. The purpose of the study was explained as analyzing how academic motivational factors are affected by challenges in college; however, information was not given regarding the hypothesized correlation of academic attitudes to the strength of parent-child relationships to avoid bias in answers. Interviews were completed by the author who gave a brief introduction that included a summary explaining the challenges in the interviewer's academic background in order to create a relaxed environment in which participants would feel comfortable relating their own challenges. Interviews lasted an average of forty minutes and were followed by a short online questionnaire including demographic information. In-

interviews were audio recorded to be transcribed at a later date.

Interview. The interview consisted of 21 open-ended questions regarding the participants' academic paths, attitudes towards college success, relationships with parents, and the perceived effects of parent-child relationships on achieving academic success (see Appendix). The interview questions were presented in two categories; the first 13 questions related to participant's academic history and goals and the last 8 questions shifted to family relationships.

Questionnaire. The questionnaire consisted of demographic questions about the participant's income and education levels of their parents. In addition to the demographic questions participants completed a series of questions not analyzed in the present study.

Data Analysis

All data analyses was conducted by the author. Interviews were coded by dividing participants into three groups based on their responses to the questions, "What is your definition of an ideal parent-child relationship?" and "How do your parents compare to that ideal?" The three groups consisted of positive parent-child relationships, neutral parent-child relationships, and negative parent-child relationships. Ten participants responded that their parents met or came close to their definition of an ideal relationship, and were placed in the group "positive parent-child relationships". Six participants expressed pleasure with their parent's efforts, but also expressed disappointment in their failure to meet key roles in their definition of an ideal relationship, and were placed in the category "neutral parent-child relationships." Seven participants responded that their parents have in no way met their needs or filled their expectation of an ideal relationship, and were placed in the group "negative parent-child relationships."

All participant responses to the first research question were taken from the data and placed into one document separated into the positive, neutral, and negative participant groups. This process was repeated for the re-

maining three research questions and answers were compared side by side based on participant's categories allowing the evaluation of similar ideologies within and across groups. Responses were first analyzed in their respective group of positive, neutral, and negative parent-child relationships. Each group was analyzed separately, carefully reading through all participant responses playing close attention to common themes that emerged. Due to the small number of participants in each group common themes were considered to be ideologies shared by the majority of the group with the exception of 1 or 2 participants. Upon completion of analyses based solely on responses within groups the responses of each group were compared to the other two groups. The common themes that were found in the positive, neutral, and negative parent-child relationship groups were compared to each other for similarities and contrasts. When shared, group ideologies were not present when considering the research questions participant responses from all three groups were considered as a whole, again looking for the emergence of common themes shared by the majority of respondents.

Results

Definitions of academic success

Across the positive, neutral, and negative parent-child relationship groups no significant differences in defining academic success were found. Answers included varying combinations of several common themes including: efforts resulting in good grades, high grades coupled with social development, such as participation in campus activities, and a holistic view of progression towards an end goal of obtaining a successful career. A participant in the positive group stated, "You come to college to branch out find yourself and gain the knowledge you need for a future career." A participant in the neutral group stated, "Success in college is understanding yourself and where you can go from there. It's only opening the next door." A participant in the negative group stated, "If I can get through this semester and if I can actually retain what I learn and know I can use it for

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the rest of my life, that would be success for me, that is success... really learning.”

Attribution styles toward academic success

The second research question examined if strong parent-child relationships increased chances of academic success would participants with the strongest parent-child relationships display the highest levels of confidence in being able to achieve academic success on their own regardless of outside forces (internal attribution)? Responses to this question provided the greatest variance between the three groups.

The positive parent-child relationship group expressed the lowest levels of confidence in their ability to succeed academically without the relationship they had with their parents. One participant stated, “I probably wouldn’t even be here. I wouldn’t have any motivation to be.” The relationships between these participants and their parents were expressed as a necessity for the development of motivation to even attend college or be successful in life. Another participant stated, “I probably could, but I probably wouldn’t. I mean it’s possible that I could, but I don’t think I would be as pushed to do well.” This group displayed a more external attribution style in expressing that their relationship with their parents is more a driving force for their desire to attend and do well in college than their own internal drive and motivation. These results supported the expected findings of this research that the group with the strongest parent-child relationships would attribute more of their academic success to factors outside of themselves due to the outside support and resources they had access to.

The neutral parent-child relationship group displayed greater variance in their responses to this question. Several participants expressed high levels of confidence towards achieving success based on their own abilities. One participant stated, “I believe I can, I believe that you can do anything you want just as long as you put the effort into it.” The majority of responses, however, showed more similarities to the doubts expressed by the positive

group, for example, “In order to achieve... I don’t think that I would have met that mark without that support group.” Participants expressed that they may be able to succeed despite the lack of a relationship with their parents, but challenges would have taken longer to overcome and the process would have been more difficult. This group displays a somewhat balanced attribution style by expressing that they could still achieve success, but the relationship with their parents is important to them in excelling in their education. One participant stated, “I think I could. There might be a few times where I hit a low point and I might stay down there a little bit longer” Although there is an increase in internalization of academic success compared to the responses from the positive group this group still attributes a fair amount of their academic success externally, to outside sources of support.

It could be assumed that in accordance with previous research the negative parent-child relationship group would display lower levels of self-esteem and confidence in their own abilities as is typical of children lacking strong parent-child relationships (Verschueren & Marcoen, 2002). Conversely this group displayed the strongest feelings of determination and internal drive, that no matter whether a strong relationship existed with a parent or not they would succeed and achieve their goals. One participant stated, “I really think that’s my own success, that’s my own.” Another participant stated, “I’ll do it no matter what!” This group displayed high levels of confidence in their abilities and even a determination derived from feelings of failure and loss as well as a need to prove their worth and abilities, exemplified by one participant who stated, “For me I turned their negative nonsupport into a driving force to make me, showing them that I can be something, that I am a worthy human being.”

Expectations of parents’ roles in college

The third research question examined whether college students’ expectations for the role parents should play in their children’s college education varied based on participants’ par-

ent-child relationship quality. Across the positive, neutral, and negative groups all participants agreed that it is parents' responsibility to: play an active role in their child's education while still allowing them the autonomy to make their own life decisions, teach their child about the processes necessary to attend college, be a main source of encouragement and support, and provide a fall back during challenging times. A participant in the positive group stated, "Support them, give them advice as in what's going to benefit them in the future but don't really make the decision for them." A participant in the neutral group stated, "Encouraging... turn someone to not only get education but to find education and find out what it really is." A participant from the negative group stated, "Support thing again... like I support you in what you want to do, I'm here if you need me, and I'll do whatever I can to help you."

It is interesting to note that the majority of participants failed to relate financial support to the initial question, but with a follow up question resoundingly agreed that it is a large and very important part of the parents' role to either provide a portion of funding or aid their child in finding sources of funding.

Perceptions of parent's roles in academic success

Participants across all three parent-child relationship groups expressed a shared belief that the quality of students' relationships with their parents play an important role in their ability to be successful, but variance in answers emerged as participants elaborated on their reasoning for this belief.

Participants in the positive parent-child relationship group expressed the influence of parents as vital to academic success due to their provision of family support and providing a fall-back in times of struggle. One participant stated, "I think, definitely, if you have a good relationship with your parents it helps a lot and it's nice to have that net to fall back on." Relating to the ways in which their strong relationships with their parents have benefited them, participants in the positive parent-child relation-

ship group expressed the ability of good relationships with parents to reduce life challenges and decrease the stress of facing problems on their own. For example, one participant commented, "It gives them more of a challenge if they don't have a good relationship with their parents usually they have more problems in their life, I guess, the more stress, because they don't have the support." Another participant stated, "For someone like myself whose grown up in a good family situation and church it's important to have that interaction, reassurance from your parents." In relation to their own experiences, this group made positive connections with the ways they have benefited from a strong relationship with their own parents and their current success in college.

Participants in the neutral parent-child relationship group expressed that parents have an influence on academic success, but that the ultimate defining factor would be dependent on the student's internal motivation. For example after answering yes to the initial question, one of the participants said, "It has to come from inside, it has to be intrinsic, it has to be internal drive to do well in school. There's only so much that parents can do to help their kids." This group expressed that parents' ability to affect the academic success of their children is due to the drive and motivation they encourage and foster through providing support and a stable environment. One participant stated, "People that have a strong support system in their family have a better chance. Having a support group is helpful and if your parents are there for your support then you have a lot more capability to be successful."

Participant responses from the negative parent-child relationship group contrasted responses from the positive and neutral groups by relating to the negative impact of having a poor relationship with parents on one's ability to succeed. The negative group expressed the derogatory effect poor parent-child relationships have as creating feelings and attitudes of worthlessness and lack of confidence. For example one participant stated, "I accepted mediocrity because I felt like I wasn't worth anything

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more... that definitely derived from my relationship with my parents.” Another participant stated, “A lot of it is to prove to him that this isn’t a joke, that college degrees are a serious thing. They’re not just something where, ah well! You’re just going back to school.”

The capacity to complete college was not only expressed as dependant on internal confidence but also related to challenges on time and monetary capabilities, for example, parents’ disappointment in students not working longer hours and making more money coupled with constant pressures to do so and lack of financial aid from parents. One participant related the tension between him and his father over the economic situation of being a student when he said, “I can’t work as much as I want to and it makes him upset that I can’t make my insurance payment every month.” One participant related the reasons his parents thought he shouldn’t attend college when he said, “We can’t afford it and you have to be able to support yourself when you get out of high school. We’re not going to support you.” This is an example of how participants with weak parent-child relationships viewed the effects parents have on their child’s ability to succeed as negative and creating further challenges.

Discussion

Considering the four main research questions, we see that the way participants define success (Hypotheses 1) and what role they think parents should play in their child’s college education (Hypotheses 3) have a low association, if any, with the strength of their relationships with their parents. The common attitude expressed that parents should provide support and encouragement while allowing their child the freedom to make their own decisions is indicative of participants’ shift into young adulthood and the desire to be seen as autonomous adults while being afforded the freedom to make their own mistakes and learn from them (Bucx & Van Wel, 2008).

The results of this study supported Hypotheses 2, that participants with the stronger parent-child relationships would be more likely to attribute their academic success to external

factors based on their experience with high levels of external support. Participants with strong parent-child relationships saw the support and guidance provided by their parents as a critical part of their academic success. They struggled to imagine what their college experiences would be like without the influence of their parents to the extent that the majority of participants were unable to even imagine themselves in college without it.

The negative parent-child relationship group displayed an internal attribution style by attributing their ability to succeed in college solely to their own abilities and not to any outside forces, especially relationships with their parents. This type of an internal attribution was found to be a characteristic of students reaching high levels of academic success (Weiner, 1972) suggesting that although the majority of participants in this group had weak relationships with their parents and came from low-income backgrounds, shown to have detrimental effects on academic success, they held attitudes that would be beneficial in assuring their success in college. This indicates that the small percentages of this demographic that continue on to college are using the disadvantages from their family backgrounds in motivational ways as determination to achieve their academic goals. This does not minimize the variety of other challenges faced by these students that will play a role in their likelihood to continue to graduation.

The results of this study indicated the converse of Hypotheses 4 to be true, that students were aware of effects parent-child relationships had on their academic success. The results showed that all participants not only expressed an awareness of a causal relationship between their relationships with their parents and their ability to achieve success, but were also able to articulate how this relationship functioned. Participants with the strongest parent-child relationships saw the benefits received from this: encouragement, support, guidance, and even financial back-up, as such a crucial part of their academic success that they exhibited severe lack of confidence in their ability to

obtain their academic goals without their relationships with their parents.

Although the negative parent-child relationship group expressed strong feelings that their relationships with their parents did not affect their ability to succeed, we must consider that their high levels of determination and drive were related to their negative relationship with their parents. These levels of determination may have developed as a means of proving others wrong or proving their own worth to counteract disappointments in their relationships with their parents and lack of support and encouragement that has been available in their lives. Based on attitudes expressed by participants, it is also necessary to acknowledge that these levels of determination may be driven, in some part, by a desire to avoid being stuck in the same lifestyles as their parents. This shows that the strength of parent-child relationships plays an important role in the development of attitudes towards academic success.

Conclusions and Limitations

This study had several limitations, foremost, the small number of participants. Although within the 22 participants interviewed the sample was diverse for gender and ethnicity, the overall sample size does not allow for a strong generalization to all emerging adult college students. Additionally this study only considered the quality of parent-child relationships from the perspective of the child and it is necessary to keep in mind that parents may view the quality of their relationship with their child differently. Another limitation for certain parts of this study was asking the participant to provide responses based on hypothetical circumstances that they may never have experienced, for instance, when participants with strong parent-child relationships were asked if they could still achieve their definition of success without the relationship they have with their parents. Finally, the qualitative nature of the study restricted the ability to use scales to measure items such as locus of control and quality of parent-child relationships. For future research it would be beneficial to replicate this study

with a larger sample size in order to complete a better analyzes of gender and ethnic differences. It would also be beneficial to replicate this study with a comparison of student and parental perceptions.

The results of this research indicated that family background and the strength of parent-child relationships children grow up with do have an effect on attitudes and confidence levels necessary to achieve success in emerging adulthood. This indicates that when educational attributes and disadvantages are being discussed it is imperative to consider student's family backgrounds and their quality of relationships with their parents to fully understand all the factors influencing academic success. Educators must understand that, though college students are adults and acting autonomously, their attitudes and characteristics are still a product of the benefits or disadvantages provided by their quality of home life and relationships with their parents.

This knowledge can provide ways for educators to better understand, identify, and aid student's with particular challenges, for example, providing students who do not have a strong relationship with their parent's more encouragement and mentorship. This research also provides an opportunity for parents and children alike to gain an awareness of how the quality of their relationships will affect children's future goals and abilities. Raising awareness in parents can provide opportunities to encourage them to provide relationships that will lead their children to greater, future achievement.

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Appendix

Interview Protocol

1. Tell me about the life events that have led to you going to college?
2. How old were you when you started college?
3. Did you go straight from high school to college?
4. When you were in high school and preparing to apply for college who helped you figure out what the process was for applying and choosing a major?
5. Where there any major influences as far as why you chose your major?
6. What was your parents' role in encouraging you to go to college?
7. What do you think had a bigger affect on you going to college, your own desire or the expectations of other that you go?
8. What challenges have you had to overcome in order to go to college?
9. How have they affected your determination to do well in school?
10. Who do you talk to about those challenges?
11. What does success in college mean to you?
12. How do you think you are doing on that scale?
13. So what do you think your role is as the student in being successful?
14. What is an ideal parent-child relationship to you?
15. How does that compare to the relationship you have with your parents?
16. How often do you talk to your parents? What do you talk about?
17. Is there anything you don't feel comfortable disclosing to them?
18. What do you think a parent's role should be in their child's college education?
19. How do your parents compare to that?
20. Do the relationships that college students have with their parents affect their ability to be successful?
21. If you didn't have the relationship you do with your parents could you achieve your definition of success you explained to me earlier?

Biochemical Theory of The Hallmark Neurological Pathologies of Alzheimer's Disease

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Abstract--Alzheimer's disease (AD) is the most common age related neurodegenerative disorder that is characterized by impairment in memory and progressive deterioration of higher cognitive functions. The brain of an individual with AD exhibits three hallmark neuropathologies: an accumulation of extracellular amyloid plaques of aggregated amyloid beta (A β) protein, intraneuronal formation of neurofibrillary tangles that contain an abnormally hyperphosphorylated form of the microtubule associated protein tau, and a profound degeneration of cholinergic basal forebrain neurons that innervate the cortex and hippocampus. The purpose of this review is to summarize and evaluate available evidence indicating oxidative stress, inflammation, and A β induced toxicity as a key role in triggering and facilitating these pathologies using published articles. Although there are no available cures or preventative treatment for AD, several therapeutics are reviewed including Ginkgo biloba, cholinesterase inhibitors, curcumin, neuroglobin, polyunsaturated fatty acids, and antioxidants.

Alzheimer's disease (AD) was first described by the German psychiatrist Alois Alzheimer in 1906 and is the most common age related neurodegenerative disorder (Nunomura et al., 2006). According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR), the symptoms include impairment in memory, in orientation

of time and place, in judgement, and in reasoning (American Psychiatric Association, 2000). Individuals may also display one or more other cognitive disturbances including aphasia (a disturbance in language), apraxia (impairment in motor functioning), agnosia (a failure to recognize or identify objects despite intact sensory function) or disturbances in planning, organizing, sequencing or abstracting information. The disease is characterized by three hallmark neuropathologies: a progressive accumulation of extracellular amyloid plaques also referred to as senile or neuritic plaques, intraneuronal neurofibrillary tangles, and severe cortical atrophy (Heneka, 2006). Several lines of evidence indicate that abnormal biological and chemical functioning represented by inflammation, oxidative stress, and amyloid beta induced neuronal toxicity may play a key role in triggering or facilitating the pathologies that are believed to contribute to the clinical symptoms of the disease (Butterfield, Drake, Pocernich, & Castegna, 2001; Heneka, 2006; Pratico, 2008). Although there are no available cures or preventative treatments for the disorder, several interventions have been demonstrated to be beneficial including *Ginkgo biloba*, cholinesterase inhibitors, curcumin, polyunsaturated fatty acids, and several molecules that have antioxidant capabilities such as neuroglobin. These therapeutic approaches further support an alteration in the biochemistry that is required for normal brain functioning and maintenance as they all appear to have anti-inflammatory, antioxidant or amyloid

precursor protein metabolism modification abilities.

Hallmark Neuropathologies

Amyloid beta ($A\beta$) is the central protein subunit found in the amyloid plaques and is surrounded by degenerative axonal and dendritic fragments (De Strooper & Annaert, 2000). These plaques are found chiefly in the cerebral cortex and hippocampus. Amyloid precursor protein (APP) can be cleaved in two ways but only one pathway leads to the production of $A\beta$. In the nonamyloidogenic pathway the enzyme α -secretase cleaves APP producing α APP fragments that are not associated with amyloid plaques (Zimmermann, Borroni, Cattabeni, Padovani, & Di Luca, 2005). Conversely, the amyloidogenic pathway involves cleavage by β -secretase and subsequent cleavage by γ -secretase eventually producing the main constituent found in the plaques, the $A\beta$ protein (Heneka, 2006). The levels of $A\beta$ present in the brain and periphery is crucial to the understanding of the development of the plaques. Significant differences exist in the amounts of cortical $A\beta$ peptides between AD and age matched non-demented control patients (Roher et al., 2009). Total $A\beta$ levels are six times greater in gray matter and four times greater in white matter of post-mortem AD patients compared to controls. Amyloid plaques may, therefore, result from an imbalance between $A\beta$ production, accumulation, and breakdown or removal of the protein in AD patients. However, amyloid generation has been detected in normal aging; therefore, $A\beta$ deposition itself is insufficient to cause AD. Consequently, disease progression also depends on the presence of neurofibrillary tangles (NFT).

Neurofibrillary tangles are comprised of clusters of paired helical filaments (PHF), the major component of which is the microtubule-associated protein *tau* (Liu et al.,

2005). In PHF, *tau* is abnormally hyperphosphorylated when the phosphorylation sites are fully saturated, and aggregated into filaments (Ihara, Nukina, Miura, & Ogawara, 1986; Liu et al., 2005). Normally, *tau* promotes the assembly of microtubules by binding to microtubules and stabilizing their structure. Consequently, hyperphosphorylation of *tau* may cause alterations in the microtubule cytoskeleton that promotes and stabilizes cell structure; thus, allowing aggregation of the modified form of *tau* into PHF found primarily in the cerebral cortex and hippocampus of AD patients.

A definitive diagnosis of AD can be made only after an autopsy determines that amyloid plaques and NFT are present in the brain along with severe cortical shrinking. The brains of AD patients exhibited profound brain volume reductions than would have been expected through normal aging (Heneka, 2006). Most extensive neuronal loss occurs predominately in the hippocampus, amygdala, and neocortex.

Inflammatory Hypothesis

Extensive data has indicated that a low grade chronic inflammatory response is present in AD (Heneka, 2006). Inflammatory cytokines are critical to the development of both the innate and acquired immune response; however, they can also be neurotoxic and can therefore initiate nerve cell degeneration. Ojala et al. (2009) reported increased RNA and protein levels of the inflammatory cytokine interleukin-18 (IL-18) and interleukin converting enzyme (ICE). Interleukin converting enzyme is responsible for synthesizing the cytokine IL-18 from a biologically inactive precursor molecule. The increase in inflammatory IL-18 and ICE was found in the frontal, temporal, and occipital lobes of AD patients when compared to age matched controls. Furthermore, in AD brain samples, IL-18 was found to be associated with amyloid plaques

and co-localized with *tau*. Increased levels of IL-18 may contribute to neuronal cell loss, given that the cytokine has been shown to enhance the production of the toxic inflammatory molecule interferon- γ . A vicious cycle of neuroinflammatory responses ensues as interferon- γ is capable of inducing the expression of IL-18 and ICE.

Oxidative Stress Hypothesis

Oxidative stress has been implicated as playing a key role in the pathogenesis of AD (Pratico, 2008). Oxidation involves a loss of electrons as free radicals act on molecules, subsequently stealing their electrons. Depending on the substrate attacked by reactive oxygen species (ROS) or free radicals, oxidative stress will manifest as lipid peroxidation, protein, DNA, or RNA oxidation. The levels of oxidative products can be detected in biological fluids of living Alzheimer's patients as well as in the brains of post-mortem patients, and can be considered relatively good indices of oxidative stress. Several papers have demonstrated increased levels of oxidation associated metabolites and a decline of antioxidant levels in the cerebrospinal fluid and circulating plasma of AD patients (Butterfield et al., 2001; Pratico, 2008). Hydroxyoctadecadienoic acid (HODE) is a product of lipid peroxidation derived from linoleic acid. Levels of HODE in the plasma and erythrocytes of AD patients were significantly higher than those in healthy controls (Yoshida et al., 2009). Furthermore, levels of oxidatively modified peroxiredoxin, a large family of enzymes that have important cell signalling functions, are significantly higher in AD patients. These oxidatively modified lipids and proteins indicate higher oxidative stress in AD patients compared to controls. Furthermore, patients with a higher clinical dementia rating, representing a higher level of impairment in memory, judgment, and problem solving, had higher levels of these oxida-

tion products in their plasma and erythrocytes. According to these findings, the clinical symptoms of AD may be influenced by oxidative stress.

A direct relationship between oxidative damage contributing to the hallmark neuropathology of AD is demonstrated by Liu and colleagues (2005). The researchers found that 4-hydroxy-2-nonenal (HNE), a highly reactive product of lipid peroxidation reacts with normal *tau*. Epitopes of *tau* are portions of the molecule to which antibodies bind and this structural change in shape of the *tau* protein is detected by the amount of antibody binding. After HNE treatment, phosphorylated *tau* showed enhanced antibody recognition. Therefore, HNE promotes major conformational changes of *tau* associated with NFT, because HNE modifies *tau* forming the major epitopes found in the tangles themselves. HNE is thus a major factor for NFT formation, hence, supporting the involvement of early oxidative stress in the formation of the pathologies that characterize AD. Furthermore, the levels of HNE in post-mortem AD brains is significantly higher than those in age matched controls (Markesbery & Lovell, 1998). The fact that only phosphorylated *tau*, but not other forms (e.g., methylated, ubiquitinated, oxidized, or proteolytically processed *tau*) aggregated in cells by modifications induced by HNE indicated a relationship between *tau* phosphorylation and oxidative stress. Considering this interaction between phosphorylation and oxidative stress, possible mechanisms underlying this hyperphosphorylation of *tau* have also been a focus of study as a means of determining NFT formation. Hyperphosphorylation of *tau* in AD patients has been suggested to be due to irregularities in kinases which have the ability to phosphorylate molecules. Multiple kinases exhibiting increased activity may be potential contributors to this excessive phosphorylation of the microtubule protein and subsequently

contribute to *tau* aggregation into NFT in the brains of AD patients.

Deoxyribonucleic acid (DNA) and Ribonucleic acid (RNA) are also susceptible to oxidative damage. Identification of the levels of oxidatively damaged DNA and RNA in the brains of AD subjects is the next logical step in support of an oxidative stress hypothesis of AD. More than 20 oxidized DNA bases have been characterized and are used as indicators of DNA oxidative damage. The levels of six modified DNA bases in nuclear and mitochondrial DNA extracted from the cerebellum, frontal, parietal, and temporal lobes of post-mortem AD patients are higher than post-mortem controls (Wang, Xiong, Xie, Markesbery, & Lovell, 2005). The level of oxidized bases in mitochondrial DNA is approximately ten fold those found in nuclear DNA. This higher oxidation of mitochondrial DNA, however, may be due to its proximity to free radicals during the production of ATP. Nevertheless, the levels of oxidation in several brain regions in AD subjects are much higher than control subjects regardless of the minor impact of free radicals produced by normal cellular respiration. Depending on the region of DNA that has been oxidized there could be potentially devastating consequences upon cellular functioning. If this high level of oxidative damage to DNA is not repaired, it may cause impairments in mitochondrial and cellular functioning which may result in the premature triggering of apoptosis or neuronal cell death. Furthermore, the primary role of mitochondria is to produce energy to sustain the demands of a cell; the accumulation of oxidation to mitochondrial DNA may lead to impairments in functioning, subsequently leading to deficiencies in energy production which may eventually render a cell incapable of continuing to function.

Oxidation of any substrate is recog-

nized as a disturbance in the functioning of the molecule whether it is a lipid, protein, DNA, or RNA. The potential role of RNA oxidation on AD pathology has also been studied due to declines in protein synthesis that have been identified in the earliest stage of the disease (Ding, Markesbery, Cekarini, & Keller, 2006). Ribosomes are large intracellular proteins that aid in the translation of mRNA into peptides. The parietal lobe of post-mortem AD patients demonstrates a gross elevation in RNA oxidation within the ribosome complex compared to control subjects. This finding is significant as proteins are constituents of every cell and their functions vary from cell signalling to cell maintenance such that any alteration in ribosomal RNA may interfere with protein synthesis and result in a distortion from normal cellular functioning. This may consequently lead to abnormalities in cells and perhaps even subsequent cell death.

Protein carbonyl formation is an important marker of protein oxidation and can develop from a direct attack of free radicals on some amino acid side chains (Butterfield et al., 2001). Protein oxidation, measured by protein carbonyl levels is significantly increased in the frontal and temporal lobes as well as in the hippocampus of AD patients in relation to controls. This finding further supports the oxidative stress hypothesis for AD as the hallmark neurological pathologies are localized within these brain regions.

Therapeutic Approaches

Amyloid beta levels in the brains of AD patients were significantly higher than those in control patients; this may be caused by an imbalance between A β production, accumulation and clearance (Zimmermann et al., 2005). The combination of these factors has been proposed to influence A β aggregation into fibrils, the key components of the plaques (Ono, Naiki, & Yamada, 2006). It has been suggested that abnormal cleavage of APP

leading to subsequent overproduction of A β may be due to increased activity of β and γ secretase enzymes (Zimmermann et al., 2005). Potential opportunities for intervention include identification and modification of these enzymes. Each stage of the amyloid process may offer possibilities for pharmacological manipulation, thus interfering with pathogenesis. Therapeutic agents that interfere with A β production and therefore are capable of dispersing amyloid deposits include *Ginkgo biloba* extract, and cholinesterase inhibitors.

Ginkgo biloba tree extract EGb761 is demonstrated to have anti-inflammatory and antioxidant activity in cultured cells and laboratory animals (Augustin et al., 2009). Transgenic mice expressing the mutation of human APP that were fed a diet of this extract for sixteen months had approximately 50% lower human APP levels in the cortex compared to mice fed the control diet. Furthermore, protein levels were moderately decreased in the hippocampus but did not reach statistical significance. Mice that were on the diet for only one month did not have significantly decreased APP levels; therefore, the efficacy of this extract as a potential therapy for human subjects may depend on the length of treatment. Further studies are necessary to investigate whether the changes in APP levels in response to the extract are also associated with changes in A β levels. Due to its antioxidant and anti-inflammatory capabilities, *Ginkgo biloba* may also be effective for reducing A β induced neurotoxicity, oxidative damage and neuroinflammatory responses. Therefore, the efficacy of this treatment in human subjects may prevail beyond the reduction of APP levels.

As AD progresses, the brain produces less and less acetylcholine due to the loss of basal forebrain cholinergic neurons that innervate the cerebral cortex (Francis, Palmer,

Snape, & Wilcock, 1999). As such, cholinesterase inhibitors that reduce the breakdown of acetylcholine in the synapse are highly used pharmacological treatments (Francis et al., 1999; Zimmermann et al., 2005). An imbalance exists among alpha and beta secretase activity in AD patients in vivo; such that beta secretase activity is predominant, based upon the ratio of its metabolites. The aim of the study by Zimmermann and colleagues (2005) was to determine whether short term cholinesterase inhibitor treatment affects APP metabolism in vivo. After 30 days of treatment with a cholinesterase inhibitor, patients appear to have significantly higher levels of α -secretase metabolites and lower levels of β -secretase metabolites. This represents an increase in the production of less harmful alpha products and a decrease in harmful A β . These findings indicate that the balance between alpha and beta secretase activity altered in AD pathology is capable of being restored with short term treatment with a low dose of a cholinesterase inhibitor. Furthermore, an alteration in APP processing leading to a cascade of neurotoxic A β as a possible cause to the development of amyloid plaques is supported by the ability of cholinesterase inhibitors to influence APP metabolism.

In addition to interventions aimed at A β production, curcumin, the yellow coloring principle of turmeric has been demonstrated to influence the aggregation of A β (Ono, Hasegawa, Naiki, & Yamada, 2004). The addition of increasing doses of curcumin to A β peptides were found to dose dependently decrease the aggregation of these peptides in vitro. When A β is added to a solution of pre-existing amyloid fibrils that are extracted from the brains of AD patients there appears to be an increase in the levels of fibrils measured. However, the addition of curcumin to this solution of pre-existing fibrils in vitro significantly decreased the levels of fibrils measured. In combination these results indi-

cate that curcumin dose dependently inhibits A β fibril formation, extension or growth of fibrils, and stabilization of preformed fibrils. In addition, curcumin acts as an antioxidant, scavenging ROS that have harmful effects on cells.

Excessive accumulation of A β has been proposed as a pivotal event in the development of pathology in AD (Li et al., 2008). Possible mechanisms underlying A β induced neuronal toxicity include excess production of ROS and molecules associated with apoptosis. Amyloid beta added to PC12 cells significantly increased ROS production and the activity of caspase, an enzyme associated with apoptosis, as well as significantly decreasing cell survival. The addition of neuroglobin to PC12 cells that contain A β has neuroprotective and ROS scavenging functions, as demonstrated by reduced ROS accumulation, decreased caspase activity, and improved cell survival. Furthermore, A β treatments induce mitochondrial dysfunction as evidenced by decreased mitochondrial membrane potentials, whereas neuroglobin improved impairments induced by A β . As such, the A β peptide has been proposed as an important mediator of neuronal death in AD.

Nutritional interventions may also have therapeutic benefits for AD. An inverse relationship exists between polyunsaturated fatty acid intake and AD risk (Boudrault, Bazinet, & Ma, 2009). Cell culture studies show lower A β levels, a reduction in apoptosis and a reduction in markers of apoptosis in cells treated with DHA, the polyunsaturated fatty acid found in fatty fish and fish oils. These effects may in part be related to the anti-inflammatory effect of fatty acids. For example, DHA lowers mRNA levels of proinflammatory lipid mediators. Likewise, oxidative reactions and their by-products have consistently been implicated in AD pathology, such that a diet rich in antioxidants

has been considered one necessary therapeutic approach (Pratico, 2008).

Conclusion

Extensive evidence has indicated that the brains of AD patients as well as their biological fluids have increased levels of lipid and protein oxidation products, increased DNA and RNA oxidation, and lower levels of antioxidants. Therapeutic approaches that rely heavily on antioxidants and other repair mechanisms counteracting oxidation have received much attention as potential treatments to prevent or destroy the pathologies that are presumably caused by this elevated oxidative stress. In addition to oxidative stress, a neuroinflammatory response and an increase in toxic A β levels are suggested to influence the pathologies that characterize the disease. Although there are currently no definitive cures or preventative measures of AD the reported reduction in oxidation by antioxidants, modifications in APP processing by *Ginkgo biloba* and cholinesterase inhibitors, modifications of A β by curcumin, and finally the anti-inflammatory effects of polyunsaturated fatty acids can be considered key molecules for the development of preventives and therapeutics. Future research in AD will seek to improve prevention, diagnosis, and treatment. Future improvements in early and more accurate diagnosis may be achieved by refinements in imaging techniques that allow for the visualization of the plaques and tangles and by the detection of biological markers in the blood, urine, and cerebrospinal fluid. Advocating lifestyle changes such as a diet rich in antioxidants may help to prevent or delay the onset of the disease. Future molecular genetic studies may uncover genes implicated in the development of the disorder, which may help to identify individuals at a higher risk of developing the disease and thus might benefit from preventative therapies. As researchers continue to understand the physio-

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logical processes underlying the development of the disease, they hope to find ways to stop the progression of AD, as current therapies focus on treating symptoms and have demonstrated little long term efficacy. One obvious limitation with research on AD revolves around the issue that correlation does not verify causation. Although higher levels of oxidation products, inflammatory molecules, A β , and apoptosis associated molecules are evidenced in the biological fluids and the brains of AD patients there is still a relative uncertainty whether they are in fact causing these hallmark pathologies. The issue of temporality is also of concern, because although these changes in biochemical compounds have been extensively reported, researchers are still unable to differentiate whether they are the factors contributing to the development and progression of the pathologies or are a result of the pathologies.

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