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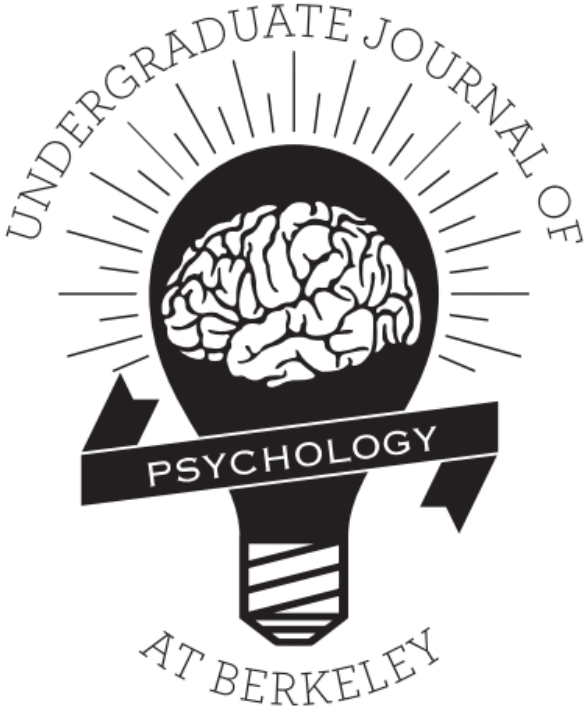

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SPECIAL THANKS TO

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EDITOR'S NOTE

Welcome to the 12th edition of the Undergraduate Journal of Psychology at Berkeley. Through our publication of this journal, we aim to inspire undergraduate students to produce and consume research.

In this edition, we present undergraduate research on a variety of topics in the psychological sciences. These articles demonstrate sound research that has been both critically analyzed and carefully applied.

I would like to thank our Executive Directors, Katy Kincannon and Grace Allison, for their excellent leadership, and our Faculty Sponsor, Professor Ann Kring, for her continual support and guidance. Furthermore, I would like to express my gratitude for the dedication and tireless effort of our editors. Thank you all for your efforts, which lie culminated in the following pages.

We hope readers will enjoy this edition of our journal.

With gratitude,

Riley McDanal

Editor-in-Chief

PREFACE

Welcome to the 2019 edition of the Undergraduate Journal of Psychology at Berkeley!

I am delighted to introduce the latest edition of the Undergraduate Journal of Psychology. As Chair of the Department of Psychology at UC Berkeley, it is my privilege and pleasure to work with the student editors who have put together this journal. These editors work together to carefully to select and edit articles that reflect the very best of psychological science, and they have done an outstanding job with this edition.

At UC Berkeley, we are committed to supporting and promoting research of the highest quality, in order to understand the brain and mind, personality and social interactions, lifespan development, cognition, and mental illness. The papers in the 2019 volume showcase many exciting new findings in different domains of psychology.

Our faculty have the great good fortune to teach and collaborate with a very talented group of undergraduates at Berkeley. Our students not only engage in the intensive study of a problem that reflects their personal interests, but, as important, gain skills in the scientific method. An important part of this skill set is clearly writing about complicated laboratory observations.

Congratulations to all of the participants – contributors and editors alike – who have created another amazing edition of the Undergraduate Journal of Psychology.

ANN M. KRING
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Feminist Perspectives of Resilience for Women with Anorexia Nervosa

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University of Michigan

This paper reviews literature about current understandings, diagnostic criteria, and treatments for anorexia nervosa in the United States. The theoretical review uses 21 papers and a feminist approach to analyze how the current paradigms of anorexia nervosa fail to capture minority women's experiences and disempower women during recovery. Women of color have been excluded from mainstream research on the etiology, expression, and treatment of eating disorders. An overfocus on refeeding patients during recovery may inhibit patient autonomy. The paper identifies mindfulness-based cognitive therapy as a potentially empowering, accessible and cross-cultural treatment. It recommends inclusive studies of diverse women's experiences with disordered eating and anorexia nervosa for improved understanding of the illness, as well as future research on the efficacy and reliability of mindfulness-based cognitive therapy.

Keywords: feminist critique, resilience, anorexia nervosa, intersectionality, mindfulness-based cognitive therapy

Acknowledgements: I would like to express my appreciation to Dr. Sheryl Olson for her support and guidance during the writing of this paper, as well as introducing to me the topic of resilience with comprehensive and compassionate understanding. I would also like to thank the Departments of Psychology and Women's Studies at the University of Michigan for providing an interdisciplinary framework to challenge how I approach and apply my learning.

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Over 30 million people in the United States meet the current medical criteria for an eating disorder, contributing to its status as an epidemic in the Western world (Kring et al., 2014). Anorexia nervosa is an eating disorder listed in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) published by the American Psychiatric Association (APA). To receive a diagnosis of anorexia nervosa, patients must meet the following diagnostic criteria: food intake restriction leading to significantly low body weight; an intense fear of gaining weight or becoming fat; and disturbance in body image, which can include denial about their low body weight (American Psychiatric Association, 2013). Many patients also experience comorbid depressive and anxiety disorders, and restrictive behaviors are often correlated with obsessive, perfectionist personality traits and a history of trauma (Kring et al., 2014). Patients face a high risk of relapse: on average, only half recover without relapsing and one-fifth remain chronically ill in their lifetimes (Kring et al., 2014).

The estimated prevalence of anorexia nervosa for American women is 0.9%,

however, eating disorders are largely underreported and untreated (Hudson, 2007). Women of color may be dissuaded from asking for help or may fail to receive a diagnosis due to the stereotypical vision of who develops eating disorders (Hudson, 2007). Feminist perspectives of eating disorders and their treatment emphasize sociocultural factors, such as gender roles, race, and socioeconomic status, that contribute to eating disorder prevalence and treatment (Dohm et al., 2009; Sabik et al., 2010; Striegel-Moore & Bulik, 2007). They recognize the exclusion of women of color in current research about eating disorders and how current treatments uphold imbalanced power dynamics between all patients and physicians (Dohm et al., 2009; Kring et al., 2014). Feminist perspectives identify mindfulness-based cognitive therapy (MBCT) as an accessible and culturally-sensitive treatment. MBCT endorses patient autonomy by encouraging the patient to accept their body and thoughts and give them control in their recovery (Wolver & Best, 2009).

Anorexia Nervosa in Women of Color

While anyone can be at risk of developing anorexia nervosa, it is typically conceptualized by the media and represented through clinical research as a white, middle-to-upper class, female illness (Kring et al., 2014). Other women with eating disorders are generally excluded from research studies on anorexia nervosa and are less likely to receive a diagnosis or be recommended for inpatient treatment (Kring et al., 2014). In situations where white Western women's experiences with eating disorders are considered prototypical, clinicians can marginalize women of color's experiences during diagnosis and consequently limit treatment opportunities. Using such a narrow scope to inform diagnostic criteria and treatment plans neglects the different ways women can experience negative body image and disordered eating. To truly understand the etiology of eating disorders and properly treat patients, we must conduct more empirical research using diverse populations with varying beauty ideals. Researchers should evaluate the accessibility and efficacy of common treatments for anorexia nervosa, such as cognitive behavioral therapy or inpatient and partial hospitalization programs, for non-white women.

Current research claims that women of color experience higher levels of body satisfaction, asserting that they are less likely to develop eating disorders because they are more resilient than white women (Sabik et al., 2010). However, conventional diagnostic measures of body dissatisfaction, like the Eating Disorders Inventory, assume a white-as-normative bias. "I think my thighs are too large" is one statement from the inventory; a black, Asian, or Hispanic woman may not agree with this as often as a white woman, leading the evaluator to believe she has higher body satisfaction (Cole & Sabik, 2009, p. 175). However, poor body image is manifested in different ways for many women. For example, Asian American and Hispanic women report relatively low levels of body satisfaction, similar to that of white women, but also lower drives for thinness than white women; however, some research studying the effects of acculturation contradicts this (Ball & Kenardy 2002; Cachelin et al., 2006; Sabik et al., 2010). Their body ideals may differ from white women's, but their negative body image and self-esteem can still make them vulnerable to disordered eating. Questions about body ideals and satisfaction used to study and diagnose eating disorders need to acknowledge cultural differences to better recognize and understand marginalized identities' experiences.

Body dissatisfaction is not the only cause of eating disorders; certain

sociocultural factors can put women of color at an increased risk compared to white women. Racial teasing and pressures to assimilate have been associated with disordered eating in South Asian and Indian women (Iyer & Haslam, 2003). Greater acculturation to Western society also correlated with a stronger thin-ideal and disordered eating for Mexican and Asian American women (Ball & Kenardy 2002; Cachelin et al., 2006). Racial group socialization and identification can also affect the likelihood of women expressing poor body image or disordered eating behavior. Popular culture, such as magazines or advertisements, normalizes disordered eating, poor body image, and a desire to lose weight for white adolescents. However, research on racial socialization shows that Black children are often raised with a sense of group pride. Black women may be apprehensive to endorse poor body image if they think it will misrepresent or disparage their racial group (Cole & Sabik, 2009). The assumption that women of color are protected from eating disorders due to lower reports of body dissatisfaction enforces the idea that anorexia nervosa only affects white women and ignores the unique risks minority women experience. Because body dissatisfaction does not mediate the relationship between women of color and eating disorders, more research needs to be done on how and why women of color engage in disordered eating to understand the diverse ways anorexia nervosa can be embodied and effectively treated.

Patient Autonomy

Feminist approaches emphasize the importance of patient autonomy by identifying implicit biases and structural oppression that obstruct people from exercising full agency. Patient autonomy is the ability to make one's own medical decisions without coercion from doctors or other health care professionals (Entwistle et al., 2010). Feminist perspectives on patient autonomy acknowledge women's vulnerability within hierarchical hospital settings, reflecting patriarchal patterns that obstruct women's ability to access full agency (Entwistle et al., 2010). Additionally, a current lack of racial diversity among clinicians can disempower women of color who experience anorexia nervosa from expressing their agency, feeling "culturally neglected" and facing "institutionalized barriers to effective mental health treatment" (Hayes et al., 2018). Race and ethnicity significantly moderate treatment outcomes for patients with anorexia nervosa with white women reporting a better quality of life and functionality than minority women (Hayes et al., 2018). More research needs to be conducted to evaluate how intersections of race and culture affect women of color's experiences in inpatient settings.

Inpatient, partial hospitalization and intensive outpatient treatments can endorse imbalanced power dynamics between physicians and patients that prevent patients from developing a healthy sense of self and control necessary for recovery. These forms of treatments focus on patient rehabilitation through close monitoring and programming under the supervision of medical staff (Hayes et al., 2018). To be discharged, patients typically follow heavily-monitored meal plans to gain enough weight to reach the physician-determined "goal weight" (Birmingham, 2010). Prioritizing the patient's physical health and diet complicates the feminist emphasis on patient autonomy because patients are required to increase their intake under the direction of physicians for their physical symptoms to be treated. However, their relationship with food can remain antagonistic because the purpose of the food is to get them to gain weight, so the role of food does not change. Patients may gain weight without true psychological recovery; their beliefs about food needing to be controlled and perfected are

propagated by the emphasis on weight restoration (Birmingham, 2010). Creating an environment that seizes all power and control of food from a patient may be problematic because they do not teach patients other ways to manage their emotions toward food freely and prevent them from feeling responsible for their recovery (Birmingham, 2010).

Patients' racial and ethnic identities also influence their ability to exercise autonomy during recovery. Intersections of race and gender can intensify the patient-physician power dynamic and create health inequities in marginalized populations (Hayes et al., 2018). Unfortunately, few studies examine how race plays a role in anorexia nervosa patients' recovery, but non-Hispanic white women tend to experience a greater quality of life post-treatment than women of color (Hayes et al., 2018). A lack of diversity and cultural competency in physicians may make them less equipped to treat women of color with anorexia nervosa, and their applications of generalized diet plans may not be appropriate. Their strict meal plans may not address cultural variances in diet or accessibility to healthy food options, revealing the need for research on how women of color perceive meal plans and diet in relation to cultural identities. The high cost of inpatient treatment is also prohibitive, and current research does not address how this barrier intersects with income inequality across racial groups (Toulany et al., 2015). To promote recovery among all patients, physicians need to provide accessible and culturally-sensitive treatments that empower individuals to make choices and lead their recovery.

Resilience through Mindfulness-Based Cognitive Therapy

Mindfulness-Based Cognitive Therapy (MBCT) is an empirically-based treatment for mood disorders, including anorexia nervosa. MBCT uses meditation and mindfulness to teach patients to be fully aware of their thoughts and senses so their behaviors can be untethered to maladaptive patterns (Merwin et al., 2011; Slyter, 2012). MBCT promotes patient autonomy and inclusivity by encouraging patients to recognize their identities as essential to what, how, and why they experience the world and their disorder. MBCT differs from other forms of treatment like cognitive based therapy (CBT), which focuses on changing dysfunctional thoughts that lead to disordered behavior and involves talk therapy where the therapist helps the patient develop skills to think more positively. MBCT, on the other hand, encourages patients to have cognitive awareness but emphasizes the importance of accepting the negative thoughts and behaviors without judgment or self-criticism (Metcalf & Dimidjian, 2014).

Through mindfulness practice, patients are taught how to focus their attention on more positive sensations and cognitions and disengage from harmful attitudes. Mindfulness exercises typically use the breath as an anchor and advise patients to allow themselves to experience their thoughts and emotions freely, and "become an unbiased filter of all that transpires internally and externally" (Merwin et al., 2011, p. 73). Through mindfulness practice, patients are taught how to focus their attention on sensations and cognitions without assigning values to them, thus disengaging from harmful attitudes. This can help them become resilient to fixations on body image and the body as something to be controlled; instead, patients are empowered to accept the body as a vessel for internal and external experiences and as a site of change, action, and productivity. MBCT facilitates patient autonomy by emphasizing the individual's unique thoughts and experiences as something he or she has full ownership over and that acceptance can only come from within.

MBCT requires more research as a treatment for anorexia nervosa across different populations. In one study on the effectiveness of mindfulness for eating disorders, psychologist Carlota Las Hayas informally interviewed

women in recovery who reported that mindfulness supported them (2016). They said that mindfulness helped them recognize their strength and autonomy, and their motivations for recovering went beyond gaining weight (Las Hayas et al., 2016). The women in the study were motivated to develop healthy relationships with their food and bodies and felt empowered to do so by engaging in the present moment (Las Hayas et al., 2016). This study shows that mindfulness helps patients self-monitor their eating behaviors in an adaptive and positive way that promotes their recovery.

Allowing MBCT to supplement inpatient therapy and enhance physician-developed feeding plans makes treatment patient-focused and perhaps more effective in preventing relapse (Wolver & Best, 2009). MBCT emphasizes the patients' role in identifying their own experiences and sensations, giving them room to discover how their identities may inform how they live with and how they can recover from anorexia nervosa (Wolver & Best, 2009). Further research is required to study the long-term effectiveness of MBCT and other mindfulness meditation practices, particularly in marginalized populations, and how it interacts with intersecting social identities and comorbid disorders (Bell, 2015).

Conclusion

Feminist perspectives for anorexia nervosa diagnosis and treatment emphasize inclusivity for women of color's experiences and emphasize patient autonomy. Knowledge of who experiences anorexia nervosa and why has been limited to Western, white women (Kring et al., 2014). Because women of color have been excluded from this narrative, they are less likely to receive appropriate treatment for their eating disorders (Hayes et al., 2018). Furthermore, women of color are more vulnerable to losing their autonomy during treatment because of a lack of cultural sensitivity and understanding within the hospitals (Hayes et al., 2018). Treatments that prioritize weight restoration over patients' unique maladaptive thoughts and disordered eating can disempower patients, leading them to feel less responsible for their recovery (Birmingham, 2010). To help mitigate the power dynamics between physicians and patients as well to as make treatment more accessible to women of color, MBCT may motivate patients to feel more in control of their thoughts and behaviors. MBCT encourages patients to accept the present moment without judgment, helping them identify what triggers their eating disorder and treat themselves compassionately (Merwin et al., 2011). MBCT's self-contemplative approach emphasizes patients' idiosyncrasies, making it accessible to patients of many different backgrounds and identities and empowering them to accept their unique needs (Wolver & Best, 2009).

Instead of believing that eating disorders only affect middle-to-upper class white women and using their experiences to shape standard treatments, giving all patients opportunities to share their needs can enrich current understandings and improve treatments, including MBCT. Further research on the experiences of eating disorders in non-Western, non-white contexts would enrich the quality of treatments and identify methods to protect patient autonomy within vulnerable populations. This paper focused primarily on women's survivorship with anorexia nervosa; however, there are a number of other eating disorders that women, men, and non-binary individuals may embody in their lifetimes. While anorexia nervosa is perhaps the most visible eating disorder in media and popular culture, millions of people live with other eating disorders such as binge eating disorder, bulimia nervosa, and these demographics may differ based on varying identities and cultural groups' beauty ideals (Dohm et al., 2009). To promote resilience and execute preventive measures for all women, researchers and medical professionals need to critically engage with current perceptions of and

responses to eating disorders and question how we can better create inclusivity and empower survivorship for long-term recovery.

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Verbal working memory capacity under induced emotional states: Does emotion influence the memory for words?

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The effects of emotions on working memory (WM) and executive control are often studied in isolation. The current study aims to examine the influence of emotions on the performance of a verbal WM operation span task. The task consists of verbal WM and executive control — focusing on the influence of positive and negative emotional states. Positive mood enhances executive control and WM capacity, which consequently enhances the performance on the task. Self-reported positive mood successfully predicts performance on the task, suggesting that positive mood — not arousal — best predicts performance. While the effect of negative mood on working memory is not significant, negative mood does impair executive control. However, the sample size was relatively small, and the generalizability of our findings is low and specified to Hong Kong Gratia Christian college students only.

Keywords: verbal working memory, executive control, emotion, verbal working memory operation span task, n-back task

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Working memory (WM) has been a central theme in cognitive psychology and cognitive neuroscience research, and it is closely related to a wide range of high-level cognitive abilities such as rational thinking, analyzing, and learning (Kyllonen, 2002). Researchers have demonstrated that WM is related to academic achievement in the domains of reading (Daneman & Tardif, 1987), writing (Abu-Rabia, 2003), and mathematics (Gathercole, Pickering, Knight, & Stegmann, 2004). WM is defined as a cognitive system responsible for storing small bits of information that can be temporarily accessed under continuous rehearsal (Baddeley, 2002).

WM consists of three components: the central executive, the visuospatial sketchpad, and the phonological loop (Baddeley & Logie, 1999). The executive control component in WM is responsible for supporting information processing (Baddeley, 2002). Recent research studies have expanded our understanding on the function of executive control to a system that also maintains attention (Engle, 2002) and inhibits irrelevant information (Miyake et al., 2000). Executive control ensures that information is efficiently handled by directing attention to relevant information while inhibiting irrelevant information (Banich, 2009; Braver, 2012; Colzato, Spape,

Pannebakker and Hommel, 2007). When the memory load incrementally increases with the arrival of additional input, the executive component of WM is responsible for both updating WM (McCabe et al., 2010) and monitoring the storage capacity remaining in WM (Amichetti, Stanley, White & Wingfield, 2013). WM is capable of storing approximately seven items for a short duration. The executive control component reflects the efficiency of handling information in WM (Colzato et al., 2007). It is well-demonstrated that emotion may affect WM and executive control when assessed independently (Storbeck, 2012). The goal of the current study was to investigate the effect of emotion on the performance of a verbal WM operation span task that involves both WM and executive control.

WM is a domain-specific system that maintains domain-relevant information (Baddeley & Logie, 1999). Researchers have identified two domains of WM, namely verbal and visuospatial (Petrides, 1995; Fletcher & Hanson, 2001). According to Logie (2011), the maintenance of WM relies on the domain-specific mechanism of rehearsal, that is, to prolong the activation of information by repeatedly thinking about it in mind. As opposed to verbal WM, the maintenance of visuospatial WM was discovered to intertwine with many complex cognitive mechanisms such as abstract thinking (Awh, Anllo-Vento & Hillyard, 2000). It is difficult to design a suitable experiment to examine the effect of emotions on visuospatial WM thoroughly due to limited resources, and consequently the present study focused on examining the effect on the executive control of verbal WM solely.

At an education level, this study was anticipated to help educators and school personnel to enhance teaching efficacy in schools. Given that WM is closely related to learning (Kyllonen, 2002), by clarifying the influence of emotion on WM, teachers can create a suitable classroom learning atmosphere and enhance students' learning.

Emotion

Emotion is defined as a complex state of feeling that results in physical and psychological changes that influence thought and behavior (Adolphs, 2000). A substantial body of research focuses on the influence of emotion and different cognitive performances such as creativity, problem solving, reasoning and decision making (see Isen, 2008 for a review). Both WM and executive control are influenced by emotion when assessed independently (Storbeck & Maswood, 2016).

Emotion and Working Memory

According to Luo and his colleagues (2014), emotions can cause both impairment and enhancement of ongoing processes such as WM. Positive emotion increases dopamine levels in prefrontal brain regions to help activate the maintenance of information in the face of ongoing interference, which then facilitates executive control as well as both verbal and spatial WM (Ashby, Isen, & Turken, 1999). In contrast, negative emotion, like sadness, may hinder the cognitive processes of WM as negative affect heavily draws upon visuospatial attention (Awh & Jonides, 2001). Given that visuospatial attention is also necessary for spatial WM (Awh, Anllo-Vento & Hillyard, 2000), the negative effect of negative emotion may compete with spatial WM for attentional resources (Chan, Li & Luo, 2010). This competition is less salient in the case of verbal WM because of its primary dependence on phonological processes (Sakai & Passingham, 2004). The encoding process of vocabularies in verbal WM may be intact under the influence of negative emotion. Hence, the present study attempted to investigate the retrieval of vocabularies, which were encoded and retained after the operation of an interference task under the influence of negative emotion.

Recent research studies have shown the effects of negative emotion on verbal WM may differ from effects on visuospatial WM (Lavric, Rippon & Gray, 2003; Gray et al., 2005; Li, Li & Luo, 2006). According to Li and his colleagues' study (2006), it was demonstrated that sadness-evoked negative emotions selectively impaired the performance of spatial n-back tasks but not verbal n-back tasks. Given that the n-back task is used to access the earnestness in maintaining information within a specific working memory domain (Gray, 2001), results obtained from Gray's study (2001) using a n-back task also revealed that negative emotion significantly impaired verbal WM. It is therefore of great interest to investigate the discrepancy between the influence of negative emotions on verbal WM and visuospatial WM.

Emotion and Executive Control

Positive emotion significantly improves executive control, especially for cognitively challenging tasks (Mitchell & Phillips, 2007), whereas negative emotion has little influence on executive control (Pessoa, 2009). For tasks that require proactive control of maintaining goal relevant information, positive emotion shows impairment (Dreisbach, 2006). The induction of negative emotion, however, fails to influence proactive control when compared to the control (neutral emotion induction) condition (Isaac et al., 2012). For tasks that require reactive control or flexible control, inhibiting goal-irrelevant information or shifting among goals, positive emotion shows enhancement of these abilities (Ashby, Isen & Turken, 1999), while negative emotion causes no influence (Van-Steenbergen, Band & Hommel, 2010). The influence of emotions on executive control varied across situations. This study aimed to study the influence of emotions on a task that requires both the involvement of executive control and verbal WM.

Overview and Significance of the study

The classic n-back test has traditionally been used to assess short-term memory storage (Leon-Dominguez, Martín-Rodríguez & Leon-Carrion, 2015) without considering the executive control component of WM (Storbeck, 2012). It is sensitive to short-term memory storage capacity instead of the WM capacity (Conway et al., 2005). In the present study, we sought to fill this important gap by studying the influence of emotions on the performance of a verbal WM operation span task that consists of verbal WM and executive control. Our primary aim was to determine whether induced emotions influence the performance of a verbal WM operation span task that consists of verbal WM and executive control, especially focused on the influence of positive and negative emotional states. Participants will be tested on the capability to retrieve a list of words after performing an interference task, which is to solve a number of math problems under an induced emotional state.

Our experiment was a between subjects design; every participant was required to complete both the verbal WM task and operation task. Our dependent variable was the observed performance on a verbal WM operation span task. We included three levels of independent variables: positive, negative, and neutral emotional states. In the positive mood condition, happiness was induced; sadness was induced in negative mood condition, and calmness was induced in neutral mood condition. The neutral mood condition served as a control group. Our hypothesis is that induced emotion state will influence the performance on verbal WM operation span task. Positive emotions are predicted to improve performance, while the performances of negative and neutral condition are predicted to show no significant effects on accuracy and reaction time.

It is hoped that this study may contribute to psychology by providing a more comprehensive understanding of the influence of emotions on verbal WM. Given that verbal WM is a critical and complex ability that underlies a wide range of cognitive and social processes (Yang, Yang &

Isen, 2013), understanding the effects of emotions on verbal WM would allow us to avoid staying in a particular emotional state that hinders the processes of verbal WM. Also, clarifying the influence of emotions on the performance on a verbal WM span task will help researchers to understand the necessity to assess participants' emotional state before the task begins. For example, if positive emotional state was found to enhance the performance and/or negative emotional state was found to hinder the performance, researchers should calm the participants before the task begin to reduce the interference of emotion.

Methods

Participants

Forty five undergraduate students (24 males, 21 females) from Hong Kong Gratia Christian College participated in this study as volunteers. Convenience sampling was used to recruit participants. The mean participant age was 21 years (SD=2.54), ranging from 18 to 28 years. The experimental protocol was approved by the human participants research ethics committee at Hong Kong Gratia Christian College.

Materials

Mood induction

With reference to Storbeck (2012), positive, negative and neutral emotion could be induced by viewing a video clip conveying the corresponding affections (Storbeck, 2012). Specifically, happiness, sadness and calmness are the emotional states to be evoked, respectively (Storbeck, 2012). A similar method will be employed to induce the corresponding emotional states. Positive mood (happiness) was induced with a 40-second clip from a television series titled "We Married As A Job's Hilarious Dancing Scene" (月薪嬌妻: 片尾舞爆紅瘋傳 星野源戀) (Life Hubs, 2017), negative mood (sadness) with a 40-second clip from Scoop News reporting the death of a Hong Kong actor Raymond Tsang Sau Ming (報道曾守明死訊: 陳庭欣感觸落淚) (Ontv 東網電視, 2017) and neutral mood (calmness) with a 40-second clip from Public Speaking: How to Speak in Front of a Big Crowd (Howcast, 2013). The three video clips were presented to thirty outsiders before our study began, who were required to match the presented clips with their corresponding induced emotions; 90% matched the positive clip with positive, 80% matched the negative clip with negative, and 76.7% matched the neutral clip with neutral. The appropriateness of using these three video clips to induce the corresponding emotions was demonstrated.

Verbal working memory operation span task.

Both WM and executive control are included in the WM operation span task. Although the WM operation span task and the n-back task are both valid assessments to assess WM capacity (Engle, 2002), the operation span task places greater demands on executive control compared to the n-back task. Executive control is required to coordinate between the primary goal of remembering information in WM and the secondary goal of processing distracting information. Yang and his colleagues (2013) showed that the induction of positive emotion improved performance on a verbal WM operation span task in comparison to the neutral condition; however, a negative mood condition was not included in the study, and therefore the influences of negative emotion on a verbal operation span task remain unknown. A modified version of the WM operation span task (Conway et al., 2005) was used to specify the assessment of verbal WM.

Two components were included in the verbal WM operation span task: the verbal WM task and the operation task. A set consisted of a learning phase for the words, solving math problems and recalling the pre-displayed words. The word list was comprised of ten neutral words, five monosyllables and five five-syllables (word list available in Appendix A). Words on the word list were obtained from and validated using the MRC (Wilson, 1988) database, a common database used in psychology research. Then, six math

problems used in Storbeck and Maswood's (2016) study were presented (math problems available in Appendix B). The math problems were simple; however, the correct order of operations had to be followed to solve them. After completing the math problems, sixteen word-recalling questions were presented, and the ability to differentiate pre-displayed words from non-displayed words was assessed (word recalling questions available in Appendix C). The six non-displayed neutral words were obtained from the MRC (Wilson, 1988) database as well, including three monosyllables and three five-syllables (non-displayed words available in Appendix D).

Prior researchers have failed to account for the processing trade-offs between the operation task and WM span task, particularly the trade-offs between solving math problems and recalling pre-displayed items (Kane et al., 2004). Participants who scored below 70% in the verbal WM operation span task were screened out, ensuring that there were no processing trade-offs (Conway et al., 2005).

Mood manipulation check

The mood check developed by Storbeck and Maswood (2016) was used. Four questions were included — two assessing arousal and two assessing valence. Participants were required to indicate how they felt while viewing the video clip using a 6-point scale (mood manipulation check available in Appendix E). Scores of two arousal assessing questions (Questions 1 and 2) were averaged to create the composite score arousal, and scores of two valence assessing questions (Questions 3 and 4) were averaged to create the composite score valence.

Procedure

Participants were informed about the nature of the study and were asked to consent to participate. Once they consented, they were randomly assigned to one of the three mood conditions (positive, negative, or neutral), and each condition consisted of fifteen participants. A video clip was presented to induce the corresponding mood state, and the participants were instructed to focus on their feelings after viewing the clip. The word list was then presented for three minutes during the learning phase, and participants were instructed to memorize all the presented words. Six math problems were presented right after the learning phase, and participants were required to choose the correct answer by pressing "A" for choice "A", "B" for choice "B", "C" for choice "C" or "D" for choice "D". Participants then completed sixteen word recalling questions by pressing "Y" for words pre-displayed and "N" for words non-displayed. Finally, a mood manipulation check was completed. Participants were thanked for participating in our study.

Results

Verbal working memory operation span task

Participants' overall scores on the five math problems were converted into percentages and named as percentage math accuracy (see Figure 1). A one-way ANOVA of mood induction for percentage math accuracy revealed a significant main effect ($F(2, 42) = 3.91$, $p < .05$). The Tukey post-hoc analysis indicated that the difference between positive and negative mood condition was significant ($p < .05$), while the difference between positive and neutral mood condition was insignificant ($p = .46$). The difference between negative and neutral mood condition was also insignificant ($p = .26$). Consistent with prior research, participants under a positive emotional state performed significantly better than those under a negative emotional state (see Table 1 for descriptive statistics).

Verbal working memory task

Participants' overall scores on the sixteen word-recalling questions were converted into percentages and named percentage word-recalling accuracy. A one way ANOVA of mood induction for percentage word-recalling accuracy revealed a significant main effect ($F(2, 42) =$

8.77, $p < .05$). The Tukey post-hoc analysis indicated that the difference between positive and negative mood condition was significant ($p < .05$), and a significant difference was also revealed between positive and neutral mood condition ($p < .05$). The difference between negative and neutral mood condition was insignificant ($p = .91$). Mean differences for percentage word-recalling accuracy between mood conditions are presented in Figure 2 in the appendix.

Time spent on recalling words

A prediction was raised by Waters and Caplan (1996) that an induced positive mood may increase the motivation and dedication on a task. The word-recalling reaction time in millisecond (ms) was assessed to verify the prediction. A one-way ANOVA of mood induction for word-recalling reaction time revealed a significant main effect ($F(2, 42) = 6.73$, $p < .05$). The difference between positive and negative mood condition was significant ($p < .05$), and there was also a significant difference between positive and neutral mood condition ($p < .05$). The difference between negative and neutral was insignificant ($p = .95$). Descriptive statistics are presented in Table 1. Mean reaction time in the positive condition was significantly faster than in both the negative and neutral conditions; therefore, induced positive mood may increase participants' motivation and dedication on the task.

Mood manipulation check

Two one-way analyses of variance (ANOVAs) were conducted to assess group differences for the valence score and the arousal score. For the calculated valence, a significant main effect was observed ($F(2, 42) = 24.27$, $p < .05$). Post-hoc comparisons using Tukey HSD test indicated that the difference between positive and negative conditions was significant ($p < .05$). A significant difference was also revealed between positive and neutral conditions ($p < .05$). Participants in the positive mood condition reported significantly more positive feelings than those in the negative and neutral mood conditions. The difference between negative and neutral mood condition was insignificant ($p = .23$). There was also a significant main effect for arousal ($F(2, 42) = 34.38$, $p < .05$). The Tukey post-hoc analysis indicated that the difference between positive and negative mood condition was insignificant ($p = .91$), while the difference between positive and neutral was significant ($p < .05$). The difference between negative and neutral mood condition was also significant ($p < .05$). (See Table 1 for all descriptive statistics).

Regression

The predictability of self-reported arousal and valence during mood induction on the performance of verbal working memory task was examined. A linear regression was calculated with the dependent variable word-recalling percentage accuracy, with arousal and valence as the predictors. For valence, a significant regression equation was found ($F(2, 42) = 4.48$, $p < .05$) with an $R2$ of .18. The participants' predicted word-recalling percentage accuracy is equal to 65.816+3.424(valence) percentage accuracy when valence is measured on a 6-point interval scale. Participant's word-recalling percentage accuracy increased 3.424% for every interval of the 6-point interval scale. More positive moods during the induction resulted in better accuracy ($t = 2.90$, $p = .006$) while arousal did not predict accuracy ($t = .19$, $p = .85$). The predictability of self-reported valence on the performance of verbal working memory was significant, while the predictability of arousal was insignificant (See Figure 3).

Discussion

We observed that the performance of the verbal WM operation span task in the positive mood condition was better than that in both the negative and neutral mood conditions in terms of math processing accuracy as well as word-recalling accuracy and reaction time. In addition, the performances in the negative and neutral

mood conditions showed no significant differences with respect to the above three parameters. Although the math processing accuracy and word-recalling accuracy in the neutral mood condition were slightly better than that of the negative mood condition, participants in the negative mood condition answered the word-recalling questions slightly faster on average.

Our findings demonstrate that the induction of positive emotion enhanced performance on the verbal WM operation span task compared to both negative and neutral mood conditions. Also, the induction of negative emotion did not cause significant impairment when compared to the neutral condition. Consistent with our hypothesis, participants in the positive mood condition performed better in both verbal WM task and operation task. Moreover, a successful regression was found with participants' self-report valence predicting their word-recalling percentage accuracy. Positive feelings results in higher word-recalling percentage accuracy. The self-reported positive mood successfully predicted performance on verbal WM operation span task, which suggests that positive mood — not arousal — best predicts performance.

Positive emotion

The induction of positive emotion improved the performance on a verbal WM operation task. According to Miyake and Friedman (2012), success on the task requires both the ability to store information in WM and to flexibly coordinate among various task demands. Our findings suggest that positive mood may enhance executive control, which facilitates WM in memorizing goal-relevant information while preventing disturbances from goal-irrelevant information. Participants under a positive emotional state might be more motivated to complete the tasks. Previous studies (Yang et al., 2013; Gray, 2004) reported that positive mood condition improves performance on a verbal WM operation span task when compared to a neutral mood condition. Our results confirm the results of these studies. Researchers explained the enhanced performance with the neuropsychological theory of positive mood (Ashby et al., 1999), saying that the increases of dopamine levels in a positive mood enhances the functioning of executive control as well as the storage capacity of WM.

In this current study, the verbal WM operation span task — instead of the n-back task — was employed to testify to the influence of emotion on storage processing or the functioning of executive control, both of which are viewed as important components of WM. Our findings suggest that positive emotions may enhance executive control as well as facilitate the maintenance of goal-relevant information and inhibit the interference from goal-irrelevant information. These results suggest that the main locus of the facilitating effects of positive affect lies in improved processing control rather than in simple storage processing (Yang et al., 2013).

Negative emotion

The induction of negative mood did not significantly impair the performance of the verbal WM operation span task as compared to the neutral mood condition. This results contradicts previously established findings that found that verbal VM capacity and processing efficiency decrease under the induction of anxious worry (Eysenck & Calvo, 1992; Vytal, Cornwell, Arkin & Grillon, 2012; Vytal, 2012). Anxiety induction activates the cognitive system for threat detection instead of coping with the given task by influencing early perceptual processes (Cornwell et al., 2007). Vytal and his colleagues (2012) demonstrated that the performance was impaired under the influence of anxiety only when the task was moderately challenging. The effect of cognitive load when studying the influence of emotion states on verbal WM should be considered in future studies. It is suspected that the words displayed in this research study were relatively less challenging (i.e. a low cognitive load was required), and therefore no significant

impairment on verbal WM was recorded in the negative mood condition.

The insignificant effect of negative mood on verbal WM could be explained with the above, yet future research is needed to testify to such assumptions. Studies up to date mainly assess the influence of anxiety on verbal WM using the n-back task instead of the verbal WM operation span task (e.g. Eysenck & Calvo, 1992; Cornwell et al., 2007; Vytal et al., 2012), while the effect of anxiety on the executive control component of WM is less likely to be tested. Also, our study focused on studying the influence of negative emotion, namely sadness, on verbal WM. Therefore, using research findings obtained by investigating the effect of anxiety (e.g. Eysenck & Calvo, 1992; Cornwell et al., 2007; Vytal et al., 2012) to explain our results may not be completely suitable. It is of great interest to expand the study of investigating and comparing the influence of negative emotion on verbal WM by considering its subcategories, for instance the four discrete negative emotions (Rowe & Fitness, 2018), namely anger, sadness, fear and boredom.

Our study verified the influence of emotions on the performance of a verbal WM operation span task that consists of verbal WM and executive control, especially focused on the influence of positive and negative emotional states. It contributes to the psychology field by providing a more comprehensive understanding on the influence of emotions on verbal WM.

Limitations

The current study is not without limitations. First, the sample size of this study was relatively small, which substantially lowers the generalizability of our findings. Additionally, the findings of our study may be specified to Hong Kong Gratia Christian College students only. Future studies should incorporate large, representative samples. Second, only verbal WM was studied. Despite the fact that verbal WM and visuospatial WM share a number of neural mechanisms, the effects of negative emotion on verbal WM may not be the same as those on visuospatial WM (Li et al., 2006). As negative emotion and visuospatial WM both rely on a common visuospatial attention mechanism, the two may result in an attentional resource competition (Postle, Awh, Jonides, Smith & D'Esposito, 2004). That is, the induction of negative emotion may reduce the attentional resource available for visuospatial WM to process information. This competition is less pronounced in verbal WM, as it primarily depends on phonological processes (Buchsbaum, Olsen, Koch, Berman, 2005). The effect of negative emotion on verbal WM and visuospatial WM may be different. Hence, we may not be able to understand the discrepancy between verbal WM and visuospatial WM under negative emotion if we do not study the two together.

Future directions

Future studies of emotions and executive function interactions should be careful when choosing the n-back task since it emphasizes assessing the storage capacity of WM solely instead of assessing both WM storage capacity and the executive control (Roberts & Gibson, 2002). The findings above demonstrate that the induction of positive emotion enhances performance on the verbal WM operation span task when compared to both the negative and neutral mood conditions. An enhanced executive control under the induced positive emotional state may be accountable for the enhancement of verbal WM capacity. However, our findings failed to find a significant effect of negative mood on the performance of a verbal WM operation span task. Given that negative emotion may impair the performance of a n-back task (Vytal, Cornwell, Arkin & Grillon, 2012), the performance differences between a verbal WM operation span task and a n-back task should be studied further. Specifically, the study of WM in the perspective of neuropsychology in order to explain the neural activity differences between a verbal WM operation span task and a n-back task should be determined more clearly. Also, it is of

great interest to investigate the effect of negative emotions on verbal WM by considering its subcategories (e.g. anger, sadness, fear, boredom). By further examining the underlying reasons for any similarities and/or differences obtained, our understanding of the effect of negative emotions on verbal WM may be expanded.

Conclusion

To conclude, the induction of positive emotion enhanced performance on the verbal WM operation span task compared to both negative and neutral mood condition, which is consistent with prior studies (Gray, 2004; Yang et al., 2013). We have extended Yang and his colleagues' research (2013) by demonstrating that no significant effect of negative emotion on WM was found. However, our findings of the effect of negative emotion were contradicted with Eysenck and Calvo's research study (1992). This study demonstrated that emotion may influence the performance on the verbal WM operation span task. Specifically, enhancement of the task was detected under positive emotional state. Researchers should carefully assess participants' emotional state before the task begins and calm them if necessary in order to reduce the interference of emotion. In addition to this suggestion, this study also benefits the education field. Given that WM is closely related to rational thinking, analyzing, and learning (Kyllonen, 2002), educators should always pay attention to the classroom learning atmosphere — they can perhaps enhance students' learning by creating a positively-valenced learning atmosphere.

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Appendix A

Word list presented during learning phase

1. Sum
2. Yield
3. Wit
4. Bond
5. Twice
6. Opportunity
7. Organization
8. Immediately
9. University
10. Individual

Appendix B

Math Problems

Question 1. $6 + 8 - 7 + 5$

A) 15

B) 13

C) 11

D)12

Question 2. $9 \times 8 + 5$

A) 57

B) 27

C) 67

D) 107

Question 3. $10 \times 16 \div 5$

A) 32

B) 80

C) 13.2

D) 20

Question 4. $(3 + 4) \times 9 \div 2$

A) 18

B) 35.5

C) 31.5

D) 42.5

Question 5. $6 \div 4 \div 2 \times 8$

A) 6

B) 12

C) 9

D) 7

Appendix C

Word recalling questions

Please press “Y” for words appeared before and “N” for words did not

Question 1. Did the word “sum” appeared before?

Question 2. Did the word “yield” appeared before?

Question3. Did the word “wit” appeared before?

Question4. Did the word “bond” appeared before?

Question 5. Did the word “twice” appeared before?

Question 6. Did the word “grip” appeared before?

Question 7. Did the word “taste” appeared before?

Question 8. Did the word “mild” appeared before?

Question 9. Did the word “opportunity” appeared before?

Question 10. Did the word “organization” appeared before?

Question 11. Did the word “immediately” appeared before?

Question 12. Did the word “university”appeared before?

Question 13. Did the word “individual” appeared before?

Question 14. Did the word “association” appeared before?

Question 15. Did the word “considerable” appeared before?

Question 16. Did the word “representative” appeared before?

Appendix D

The six non-displayed words

1. Grip
2. Taste
3. Mild
4. Association
5. Considerable
6. Representative

Appendix E

Mood Manipulation Check

Please indicate how you felt while viewing the clip using 4 different 6-point scales,

Question 1. "Not at all aroused" (1) to "Very aroused" (6)

Question 2. "Not at all alert" (1) to "Very alert" (6)

Question 3. "Negative" (1) to "Positive" (6)

Question 4. "Sad" (1) to "Happy" (6)

Appendix F

Table 1 *Descriptive Statistics For Verbal Working Memory Operation Span Task and Mood Manipulation Check*

	Positive	Negative	Neutral	
	n=15	n=15	n=15	P value
Verbal WM. operation span task				
- Percentage math accuracy	88 (18.21)	69.33 (21.20)	80 (15.12)	< .05
- Percentage word-recalling accuracy	89.58 (10.21)	74.03 (3.36)	75.75 (9.94)	< .05
- Word-recalling RT. (ms)	3366.67 (963.38)	4192.67 (791.62)	4273.33 (357.50)	< .05
Mood manipulation check				
- Arousal	4.80 (0.86)	4.67 (0.98)	2.47 (0.74)	< .05
- Valance	5.33 (0.49)	2.67 (1.350)	3.33 (1.23)	< .05

Notes. The table presents the means and standard deviations (in parentheses).

Verbal WM. operation task = Verbal working memory operation task. Word-recalling RT. = word-recalling reaction time.

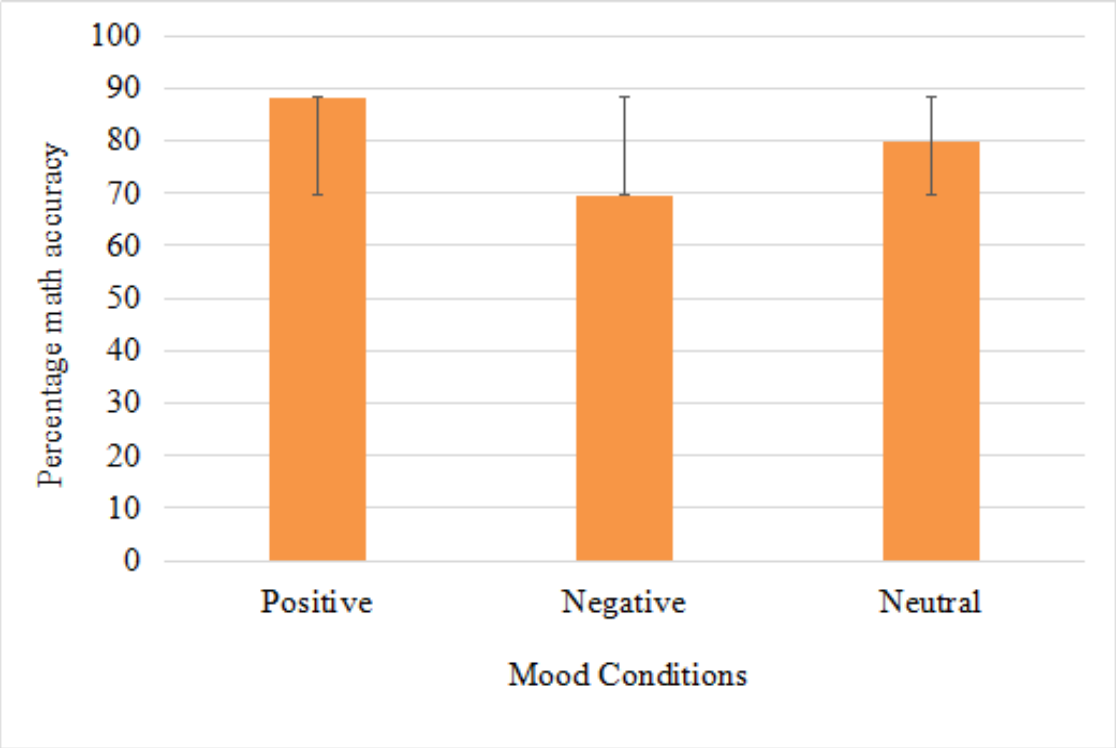

Figure 1. *Percentage math accuracy between mood conditions. Means and standard deviations are displayed*

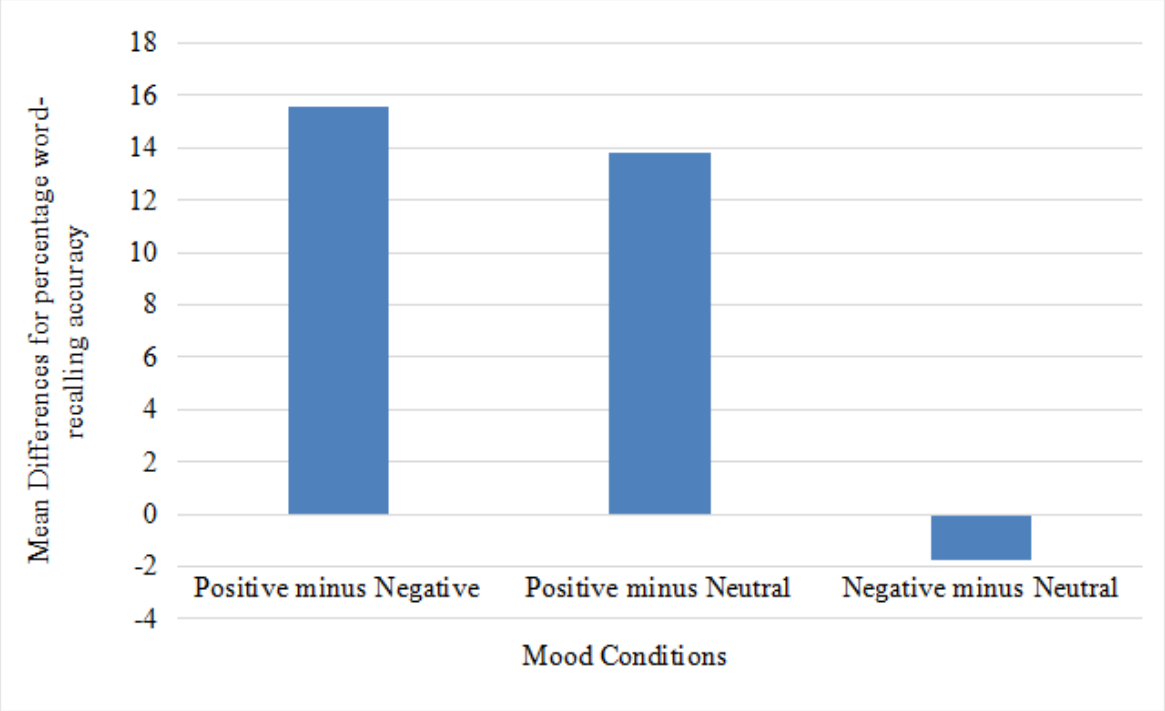

Figure 2. *Mean differences for percentage word-recalling accuracy between mood conditions*

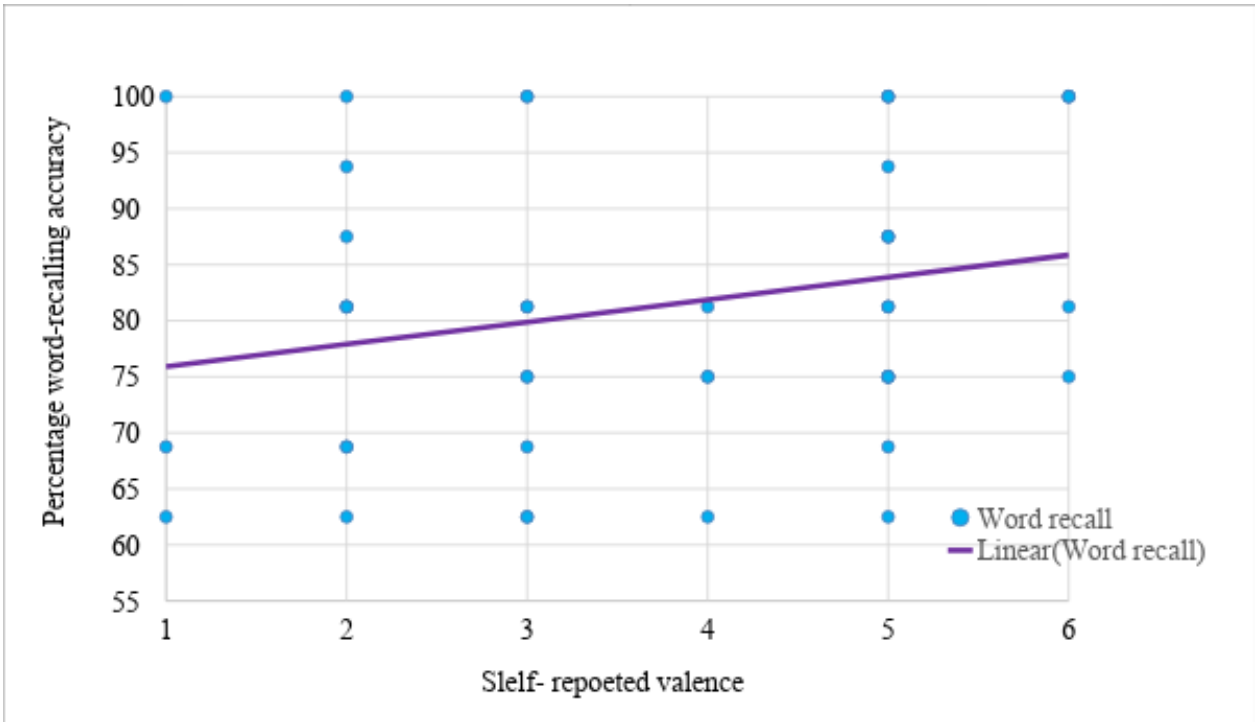

Figure 3. *A scatterplot with linear regression line showing the relationship between self-reported valence and percentage word-recalling accuracy.*

The Relationship Between Maslow's Hierarchy of Needs and Persistence in College

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In this study we assess the needs of undergraduate college students, according to Maslow's Hierarchy of Needs (Maslow, 1987), at two universities. Both needs-being-met and college persistence have been researched before, but not very often have they been researched together. Our hope was to find a correlation between needs being met and college persistence. In order to determine the degree to which undergraduate students at a university are having their needs met, we distributed a survey asking if their needs based on Maslow's Hierarchy of Needs were met. We also distributed a questionnaire evaluating student's persistence at their given university. The online survey was distributed to both Huntington University (n=128) and Utah Valley University students (n=46). We found significant correlations demonstrating which needs are most closely related to college persistence indicators. We also examined differences across institutions and genders. This study helps demonstrate the importance of needs being met for college students. This study is crucial for Higher Education institutions to be aware of in order to allow persistence at universities.

Keywords: Maslow's Hierarchy of Needs, college persistence, undergraduate students

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In the U.S., the six-year graduation rate for full-time students in the process of receiving a bachelor's degree is 59% (U.S. Department of Education, 2017). This means that a little more than half of undergraduate students pursuing a bachelor's degree receive that degree in less than six years. A theory that is helpful in understanding college student's needs and the factors that drive their persistence in higher education is Abraham Maslow's Hierarchy of Needs. This concept is depicted in the form of a pyramid based on his theory of human motivation, and it is used to represent the needs that are important for a person's well-being. (Maslow, 1943). The pyramid consists of five levels of needs -- those at the top of the pyramid are the ultimate goal, provided that the foundational needs at the base of the pyramid are met. As seen in Figure I, from the bottom up, these different levels consist of physiological needs, safety needs, love and belonging needs, esteem, and self-actualization (Maslow, 1987).

Figure I: *Maslow's Hierarchy of Needs.*
Mcleod, S. (2018, May 21). Maslow's Hierarchy of Needs. Retrieved from https://www.simplypsychology.org/maslow.html

Physiological needs consists of the basic things one need to survive, such as water, food, and shelter. Safety needs could include one's personal safety, employment, and health. Love and belonging needs entail the idea of being loved and accepted by others through friendships, family, and intimacy. One's esteem needs deal with the desire to be respected and recognized as high in status. A person must have met each of these first four levels of needs in order to reach self-actualization -- the pinnacle of the pyramid -- which involves becoming the best and most complete version of oneself.

Human needs are clearly a motivating factor in behavior and reaching self-actualization. Individuals may seek a college degree in order to reach self-actualization, and cademic persistence can be the conduit to building a successful life. This commitment is impacted by many factors (e.g., community, academia, cost, gender, etc.) throughout the college experience. Over the years, faculty and staff in higher education institutions have wondered what helps students to persist to graduation. A study asking alumni at a university to answer a questionnaire about their experiences as a freshman found that variables such as financial obligations, family opinions, and personal basis of college choice all contribute to an elevated risk for dropping out (Brown, 2012). As one might expect, research also shows that when individuals have mental health struggles like depression, these also can lead to students dropping out of their institution (Boyraz, Horne, Owens, & Armstrong, 2016).

Maslow's hierarchy closely predicts persistence in college. Lester (1983), found that a fulfilment of Maslow's five hierarchical levels led to improved psychological health. Maslow's Hierarchy of Needs has even been demonstrated to be a cross-cultural predictor to wellbeing in University students in Chennai, India. The study provided validity for Maslow's hierarchy, where one's basic needs being met resulted in an individual pursuing higher needs (Winston et al., 2017). Regarding gender, studies have shown that neither being male nor female impacted persistence in college, but ethnicity was a strong factor in persistence (Stewart, Lim, Kim, 2015). Tükdogan and Duru (2012), for example, found that basic need achievement predicted well-being in university students. Well-being was associated with freedom, fun, and power needs being met. Institutions of higher education have tried many different ways to

improve college persistence, and one way to execute this may be through a retention intervention. In a qualitative study of 15 business students, researchers conducted two separate focus groups and found that this exercise built group togetherness, helped them learn together, and improved overall retention rates (Masika & Jones, 2016). Interestingly, this intervention focused on both academic and social factors, suggesting the importance of a broad scope of needs. In support of such an approach, Flynn (2014) found that social engagement and academic engagement were independently significant in graduation attainment. That is, students who began college with higher levels of social or academic engagement, or a combination of both, had a higher probability of graduating.

Present Research

The purpose of this study is to explore the relationship between Maslow's Hierarchy of needs and university students' persistence in higher education. Many studies have found correlations between Maslow's Hierarchy of needs and well-being and life satisfaction (Tükdogan and Duru 2012; Winston et al., 2017). Some research has shown that college persistence is correlated with need achievement (Lester, 1983; Boyraz et al., 2016). In the present study we attempt to explore this relationship further, at least in terms of students' planned persistence in college and at their current institution, where planned persistence is defined as an individual's intent to continue their education at their current college and/or any other institution of higher education. We hypothesize that the degree to which students' needs are being met will correlate with their academic motivation, planned persistence at their given university, and planned persistence of attending any college in general.

Method

Participants

Participants included undergraduate students (N=174) from Huntington University (HU; N = 128) and Utah Valley University (UVU; N = 46). HU is a small, Midwestern, religiously-affiliated liberal arts institution. UVU is a large, Western, public university. The study included 116 females and 58 males. The sample was predominantly caucasian (N = 151), followed by Hispanic/Latino/Chicano (N = 7). The remaining participants came from varied racial/ethnic backgrounds. Participants from HU were recruited via online newsletter or e-mails from professors who offered their students course credit for their participation in research studies. Since most students were not offered this academic benefit, HU students were further incentivized with the chance to win a $25 gift card in a drawing. Participants from UVU were recruited through an online participant pool and were awarded course credit.

Materials/Procedures

We used the Need Satisfaction Inventory (Lester, 1990) to measure the degree to which needs are being met (See Appendix A for Need Satisfaction Inventory). This survey consisted of 50 items based on the five tiers of Maslow's Hierarchy of Needs (physiological, safety, belongingness, esteem, and self-actualization; Maslow, 1987). Responses are scored on a 6-point scale (ranging from -3 to +3) for each item, with -3 indicating strong disagreement and +3 indicating strong agreement. An example of a statement from the Needs Satisfaction Inventory is, "My life has meaning" (Lester, 1990). We kept most of the original survey intact. However, because of the large population of students from conservative religious backgrounds at both institutions, we

slightly modified item 16 that referred to satisfaction of participants' sexual needs. We believed it would be appropriate to offer participants the option of "not applicable" rather than have them leave the question unanswered. If they selected the "not applicable" option, then that item was not included in their total score, and their total was adjusted to remain on the same metric as other participants.

We used the College Persistence Questionnaire (Lindheimer, 2011) to measure students' academic motivation and planned persistence. The original questionnaire is multi-dimensional and 82 questions long. We shortened it by only including items from the factors of degree commitment (5 items), institutional commitment (7 items), and academic motivation (8 items). Each item is scored on a 5-point scale (ranging from -2 to +2) with -2 indicating a low level of college persistence and +2 showing a high level of college persistence. An example item is "In general, how enthused are you about doing academic tasks?"

All participation was voluntary. The informed consent statement was placed at the beginning of the survey. Each participant gave informed consent prior to completing the questionnaires. The study procedures were approved by the Internal Review Board at Huntington University.

Results

We hypothesized that the degree to which students' needs are being met will correlate with their planned persistence at their given university and in higher education overall. To test this hypothesis, we looked at how participants' Needs Inventory subscale scores correlated with College Persistence subscale scores overall. Then, we examined differences between the two institutions and differences between genders. The general descriptive statistics for all subscales can be found in Table 1. To examine the relationship between the subscales overall we ran a Pearson's r correlation as shown in Table 2. As demonstrated in Table 2, self-actualization correlated significantly with institutional commitment, degree commitment, and academic motivation. Esteem needs correlated significantly with degree commitment and academic motivation. Belonging only correlated significantly with degree commitment. Safety correlated with institutional commitment, degree commitment, and academic motivation.

Table 1. Descriptive Statistics for Subscales

Variable	N	M	SD	Min	Max
Physiological	174	35.84	4.97	23	48
Safety	174	34.66	4.75	22	48
Belonging	174	40.49	5.26	25	54
Esteem	174	40.07	5.79	19	51
Self-actualization	174	43.19	5.77	24	55
Institutional Commitment	174	26.63	3.65	16	34
Academic Motivation	174	22.23	2.83	12	25
Degree Commitment	174	26.7	4.31	15	39

Table 2. Correlation of Needs and College Persistence

	Institutional Commitment	Degree Commitment	Academic Motivation
Physiological	0.148	0.038	0.043
Safety	0.175*	0.094*	0.172*
Belonging	0.144	0.199**	0.052
Esteem	0.134	0.220**	0.193*
Self-actualization	0.274**	0.353**	0.292**

Note: * indicates that $p < .05$; ** indicates that $p < .01$.

Descriptive statistics broken down by institution can be found in Table 3. When comparing correlations between the two institutions (Table 4), we found that Needs Inventory scores were more likely to correlate significantly with college persistence among Huntington University students than Utah Valley University students. When examining Institutional Commitment, Huntington University had statistically significant results for all five needs while Utah Valley University had no statistically significant results. Both self-actualization and belonging were correlated with degree commitment for Huntington University participants. However, only self-actualization was correlated with degree commitment for Utah Valley University participants. Safety, esteem, and self-actualization were all correlated with academic motivation for Huntington University, whereas only self-actualization was correlated with academic motivation for Utah Valley University.

Table 3. Descriptive Statistics for Universities

University	Variable	N	M	SD	Min	Max
Utah Valley University	Physiological	46	35.33	5.12	27	48
	Safety	46	34.65	4.54	27	48
	Belonging	46	39.93	5.49	25	52
	Esteem	46	39.7	6.18	26	51
	Self-actualization	46	42.79	6.32	24	55
	Institutional Commitment	46	25.89	3.81	16	33
	Academic Motivation	46	21.89	3.32	12	25
	Degree Commitment	46	27.22	4.95	18	37
Huntington University	Physiological	128	36.02	4.93	23	48
	Safety	128	34.66	4.84	22	47
	Belonging	128	40.7	5.18	28	54
	Esteem	128	40.2	5.66	19	51
	Self-actualization	128	43.33	5.57	28	54
	Institutional Commitment	128	26.89	3.57	17	34
	Academic Motivation	128	22.35	2.63	12	25
	Degree Commitment	128	26.52	4.07	15	39

Table 4. Correlations Comparing Institutions

		Institutional Commitment	Degree Commitment	Academic Motivation
Utah Valley University	Physiological	-0.047	0.077	-0.049
	Safety	-0.012	0.100	-0.013
	Belonging	-0.276	0.031	-0.143
	Esteem	-0.044	0.237	0.110
	Self-actualization	0.178	0.401*	0.377*
Huntington University	Physiological	0.216*	0.014	0.091
	Safety	0.243**	0.094	0.249**
	Belonging	0.303**	0.274**	0.148
	Esteem	0.202*	0.210*	0.238**
	Self-actualization	0.311**	0.326**	0.256**

Note: * indicates that $p < .05$; ** indicates that $p < .01$.

Descriptive statistics for males and females can be found in Table 5. When comparing correlations between males and females, as shown in Table 6, it is clear that there are some differences. For males, institutional commitment correlated with self-actualization needs. Degree commitment correlated with belonging needs, esteem needs, and self-actualization needs. Academic motivation correlated with self-actualization needs. Similarly, for females, institutional commitment also correlated with self-actualization needs. Degree commitment correlated with esteem needs and self-actualization needs, but not belonging needs. Similarly, academic motivation correlated with safety needs, but not self-actualization needs.

Table 5. Descriptive Statistics for Gender

Gender	Variable	N	M	SD	Min	Max
Male	Physiological	58	34.72	4.43	23	43
	Safety	58	33.60	3.71	26	44
	Belonging	58	39.84	5.18	28	52
	Esteem	58	40.55	5.31	30	51
	Self-actualization	58	42.95	5.17	31	54
	Institutional Commitment	58	26.19	3.54	18	34
	Degree Commitment	58	21.57	2.75	15	25
	Academic Motivation	58	26.65	3.70	18	35
Female	Physiological	116	36.40	5.15	26	48
	Safety	116	35.19	5.12	22	48
	Belonging	116	40.82	5.29	25	54
	Esteem	116	39.83	6.02	19	50
	Self-actualization	116	43.30	6.06	24	55
	Institutional Commitment	116	26.84	3.70	16	33
	Degree Commitment	116	22.56	2.82	12	25
	Academic Motivation	116	26.73	4.61	15	39

Table 6. Correlational table comparing gender

		Institutional commitment	Degree commitment	Academic motivation
Female	Physiological	0.119	-0.049	0.037
	Safety	0.155	0.131	0.143
	Belonging	0.141	0.184*	0.001
	Esteem	0.183	0.205*	0.181
	Self-actualization	0.272**	0.322**	0.311**
Male	Physiological	0.183	0.158	0.057
	Safety	0.198	-0.101	0.277*
	Belonging	0.13	0.197	0.182
	Esteem	0.038	0.302*	0.232
	Self-actualization	0.276*	0.431**	0.237

Note: * indicates that $p < .05$; ** indicates that $p < .01$.

Discussion

Our hypothesis that there is a relationship between Maslow's Hierarchy of Needs and college persistence is supported through our findings. Degree commitment was significantly correlated with four of the five needs measured in the Needs Inventory. Academic motivation was significantly correlated with three needs, while institutional commitment was correlated with two needs. This shows that degree commitment was the most dependent on student needs being met.

Our findings are consistent with some of the research previously discussed. In addition to confirming the vital role that need satisfaction plays in influencing college persistence, the results of our study also present novel findings. Needs and persistence factors were more strongly connected for the Huntington University participants than the Utah Valley University participants. For Huntington University institutional commitment correlated with all five needs, degree commitment correlated with three of the five needs, and academic motivation correlated with three needs as well. For Utah Valley University degree commitment and academic motivation only correlated with one need (self-actualization). For students attending a small, private institution, it could simply be that one's level of commitment to one's institution is more dependent on how well one's needs are being met at that institution than at a larger state institution where expectations about individualized attention and resource availability may be different.

The significant correlations with gender went against past research's findings (Stewart, Lim, & Kim, 2015). In our study, females and males had comparable numbers of significant correlations between persistence and needs. Females had a few more significant correlations than males which could be caused by the larger number of female participants to male participants in the study (66% female, 33% male) where past research had a closer gender ratio (52.9% female, 47.1% male; Stewart, Lim, & Kim (2015). Furthermore, our study

measured overall needs in the levels of safety, belonging, esteem, etc. in conjunction with college persistence, whereas Stewart, Lim, & Kim correlated specific needs like financial aid, family life, etc. with college persistence. Our study has shown that female's institutional commitment was correlated with one of the five needs, degree commitment was correlated with three needs, and academic motivation was only correlated with one need. For males, institutional commitment was only correlated with self-actualization. Academic motivation was only correlated with safety, while degree commitment was correlated with two of the five needs. It is not clear why safety needs are correlated with academic motivation for males but not females. It could be that males are more likely to feel safe in most situations in college, and so when they feel less safe it has an impact on their academic motivation. The mean for females (M= 35.19) was higher than for the males (M= 33.60), which could allude to the fact that females feel more unsafe, and therefore desensitized to needing to feel safe for institutional commitment, degree commitment, and academic motivation. For institutional commitment and degree commitment, males and females were fairly similar in how their needs related to their persistence factors which suggests that males and females both find that the achievement of specific needs (self-actualization and esteem) are important for their institutional and degree commitment. While the five needs of Maslow's Hierarchy of Needs are not all correlated with college persistence, we replicated many significant relationships consistent with Lester (1983). The correlations represent that there is a relationship between needs of college students and their persistence. However, the different correlations show that needs being met and persistence may differ based on the gender of the student and the institution attended.

Implications

The overall goal of this study was to demonstrate the importance of needs being met for students to help improve their persistence in college. Colleges can use this information to implement new programs in order to help build students' self-esteem, and increase their sense of safety and belonging. Some of these programs could be small groups, academic and interest focused clubs, or a campus safety program. Another specific program that a university could implement in a small group setting is the Clifton StrengthsFinder. This is an assessment tool with 34 strengths that someone could possess, often used to understand people's strengths and talents better (Rath, 2007). Different groups on campus could incorporate this test to better understand themselves and others. This type of test could help build self esteem and belonging through pairing students with the groups, activities, and programs that best fit their strengths, and providing students with areas that they feel they are connected with and contributing to. Thus, implementation of these programs could overall help with degree commitment. Programs focused on self-actualization and safety could help institutional commitment. Furthermore, programs focused on safety, esteem, and self-actualization can help promote academic motivation.

Limitations

There are a few limitations that can be found within this study. It was intended that including UVU in the study would allow for greater diversity in gender, participant numbers, and ethnicity, however, we did not find this effect. In our study, the diversity of race and ethnicity was extremely limited. Also, there were substantially more females than males in the sample, which was

representative of college student demographics in the country. Overall, we hoped to match the same amount of diversity that is displayed in the United State's college demographics. These limitations mean that the study's findings do not represent the overall population as well as it could. Another important limitation is that the study was based completely on self-report data. Therefore, we would be remiss if we did not acknowledge that self-report bias could be an issue.

In future studies, we would also like to evaluate the difference between religious and non-religious institutions of higher education to see if needs are different and if this religious aspect is related to college persistence. Furthermore, this study could be adapted into a longitudinal study where students are evaluated at the end of their first year and then in the following years as long as they persist or until they graduate. This information could then be correlated to see if needs being met and planned college persistence correlate with retention rates. Another avenue that could be looked into is graduate programs. A study could be done to examine the comparison between undergrad and graduate programs in needs being met and college persistence because they may have differing needs due to the amount of time they have spent in schooling.

Conclusion

This study shows how important it is for Higher Education institutions to actively work to meet their students needs, and to encourage persistence in their academic endeavors. Due to the gaps in current research, this study and future studies further exploring this topic are crucial for Higher Education advancement and persistence. Without needs being met, students seem to be more likely to not persist at their given institution. Our hypothesis in which we believe the degree to which students' needs are being met will correlate with their academic motivation, planned persistence at their given university, and planned persistence of attending any college in general is supported by the findings in our research.

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Appendix A

Need Satisfaction Inventory (Lester, 1990)

Here is a series of general statements. Indicate how much you agree or disagree with them. Put your answer in the blank space in front of each item according to the following scale:

+1 slight agreement	-1 slight disagreement
+2 moderate agreement	-2 moderate disagreement
+3 strong agreement	-3 strong disagreement

Read each item and decide quickly how you feel about it. Put down your first impressions. Please answer every item. Thank you.

_____ 1. I never have trouble getting to sleep at night.

_____ 2. I think that the world is a pretty safe place these days.

_____ 3. I know my family will support me and be on my side no matter what.

_____ 4. I feel dissatisfied with myself much of the time.

_____ 5. I have a good idea of what I want to do with my life.

_____ 6. I have an income that is adequate to satisfy my needs.

_____ 7. I would not walk alone in my neighborhood at night.

_____ 8. I am involved in a significant love relationship with another.

_____ 9. I feel respected by my peers.

_____ 10. My life has meaning.

_____ 11. I get an adequate amount of rest.

_____ 12. My anxiety level is high.

_____ 13. I feel rootless.

_____ 14. I seldom have fears that my actions will cause my friends to have a low opinion of me.

_____ 15. I am uncertain about my goals in life.

_____ 16. I have a satisfactory sex life.

_____ 17. I feel secure about the amount of money I have and earn.

_____ 18. I have a group of friends with whom I do things.

_____ 19. I can stand on my own two feet.

_____ 20. I feel I am living up to my potential.

_____ 21. In general, my health is good.

_____ 22. I feel safe and secure.

_____ 23. I feel somewhat socially isolated.

_____ 24. I feel confident in my present field of endeavor.

_____ 25. I am seeking maturity.

_____ 26. In winter, I always feel too cold.

_____ 27. I am afraid to stay in my house/apartment alone at night.

_____ 28. I have few intimate friends on whom I can rely.

_____ 29. I would describe myself as a self-confident person.

_____ 30. I find my work challenging,

_____ 31. I eat enough to satisfy my physiological needs.

_____ 32. My life is orderly and well-defined.

_____ 33. I feel close to my relatives.

_____ 34. I have earned the respect of others.

_____ 35. I know what my capabilities are and what I can't do.

_____ 36. I get an adequate amount of exercise.

_____ 37. I can depend on others to help me when I am in need.

_____ 38. I am interested in my ethnic roots and feel a kinship with others in my ethnic group.

_____ 39. I don't spend much time worrying about what people think of me.

_____ 40. I feel I am doing the best I am capable of.

_____ 41. There's usually some part of my body that is giving me trouble.

_____ 42. I am often worried about my physical health

_____ 43. I am religious and consider myself to be a member of a religious group.

_____ 44. I feel that I am a worthy person.

_____ 45. I feel that I am growing as a person.

_____ 46. The summers are too hot for me to ever feel comfortable.

_____ 47. My life has a nice routine to it.

_____ 48. I am able to confide my innermost thoughts and feelings to at least one close and intimate friend.

_____ 49. In groups, I usually feel that my opinions are inferior to those of other people.

_____ 50. My educational achievements are appropriate given my ability.

Appendix B

College Persistence Questionnaire (Lindheimer, 2011)

1. How supportive is your family of your pursuit of a college degree, in terms of their encouragement and expectations?

a. Very supportive
b. Somewhat supportive
c. Neutral
d. Somewhat unsupportive
e. Very unsupportive
f. Not applicable

2. In general, how enthused are you about doing academic tasks?

a. Very enthusiastic
b. Somewhat enthusiastic
c. Neutral
d. Somewhat unenthusiastic
e. Very unenthusiastic
f. Not applicable

3. How confident are you that this is the right college or university for you?

a. Very confident
b. Somewhat confident
c. Neutral
d. Somewhat unconfident
e. Very unconfident
f. Not applicable

4. Some courses seem to take a lot more time than others. How much extra time are you willing to devote to your studies in those courses?

a. Very much extra time

b. Much extra time
c. Some extra time
d. A little extra time
e. Very little extra time
f. Not applicable

5. How inclined are you to do most of your studying within 24 hours of a test rather than earlier?

a. Very inclined
b. Somewhat inclined
c. A little inclined
d. Not very inclined
e. Not at all inclined
f. Not applicable

6. At this moment in time, how strong would you say your commitment is to earning a college degree, here or elsewhere?

a. Very strong
b. Somewhat strong
c. Neutral
d. Somewhat weak
e. Very weak
f. Not applicable

7. How much thought have you given to stopping your education here (perhaps transferring to another college, going to work, or leaving for another reason)?

a. A lot of thought
b. Some thought
c. Neutral
d. Little thought
e. Very little thought
f. Not applicable

8. How often do you read educationally-related material not assigned in courses?

a. Very often

b. Somewhat often
c. Sometimes
d. Rarely
e. Very rarely
f. Not applicable

9. When you think of the family and friends who mean the most to you, how disappointed do you think they would be if you quit school?

a. Very disappointed
b. Somewhat disappointed
c. Neutral
d. Not very disappointed
e. Not at all disappointed
f. Not applicable

10. Students vary widely in their view of what constitutes a good course, including the notion that the best course is one that asks students to do very little. In your own view, how much work would be asked of students in a really good course?

a. Very much
b. Much
c. Some
d. Little
e. Very little
f. Not applicable

11. There are so many things that can interfere with students making progress toward a degree; feelings of uncertainty about finishing are likely to occur along the way. At this moment in time, how certain are you that you will earn a college degree?

a. Very certain
b. Somewhat certain
c. Neutral
d. Somewhat uncertain
e. Very uncertain
f. Not applicable

12. After beginning college, students sometimes discover that a college degree is not quite as important to them as it once was. How strong is your intention to persist in your pursuit of the degree, here or elsewhere?

a. Very strong
b. Somewhat strong
c. Neutral
d. Somewhat weak
e. Very weak
f. Not applicable

13. This semester, how much time do you spend studying each week relative to the number of credit hours you are taking? Assume each credit hour equals one hour of studying per week.

a. Many more hours studying than credit hours
b. A few more hours studying than the credit hours
c. The same number of hours studying as the credit hours
d. A few less hours studying as the credit hours
e. A lot less hours studying than the credit hours
f. Not applicable

14. How much time do you spend proofreading writing assignments before submitting them?

a. A lot
b. Some
c. Little
d. Very little
e. None
f. Not applicable

15. How likely is it that you will re-enroll here next semester?

a. Very likely
b. Somewhat likely
c. Neutral
d. Somewhat unlikely

e. Very unlikely
f. Not applicable

16. How likely is it you will earn a degree from here?

a. Very likely
b. Somewhat likely
c. Neutral
d. Somewhat unlikely
e. Very unlikely
f. Not applicable

17. When you think about the advantages and disadvantages of attending this school how much do you think the advantages outweigh the disadvantages, or vise versa?

a. Disadvantages far outweigh the advantages
b. Disadvantages somewhat outweigh the advantages
c. Disadvantages and advantages are equal
d. Advantages somewhat outweigh the disadvantages
e. Advantages far outweigh the disadvantages
f. Not applicable

18. The life of a college student typically has both positive and negative aspects. At this time, would you say that the positives outweigh the negatives, or vise versa?

a. Positives far outweigh the negatives
b. Positives somewhat outweigh the negatives
c. Positives and negative are equal
d. Negatives somewhat outweigh the positives
e. Negatives far outweigh the positives
f. Not applicable

19. How much loyalty do you feel to this college, based on your experience here?

a. Very much loyalty
b. Much loyalty

c. Some loyalty
d. Little loyalty
e. Very little loyalty
f. Not applicable

20. If you are supposed to complete a reading assignment before the next class session, how likely are you to actually do it?

a. Very likely
b. Somewhat likely
c. Neutral
d. Somewhat unlikely
e. Very unlikely
f. Not applicable

The Effect of Offenders' Education Level on Sentencing Time

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This experiment assessed the effect of offenders' education level on the sentencing time suggested by mock jurors. We hypothesized that jurors would give longer sentences to offenders with less education than offenders with more education. Ninety-six participants were randomly assigned to three groups; each group of participants read four fictitious vignettes describing different robberies. The vignettes were identical across each of the three surveys, varying only based on the offender's level of education. Group one read vignettes about an offender with no high school degree; group two read vignettes about an offender with a high school degree; group three read vignettes about an offender with a college degree. After reading each vignette, participants marked the number of years (5-20) on a number line they believed each offender should be sentenced. An Analysis of Variance (ANOVA) was used to analyze the average allocated sentence length; no statistically significant differences were found across the education level condition. Six, post-hoc, Bonferroni-corrected, paired-samples' t-tests were ran to compare the vignettes. We found that while participants did not allocate different sentence lengths depending on the offenders' educational level, they did give significantly different sentence lengths depending on the type of weapon used during the armed robberies. This discrepancy was especially present with visible shotguns and knives compared to concealed guns. The study's limitations, directions for future research, and possible reasons for the results were discussed.

Keywords: education level, college, high school, sentencing time, crime

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According to the Federal Bureau of Investigation's Uniform Crime Report (2018), law enforcement made over 10.5 million arrests in 2017. Approximately 1.2 million of said arrests were for property crimes, such as burglary, larceny, motor vehicle theft, and arson. Over half a million arrests were for violent crimes, including murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault. The remaining arrests were for offenses such as drug abuse violations, which include but are not limited to: fraud, embezzlement, vandalism, sex offenses, forgery, etc. (United States Department of Justice, 2018).

A variety of possible risk factors for criminal behavior have been examined. Risk factors are either perceived (i.e., ethnicity, attire, etc.) or true (i.e., sex, age, etc.) predictors of crime (Efran, 1974; Herzog, 2003; Roberts, 2012; Schafer, 2013; Vrij, 1997). While perceived predictors of crime are thought to be associated with criminal behavior, there is little to no evidence that they effectively predict crime. Attire is an example of a perceived predictor of crime; individuals may be judged differently based on what they wear. For example, offenders who wear darker-colored clothing are more likely to be perceived in a negative light in court than those wearing lighter-colored clothing (Vrij, 1997). More conventionally attractive and professionally dressed defendants are often seen as less guilty or receive more lenient sentences (Efran, 1974; Schafer, 2013). Ethnicity is another common perceived predictor of crime. Caucasians tend to perceive African-Americans as more violent and dangerous; this is a driving factor for Caucasian jurors to deliver harsher sentences to African-American offenders (Herzog, 2003; Roberts, 2012).

Blatant or explicit juror bias is controlled by the jury selection process known as voir dire, where potential jurors are questioned about their ability to set aside their personal beliefs to make a fair judgement based on the law and facts of the case. However, implicit biases may not be as easily assessed and avoided within the court system (Greene & Heilbrun, 2013). Implicit bias refers to the people's tendency to subconsciously attribute different stereotypes to outgroup members. As such, an offender's personal characteristics such as conventional attractiveness, occupation, marital status, criminal history, and personality traits may also influence a juror's sentencing decision (Visher, 1987).

Empirical evidence suggests there exist true predictors of crime such as: sex, poor school achievement, truancy, a history of family criminality, daring or risk-taking behaviors, poverty, and poor parenting or supervision (Farrington, Coid, Harnett, Jolliffe, Soteriou, Turner, & West, 2006; Jung, Herrenkohl, Klika, Lee, & Brown, 2015; Olate, Salas-Wright, & Vaughn, 2012; Reniers, Murphy, Lin, Bartolomé, & Wood, 2016). Low academic performance and truancy positively correlate with physically aggressive acts such as assault (Olate et al., 2012). Additionally, individuals who are frequently truant are over three times more likely to commit criminal offenses (Feinstein, 2002).

This relationship between lower educational attainment and criminal activity may exist for a variety of reasons. Prior research shows that daring behavior is a common risk factor for criminal behavior (Reniers et al., 2016). Those with less education also tend to be more likely to face social exclusion, which could lead to offending behaviors (Bäckman & Nilsson, 2016). In addition, years of education has been shown to correlate with changes in attitudes and social norms towards criminal behavior (Groot & Van den Brink, 2007). While education level is associated with the likelihood of criminal offending, it is also correlated with the type of crimes committed. Education negatively correlates with vandalism, threats, and assaults but positively correlates with driving under the influence and financial crimes such as white collar crimes (Groot & Van den Brink, 2007).

As the most incarcerated industrial nation in the world, the United States has been facing a rise in incarceration over the last couple of decades (Ziv, 2014). Studies have found that education level is the most important demographic predictor for incarceration (Spiranovic, Roberts, & Indermaur, 2012). Moreover, education level is negatively correlated with

likelihood of imprisonment (Feinstein, 2002; Johnston, 2004; Jung et al., 2015; Mercer, Farrington, Ttofi, Keijsers, Branje, Meeus, & Ttofi, 2016; Murray, 2009).

However, higher education level does not decrease the likelihood of incarceration for African American youth at the same rate as Caucasian youth (Lochner & Moretti, 2004). In 1980, Caucasian high school dropouts had a 0.8% higher probability of incarceration than Caucasian high school graduates, while African-American high school dropouts had a 3.4% higher probability of incarceration than African-American high school graduates (Lochner & Moretti, 2004).

Lochner and Moretti (2004) used Census data to analyze the implications of schooling on incarceration. Specifically, they used an ordinary least square (OLS)—a tool for estimating unknown parameters of a linear regression model, and forecasted that a one-year increase in the average years of schooling may reduce "murder and assault by almost 30%, motor vehicle theft by 20%, arson by 13%, and burglary and larceny by about 6%" (Lochner & Moretti, 2004, p. 19).

In this study, we hypothesized that participants would assign a shorter sentence to an offender with greater education (defined as completion of college) compared to an offender with less education (defined as completion of high school, followed by non-completion of high school). Researching the disparities in criminal sentencing and incarceration is crucial to combatting biases tied to various predictors, such as education level.

Methods

Participants

A convenience sampling method was used to recruit 96 undergraduate participants who were enrolled in various courses offered at a private, mid-Atlantic liberal arts college. Seventy-four percent (N = 71) of the participants were female, twenty-four percent (N = 23) were male, and two percent (N = 2) identified as other. The participants ranged in age from 18 to 49, with a mean and median age of 21 and 20, respectively (79% were 21 years old or younger). Sixteen percent (N = 15) identified as Freshmen, twenty-seven percent (N = 26) as Sophomores, twenty-three percent (N =22) as Juniors, and thirty-four percent (N = 33) as Seniors. Sixty-six percent (N = 63) were Caucasian, nineteen percent (N = 18) were African-American, nine percent (N = 9) were Asian-American, three percent (N = 3) were Hispanic or Latino, one percent (N = 1) were Native American, and two percent (N = 2) identified as Other. No participants reported a history of conviction for a crime.

Materials and Procedure

Participants signed a consent form before they were randomly assigned to read one of three sets of vignettes. Each set included four stories about a hypothetical robbery with a dangerous weapon committed in the state of Maryland. The vignettes were identical across each of the three surveys, varying only based on the offender's education level. Group one's vignettes described an offender without a high school degree (see Appendix A); group two's vignettes described an offender with a high school degree (see Appendix B); group three's vignettes described an offender with a college degree (see Appendix C). The different conditions within each vignette, including the location, location type (private vs public), weapon, and weapon type (concealed vs non-concealed) are outlined in Table 1. One of the vignettes, depicting convenience store robbery, was slightly modified from sample case one (p. 69) in the Maryland Sentencing Guidelines Manual (Maryland State Commission on Criminal Sentencing Policy, 2016). The rest of the vignettes

were modeled after the same robbery case but differed in the type of weapon used as well as the location of the crime. All of the vignettes stated that the offenders pleaded guilty.

Before reading the vignettes, participants in all three groups were given a description of the Maryland Criminal Law Code (2015) § 3-403 for robbery with a dangerous weapon, outlining that in Maryland, the maximum sentence for this crime is twenty years (see Appendix D). While the Criminal Law Code does not specify a minimum sentence length, this information was added for the participants. The mandatory minimum sentence length for violent crimes while using or carrying a firearm is five years (18 U.S. Code § 924). As such, the description included a minimum possible sentence of five years for the purpose of this exercise.

The participants were instructed to mark, on a 5 to 20 year number line, the appropriate sentence length (in years) for each offender. Participants then answered questions in regards to their sex, age, ethnicity, class year, and major. Additionally, they were asked if they had been previously convicted of a crime, reported their interest level in criminal justice on a five-point likert scale ranging from not at all interested to very interested, and estimated the offenders' age.

Results

The sentence length for each of the four vignettes was recorded for each participant. Table 2 displays average sentence duration ratings and standard deviations for all four vignettes across all three educational levels. We examined the effect of offender educational level (between subject: no high school, high school, and college) across four armed robbery vignettes (within subject: shotgun, knife, threat of concealed gun, baseball bat) with a 3x4 mixed-design ANOVA. There was no statistically significant main effect for educational level: $F(2, 93) = 2.46$, $p = 0.091$), with sentences for the no-high school level averaging 7.49 years (SD = 1.43), sentences for the high school level averaging 7.25 years (SD = 1.55), and sentences for the college level averaging 8.27 years (SD = 2.59). There was a statistically significant main effect for type of vignette, however: $F(3, 279) = 5.74$, $p = 0.001$, $\eta 2 = 0.06$, with convenience store armed robbery with a shotgun averaging 8.18 years (SD = 2.69), walking home robbery with a knife averaging 7.89 years (SD = 2.41), diner robbery with threat of a concealed gun averaging 6.99 years (SD = 2.66), and home robbery with a baseball bat averaging 7.64 years (SD = 2.85). There was no statistically significant interaction effect: $F(6, 279) = 1.04$, $p = 0.401$).

Because the type of vignette was statistically significant, six post-hoc, paired samples' t-tests were calculated. With a new, corrected α level of 0.008 (i.e., 0.05/6) to reduce Type I errors, two of the contrasts were statistically significant: the shotgun vs. concealed gun contrast ($t(95) = 3.95$, $p = 0.001$, $r = 0.38$), and the knife vs. concealed gun contrast ($t(95) = 3.68$, $p = 0.001$, $r = 0.35$). Table 3 displays the tobt values, degrees of freedom, and significance levels of all six paired samples' contrasts.

In summary, offenders' educational level did not predict the sentence length given by the participants; however, participants did assign significantly different sentence lengths depending on the type of weapon used during the armed robberies, with the non-concealed shotgun and knife resulting in the longest sentences.

Discussion

The United States has the largest overall prison population rate in the world (Ziv, 2014). The criminal justice system in the U.S. is more punitive than rehabilitative

(Wildeman & Western, 2010). The purpose of this experiment was to gain a better understanding of factors - in particular, the educational background of offenders - that affect different sentence lengths. The hypothesis was that the more education offenders had, the shorter the sentences the participants would assign. However, this experiment's data did not support this hypothesis. The offenders' educational level did not significantly affect the sentence duration participants assigned. The findings of this study were inconsistent with the previous research on the relationship between education and incarceration. A great proportion of incarcerated individuals have less than a high school education (Feinstein, 2002; Jonck et al., 2015). Greater education predicts less crime and fewer arrests, convictions, and incarcerations (Feinstein, 2002; Johnston, 2004; Jung et al., 2015; Mercer et al. 2016; Murray, 2009; Spiranovic et al., 2012). The likelihood of being incarcerated decreases upon completion of high school (Jonck et al., 2015). The lack of a main effect of education in this study could be explained by a lack of diversity in the sample of participants who were all college students. As college students, the participants may have held the offenders with a similar education level to a higher standard, influencing the duration of sentencing they deemed appropriate for similarly educated people (especially considering that none of the participants had ever been convicted of a crime themselves).

While there was no statistically significant main effect for education level, there was a statistically significant main effect for vignette type. Neither the type of weapon (concealed vs. non-concealed) nor the location of the robbery (private vs. public) can explain these results, however, so it may be that the perceived degree of lethality of the weapon may be a better explanation. The offender with the shotgun received the longest average sentence (8.18 years), followed by the offender with the knife (7.89 years), the offender with the baseball bat (7.64 years), and finally, the offender with the concealed gun (6.99 years).

One limitation of this study may be the sentence length measurement, a number line ranging from 5 to 20 years. As the averages for all three groups ranged from 7.25-8.27 years, there seemed to be a floor effect in the data collected. Perhaps the crime was not perceived as dangerous enough to warrant a longer sentence, since no victim was physically injured. Another possible limitation of the study is that the sample consisted exclusively of college students, making it difficult to control for the influence that identifying with someone who has the same educational background and age could have on participants' ratings. Participants may have had higher expectations of someone who is educated like them and have held them to a higher standard.

For future studies, researchers should seek participants with varying backgrounds and experience with the criminal justice system to provide a more representative sample of the population. Future researchers should also consider studying various different criminal acts instead of just robbery with a dangerous weapon to explore a stronger generalizability of the results across the criminal justice system.

Conclusion

This study raises questions about the relationship between offender education level and sentencing time. Many studies have researched variables that influence sentencing decisions in the criminal justice system, such as gender, ethnicity, and attire. Given the unexpected results of this study, more research should be done to better understand the relationship between

offenders' education level and the influence it may have in the criminal justice system, specifically with respect to sentencing time.

The Sixth Amendment of the United States Constitution grants all the right to a fair and speedy trial by an impartial jury. By gaining a better understanding of the factors that influence jurors' decision making, the criminal justice system can become a fairer and more just system. It allows criminal court officials to work to combat these influences through the voir dire process. Rather than judging someone based on demographic characteristics, they should be judged according to the crime committed.

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Table 1: *Conditions for each vignette*

Vignette	**1**	**2**	**3**	**4**
Location	Convenience store	On the street	Diner	House
Location Type	Public	Private	Public	Private
Weapon	Sawed-off shotgun	Knife	Concealed gun	Baseball bat
Weapon Type	Non-concealed	Non-concealed	Concealed	Non-concealed

Table 2: *Mean Sentence Length, in years, by Armed Robbery Vignette and Perpetrator Level of Education*

	No High School		High School		College		**Total**		
Vignette	*M*	*SD*	*M*	*SD*	*M*	*SD*	*n*	*M*	*SD*
shotgun	7.59	2.42	7.78	2.36	9.16	3.03	32	8.18	2.69
knife	7.81	2.01	7.34	1.98	8.50	3.03	32	7.89	2.41
concealed gun	6.78	2.37	6.44	1.64	7.75	3.52	32	6.99	2.66
baseball bat	7.78	3.25	7.44	2.29	7.69	3.01	32	7.64	2.85
Total	7.49	1.43	7.25	1.55	8.27	2.59	96	7.67	1.96

Table 3: *T_{obt} values, degrees of freedom, and significance levels of six paired samples' contrasts*

	paired samples t-tests		
pairs	*t*	*df*	*p*
shotgun vs. knife	1.30	95	0.196
shotgun vs. concealed gun	3.95	95	0.001*
shotgun vs. baseball bat	1.48	95	0.143
knife vs. concealed gun	3.68	95	0.001*
knife vs. baseball bat	0.80	95	0.427
concealed gun vs. baseball bat	-2.01	95	0.047

* significant Bonferroni-corrected α=0.00

Appendix A

Sentencing Exercise

Instructions: Sentence the offender to the amount of time you believe he should be incarcerated. **Circle the number below**, which corresponds to the exact amount of time you believe he should be sentenced-between 5 years (minimum sentence) and 20 years (maximum sentence).

On November 3, 2015, Maryland police officers were summoned to a convenience store for a report of an armed robbery. The cashier reported that one male had entered the store and was armed with a sawed-off shotgun. The cashier and a clerk were instructed to lie on the floor as he removed money from the cash register. The subject fled in a car and, based on a witness's description of the vehicle, was apprehended by police a short time later. The defendant was identified by the cashier as the man with the shotgun. The defendant, who does not have a high school degree and no prior criminal record, pleaded guilty to robbery with a dangerous weapon on February 4, 2016.

5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

In September 2014, Maryland police were called by a couple who had just been robbed while walking home. They told police that a man had walked up to them and was holding a knife. The couple was told to stand still, make no attempt to get help, and hand over their wallets. After the man pocketed the cash from their wallets, he fled, and the couple called 911 at a nearby gas station. After the couple provided the police with a description of the suspect, police were able to apprehend him. The defendant, who does not have a high school degree and no prior criminal record, pleaded guilty to robbery with a dangerous weapon on October 30, 2014.

5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

At 1:48AM on the morning of January 22, 2015, a man entered a small diner in southern Maryland. He provided the two remaining staff, who were preparing to close for the night, a small note, claiming to have a gun with him and ordering them to give him the money in the cash register. They complied and called the police after the man left with the money. Officers were able to get a description of the vehicle the man fled in with a nearby surveillance camera and apprehended the suspect two days later. The defendant, who does not have a high school degree and no prior criminal record, pleaded guilty to robbery with a dangerous weapon on March 21, 2015.

5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

On the morning of August 3, 2015, while bringing groceries into their house, two brothers were confronted by a man who entered their house through their open front door. The man was armed with a baseball bat and demanded that they hand over all of the cash they had on them. After pocketing the cash, the man ran out of the house. The brothers called the police, who were able to find the suspect that afternoon on a patrol around the neighborhood. The defendant, who does not have a high school degree and no prior criminal record, pleaded guilty to robbery with a dangerous weapon on November 1, 2015.

5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

Appendix B

Sentencing Exercise

Instructions: Sentence the offender to the amount of time you believe he should be incarcerated. **Circle the number below**, which corresponds to the exact amount of time you believe he should be sentenced- between 5 years (minimum sentence) and 20 years (maximum sentence).

On November 3, 2015, Maryland police officers were summoned to a convenience store for a report of an armed robbery. The cashier reported that one male had entered the store and was armed with a sawed-off shotgun. The cashier and a clerk were instructed to lie on the floor as he removed money from the cash register. The subject fled in a car and, based on a witness's description of the vehicle, was apprehended by police a short time later. The defendant was identified by the cashier as the man with the shotgun. The defendant, who has a high school degree and no prior criminal record, pleaded guilty to robbery with a dangerous weapon on February 4, 2016.

5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

In September 2014, Maryland police were called by a couple who had just been robbed while walking home. They told police that a man had walked up to them and was holding a knife. The couple was told to stand still, make no attempt to get help, and hand over their wallets. After the man pocketed the cash from their wallets, he fled, and the couple called 911 at a nearby gas station. After the couple provided the police with a description of the suspect, police were able to apprehend him. The defendant, who has a high school degree and no prior criminal record, pleaded guilty to robbery with a dangerous weapon on October 30, 2014.

5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

At 1:48AM on the morning of January 22, 2015, a man entered a small diner in southern Maryland. He provided the two remaining staff, who were preparing to close for the night, a small note, claiming to have a gun with him and ordering them to give him the money in the cash register. They complied and called the police after the man left with the money. Officers were able to get a description of the vehicle the man fled in with a nearby surveillance camera and apprehended the suspect two days later. The defendant, who has a high school degree and no prior criminal record, pleaded guilty to robbery with a dangerous weapon on March 21, 2015.

5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

On the morning of August 3, 2015, while bringing groceries into their house, two brothers were confronted by a man who entered their house through their open front door. The man was armed with a baseball bat and demanded that they hand over all of the cash they had on them. After pocketing the cash, the man ran out of the house. The brothers called the police, who were able to find the suspect that afternoon on a patrol around the neighborhood. The defendant, who has a high school degree and no prior criminal record, pleaded guilty to robbery with a dangerous weapon on November 1, 2015.

5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

Appendix C

Sentencing Exercise

Instructions: Sentence the offender to the amount of time you believe he should be incarcerated. **Circle the number below**, which corresponds to the exact amount of time you believe he should be sentenced- between 5 years (minimum sentence) and 20 years (maximum sentence).

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5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

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Appendix D

Sentencing

According to Maryland Criminal Law § 3-403- Robbery with dangerous weapon:
(a) Prohibited. -- A person may not commit or attempt to commit robbery under § 3-402 of this subtitle:
(1) with a dangerous weapon; or
(2) by displaying a written instrument claiming that the person has possession of a dangerous weapon.
(b) Penalty. -- A person who violates this section is guilty of a felony and on conviction is subject to imprisonment neither below 5 years nor exceeding 20 years.

Leo's Code Mixing and Code Switching Tendencies

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The way babies naturally absorb and produce language is a basic skill, but also one of the most perplexing human abilities. For years, researchers have studied monolingual children to understand language acquisition and development, which quickly became the foundation to analyze bilingualism. There is vast research on monolingual and bilingual language acquisition, but less regarding trilingualism. This case study explores a fascinating simultaneous trilingual two-year-old boy, Leo, who speaks English, Mandarin, and Cantonese. Data were collected in a longitudinal study by the Childhood Bilingualism Research Centre at Chinese University of Hong Kong. This study analyzes a total of twelve transcriptions over an eight-month period. We had two main objectives: a) to document and understand Leo's language development in these three languages b) to specifically investigate how he mixes these languages within and between sentences, known as code mixing and code switching, respectively. These objectives were the foundation of our self-developed coding scheme that included twelve categories. This study examined Leo's mixing and switching tendencies in relation to language dominance, parental input, and sociolinguistic factors. Contrary to popular belief and many other studies' findings, this study did not find an association with language dominance and code mixing and switching patterns. Instead, we found that the amount and the language inserted was significantly related to the interlocutor he was in interacting with, and the base language of that transcript.

Keywords: language, development, bilingualism, trilingualism, code mixing, code switching, language dominance, parental input, sociolinguistic factors

Acknowledgements: The data that are being reviewed and analyzed for this thesis are from a longitudinal study conducted by the Childhood Bilingualism Research Center (CBRC) of Chinese University of Hong Kong, which is being supported and funded by the university. We are extremely grateful for how open and encouraging CBRC has been in allowing us to use their data. The time and energy that the family members and RA's have dedicated to recording Leo is greatly appreciated. The many hours the RAs put into making the transcriptions as error free as possible, is extremely commendable and appreciated. Thank you to CBRC for allowing us to analyze their data and all their hard work on Leo's data. Thank you to Leo, who was the main actor of this thesis and who has allowed us to analyze his every utterance. Thank you to my Thesis advisor, Professor Leslie Rescorla, for believing in this project and being more than willing to begin this journey with me. All your patience, guidance, effort, time, encouragement, and support in and out of this thesis, is greatly appreciated, thank you

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In the field of psychology and linguistics, monolingualism and bilingualism have been extensively researched, with few studies conducted on trilingual children. To address the lack of literature in this area, this study explores trilingual language development, specifically utilizing the mixing of languages within and between sentences, to understand their experience. This case study analyzes a fascinating two-year-old boy named Leo. At such a young age, Leo is already a balanced trilingual in English, Mandarin and Cantonese. His acquisition and development in these languages is reinforced through a trilingual household, attending a bilingual school, and growing up in the trilingual city of Hong Kong (HK).

This article has five main sections. The first section presents the literature review, which provides a summary of research on monolingulaism, bilingualism, and trilingualism, and the definition of code mixing and code switching that this study utilizes. The main portion of the literature review examines possible contributing factors to code mixing and switching: language dominance, parental input, and sociolinguistic factors. The second section describes the method of this study, the third part presents the results, and the fourth section is the discussion. The last part explores the limitations of the literature and current study, and proposes future directions for this area of research.

Literature Review

Similarities and Differences between Language Development in Monolingual, Bilingual and Trilingual Children:

Before examining the mechanics of code mixing and code switching, the language development of monolingual, bilingual, and trilingual children must be compared. To do so, three aspects of development will be examined: phonology, lexicon, and syntax. The comparison of monolingual and bilingual development information are mostly from Bialystok's book Bilingualism in Development: Language, Literacy, and Cognition (2001) and Genesee and Nicoladis's (1997) meta-analysis.

Phonology

First, the phonological inborn abilities babies have allow them to acquire any and as many languages as they are exposed to in their environment. One study showed that 6 to 8 month monolingual English babies were able to differentiate phonemes in Hindi, whereas English-speaking adults were unable to (Werker et al., 1981). Another study of monolingual and bilingual 4.5 month old infants indicate that the children were slower when discriminating in the language they didn't speak or the language they weren't dominant in (Bosch and Sebastian-Galles, 2001). The process of production in monolingual and bilingual children typically occurs in four stages: first is crying, which turns into babbling, then at 12 months comes the one word stage, and finally at two years they start to commonly use two words.

Lexicon

Research using the MacArther Communicative Development Inventories (Fenson et al., 1994) found that on average 16 month monolingual children can understand 191 words, and can produce 64 words (Bates, Dale, and Thal, 1995). Similarly, at 30 months they can produce on average 534 words. One study found that English dominant bilingual children had English vocabulary levels comparable to those of their monolingual counterparts (Pearson, Fernandez, and Oller 1993). Bialysok et al.

(2010) found that when comparing English vocabulary amounts at each age group between 3 – 10 year old, monolinguals outscored their bilingual counterparts. One explanation for this could be translation equivalents, which are an important part of bilingual vocabularies that are not always accounted for. These bilingual synonyms (Vihman, 1985) are words with the same definition but are represented in both languages.

Syntax

The development of monolinguals' syntax capabilities begins at 18 months, where two important developmental aspects of acquisition occur. First is the morphological system. Several studies have confirmed that the sequence of acquisition of the first seven out of the total fourteen morphemes, is the same for children who are learning different languages (Brown et al., 1973). The second is overextension of rules (e.g. "foots"). This trend is noted in various languages and since these elements are seen across languages, suggests considerable universality in syntactic acquisition across languages.

The most common viewpoint of bilingual children's acquisition of syntax is that the process is the same as monolingual children. Paradis et al. (2007) found that four-year-old French-English bilingual children were as competent as their monolingual counterparts for regular past tenses in their stronger language. However, the bilingual children did not do as well as the monolinguals for the more difficult and irregular past tense structures in English.

Trilingualism

The dramatic disparity between monolingual and bilingual language development has been extensively documented, while trilingualism is still vastly understudied. Even more, research on trilingual simultaneous acquisition is absent from the literature (Stavans & Swisher, 2006; Hoffmann & Stavans, 2007), with only six studies reporting on the topic as of 2006 (Stavans & Swisher, 2006). As bilingual children are typically compared to monolinguals, bilinguals are now the standard of comparison for trilinguals. However, Stavans & Swisher (2006) believe the two groups diverge theoretically and pragmatically in demonstrated areas of linguistics, sociocultural, and psycholinguistic needs. Based on the state of the field, a thorough explanation of trilingual language development cannot be provided.

Definition of Code Mixing and Code Switching

Before going further in this literature review, two points must be noted. First, the field has not come to a consensus on the definition of code mixing and code switching. Due to this lack of agreement, most researchers individually define code mixing or switching for their own purposes. Some researchers believe there is a distinction between code mixing and switching (Yow, Patrycia, Flynn, 2016; Byers-Heinlein, 2012); however, others believe that one umbrella term is sufficient to demonstrate the general interchange between languages (Heredia & Altarriba, 2001; Goh, 2017). Yow, Patrycia, and Flynn (2016) explain a commonly held definition of code mixing and switching: "Some researchers distinguish the term code-switching from code-mixing, where the former refers to the juxtaposition of two codes (languages or dialects) in a discourse that are grammatical and constrained by regularities, and the latter is more commonly used to refer to the mixing of two or more languages in a word or within a sentence (e.g., Brice & Anderson, 1999; Faltis, 1989; Meisel, 1989, 1994; Muysken, 2000; Nicoladis & Genesee, 1997; Poplack,

2001)" . In other words, code mixing is when the languages are mixed within a term or a sentence, whereas code switching is the alteration of languages between sentences. This present study will use these definitions of code mixing and code switching.

Second, the research presented below mostly studies participants in countries where code switching is common. In some cultures, code mixing and switching are perceived as a lack of language control, because the person is unable to solely communicate in the original language (Paradis and Nicoladis, 2007). However, in this study, culture is not a main variable of focus, rather is only utilized to analyze the findings of Leo's code mixing and switching tendencies.

Factors Influencing Code Mixing and Switching

The phenomenon of code mixing and switching is heavily documented in bilingualism research, yet one underlying reason for such phenomenon has not received complete consensus. Thus the following section will examine three of the most highly discussed factors in bilingualism literature regarding code mixing and switching in young children: language dominance, parental input, and sociolinguistic characteristics.

One of the oldest and recurrently visited factors is language dominance, which was greatly studied when research on bilingualism took off as early as Redlinger and Park's (1979) paper. Bernardini and Schylter's (2004) article describe several hypotheses regarding the relationship between language dominance and code mixing and switching: Dominant Language Hypothesis (Petersen, 1988), Bilingual Bootstrapping Hypothesis (Gawlitzek-Maiwald & Tracy, 1996), and Ivy Hypothesis (Bernardini & Schylter, 2004). Though different, these hypotheses are all based on the imbalance between the two languages, and thus a certain degree of dependency of the weaker to the stronger language results in code mixing or switching (Bernardini & Schylter, 2004).

Redlinger and Park's (1979) study presents the rates of three children, which demonstrates how language proficiency can significantly influence code mixing and switching tendencies. The researchers explained that Danny had initially high rates of code mixing because he frequently mixed "ein", a German article for 'a' in English, into his English utterances. They indicated that "ein" made up half of Danny's German utterances in English. However, once he learned the article 'a' in English his mixing decreased. Thus, one of Redlinger and Park's main findings was that code-mixing behavior decreases with stronger language abilities.

There are few studies about trilingual language development, even less about simultaneous trilingualism in children and their code mixing and switching tendencies. One of the few on this topic, Stavans and Swisher (2006), embarked on a qualitative study to utilize code mixing and switching as a "window" to study trilingual language development. This study consisted of two siblings, aged 2;6 (year, month) and 5;5 at the beginning of the study. The children and an interlocutor were recorded in a naturalistic setting, with this recording later transcribed and analyzed. The children used English in school, and Hebrew and Spanish at home and during other recreational events. For both children, there was a total of 2,310 code mixes and switches, with 10% were code mixes of mostly nominal or verbal phrases. It was also found that although the children's dominant language was English, there were more mixes and switches into other languages with English as the base language. The children's morphosyntactic abilities, including when they code mix and code switch in the three languages, were on par

with their monolingual counterparts.

Building on this study, Hoffmann & Stavans (2007) examined similar subjects as the study above. Hoffmann & Stavans (2007) utilized a naturalistic observational and experimental design to examine how dominance and socio-cultural factors influence code mixing and switching. Two siblings, who grew up in a trilingual household, English, Spanish and Hebrew, were studied at two different points in time: the first period was when the children were 3 and 6 year old, and the second round was when they were 6 and 9 years old. The first round was a naturalistic observational setting, where children's interactions were recorded at home. The second round was experimental where children had to retell a story. During round one, both children code switched more than they code mixed; however, during time two, both children had much more code mixes. The researchers believe that code mixing is a more complex process, linguistically and pragmatically, and thus they explained increased code mixing amounts were due to increased linguistic knowledge. At the youngest age, there was no language alternation out of English, large amounts of alternation into English, and few away or into Spanish or Hebrew. Whereas at around age 5, there was more alternation away from Spanish and Hebrew than English. At the same time, children switched more into English than Hebrew or Spanish. At age 9, the amount of alternation into and away from the languages are more similar and balanced between the languages. The researchers do not have a conclusive explanation for this type of development, but propose two possible reasons. One reason could be that the children were more dominant in one language, specifically English. The other reason could be the children were still growing into their trilingual abilities across and between languages.

There is no doubt that language dominance is a crucial aspect of bilingualism and code mixing and code switching. A child proficient across their different languages is termed a balanced multilingual, whereas an imbalanced speaker various in their capabilities. However, these language dominant hypotheses and studies provided above, tend to describe children who are more imbalanced, and thus may not capture balanced bilinguals' situations. Since the subject of this study is a relatively balanced trilingual, exploring other factors that may influence balanced multilingual children's code mixing and switching is necessary.

Another focal area of bilingual research is language exposure, specifically parental input. Parental input is the quantity and quality of speech produced by the parents in the presence of the child, which is a foundational element of children's language development. Byers-Heinlein (2012) examined the influence of the quantity of parental input on children's language abilities by studying 1;5 year-old bilingual children. The results demonstrated a positive relationship between exposure to English by caregivers and comprehension and production scores. Regarding code mixing, they found an inverse relationship between child vocabulary size and parental code mixing, specifically a three point decrease in the child's vocabulary size for each one point increase in parental code mixing.

Yip and Matthews (2016) investigated how parental input influences the quantity and quality of code mixing in HK children by studying the English and Cantonese mixing tendencies of nine children. Seven of these children were in households with one parent one language (1P1L) setting, the other two children's parents both spoke to them in two languages (1P2L). Eight of the nine children's dominant language was Cantonese, but they all code mixed into English more when using Cantonese. The

amounts of code mixing the 1P2L children engaged in was double the amount of 1P1L children when in a Cantonese context. Also, the researchers found a similar pattern between the parent and child's code mixing. For Kasen, his father code mixed more than his mother and as a result Kasen's code mixing rate was in the middle of his parents amounts. Whereas Darren's parents both had low amounts of code mixing and so did Darren. The researchers also found various commonalities between the way the parents and children code mixed. For example, the addition of aspect markers on to verbs in English was often seen in the adult code mixing, and this pattern was also evident in the children's Cantonese mixing. Overall, this study showed how parental input can impact the amount and type of code mixing the children engage in, and deemphasized the influence of language dominance.

To further understand the influence of the interlocutor's input on children's code mixing, Comeau et al. (2003) utilized an experimental design. Bilingual RA's conducted sessions with bilingual French-English children (N=6) between the ages of 2;0 - 2;7. The RAs were instructed to code mix at a low level in session 1, high in session 2 and low again in session 3. As the RA's code mixing pattern was low, high, and low, the children's trend was also a similar pattern. This means that the children were matching the language the RA was using, the researchers explained that the children were sensitive and reacted to the interlocutor's code mixing, demonstrated through the quantity and type of mixes.

As children grow up, another important language environment is school. To explore the relationship between sociolinguistic factors and language dominance, Yow, Patrycia, and Flynn's (2016) study examines the school's environmental effect on children's code switching. This was a naturalistic observation study that took place in Singapore, a country with a diverse population with a variety of languages spoken. They studied preschool students from school M and E. Both schools conducted half of the day in Mandarin and the other half in English. The most important finding for both schools was that code switching into Mandarin, and Mandarin language abilities were positively correlated. These results show that code switching in Mandarin gave the children opportunities to practice different languages, instead of only using English. This study also highlights the importance of both the school and home environments on children's language development.

The last factor being analyzed is sociolinguistic factors on children's code mixing and switching tendencies. Paradis and Nicoladis (2007) investigated how sociolinguistic factors and language dominance may influence children's language mixing tendencies. They recruited a small sample size of 8 children aged 3;6 – 4;11 from Canada, who were bilingual in English and French. The study employed bilingual RA's to conduct free play sessions in both languages. Adding one more sociolinguistic factor, one parent sat in the room and at times interacted with the child, which may show the influence of their presence on the child's mixing patterns. The positive and negative connotations of mixing in French and English was also examined. The researchers found that the eight children maintained the intended language 90% of the time, and interpreted that the parents' presence and language choice had minimal impact on the child's language choice.

The study also wanted to understand the impact of language dominance on language switching. Half of the children were dominant in English and the other half were dominant in French. In general, there were

not that many mixes recorded for all the children, ranging from .1% to 14.1% per session. Both French and English dominant children mixed more when using their less dominant language, but different mixing patterns were found in the two languages. French dominant children mixed less in English sessions than English dominant speakers in French sessions. Three out of the four French dominant children did not mix more than 3% in English sessions. However all of the English dominant children mixed more than 5% of the time during French sessions. The correlation of the children's mixing and interlocutor's mixing was insignificant for both languages. This study demonstrated a weak relationship between the interlocutor and child's mixing patterns, but highlighted the impact of language dominance and society's viewpoint on code mixing.

Montanari (2009) also investigates how language dominance and sociolinguistic factors impact a child's code mixing and switching tendencies. Among the few studies that analyze two-year-old trilingual code mixing and switching patterns, Montanari (2009) studies Kathyrne, who speaks Tagalog, Spanish and English. Four sessions in these languages were conducted at two time periods: 1;10 and 2;4. The researcher had two main objectives: 1) determine what age children can appropriately utilize their languages 2) investigate the influence of language dominance and social cues on code mixing and switching. Results indicated that Kathyrne was able to pragmatically differentiate her languages before the age of two. Chi square tests showed a statistically significant relationship between child's language choice and the interlocutors'. Additionally, a majority of the words she code mixed were due to lack of language dominance and thus a lexical gap. Furthermore, social factors such as how receptive her family members are to code mixing and switching, and how often they may code mix and switch, strongly influenced her patterns. The researchers thought it was impressive that at such a young age, Kathyrne was able to manage all of these factors simultaneously in a multilingual environment online, instead of needing time to consider what language to use.

Limitations of Current Literature

Although we have a strong foundation for research in multilingualism and code mixing/switching; there are limitations to the literature and there are several ways we could improve the field. First, there appears to be more studies investigating preschool aged and above individuals' code mixing and switching experiences. It is understandable that the field has focused on these types of participants, since children only begin to produce more than one utterance at the age of two. However, it is important to understand children's code mixing and switching experience before preschool age, as it can show us an even more raw and natural depiction of the state of such behaviors. Second, there is much literature about bilingual code mixing and switching; however, less regarding trilingual simultaneous acquisition individuals. There is a scarcity of such studies not only because it is it difficult to find researchers who can speak multiple languages at a proficient level, but also to find participants who are balanced speakers in several languages. The third problem focuses on the languages that are studied in the current literature. As highlighted in the literature review section, the languages most frequently studied are French, English, Italian, and Spanish, languages that are linguistically similar. This is an important place to start; however, we need to expand such research to include individuals who speak vastly different

languages and may not be represented in the current literature.

The three limitations presented above demonstrate gaps in the current literature, and this study of Leo's experience as a two-year-old trilingual will try to address such issues. First, Leo's age will allow us to study an age group that has received less attention in language development and code mixing and code switching literature. Second, studying Leo will deepen our understanding of not only bilinguals, but especially trilinguals. Last, the three languages that Leo speaks are not only vastly different from each other, but also are greatly under-represented as a language combination in current literature.

Method

Data

The data utilized in this case study was from the Childhood Bilingualism Research Centre at Chinese University of HK, where the university funded the center's longitudinal study. This case study utilizes twelve transcripts of thirty-minute conversations between Leo and his family members and/or the institute's RAs. There are four transcriptions for each language: English, Mandarin and Cantonese. The twelve transcripts span an eight-month period, starting from August 2016 and end the following year in April 2017, with a two-month gap between each transcript (Table 1; see Appendix). The time periods for each of the four transcripts correspond with the transcripts in the other languages. For example, the first transcripts for each of the languages all fall within the month of August, thus in this study we controlled for age in its impact on Leo's measured language development.

Procedure

The recordings took place at Leo's home with typically one investigator or family member interacting with him, while another investigator or family member recorded the session. For each 30-minute session, there was a specific target language to be used. The interlocutors that partook in the recordings with Leo were all bilingual or trilingual. After these sessions were recorded, the RA's transcribed the recordings using the CLAN application. Once transcribed, another RA would check through the transcriptions.

Participants

This case study is about Leo, who at the time of this study, was roughly two years old. He speaks Cantonese, Mandarin and English, and was born and has lived his whole life in HK. While the differences between Chinese and English are vast, differences are also seen between Cantonese and Mandarin. Mandarin is a tonal language with four tones in total, meaning each character is assigned a unique combination of pinyin and tone. Though Cantonese is widely known as a dialect of Mandarin, the differences in phonology, vocab, and syntax make the language pairing comparable to being as different as French and Spanish (Matthews & Yip, 2011).

There are three levels of Leo's environment that are important to acknowledge, namely home, school, and the greater society. All three languages that Leo speaks are also used at home; though not all members of his family can speak each language, and those that can, vary in proficiency levels. His mother is native in Mandarin and Cantonese and extremely proficient in English. His father's mother tongue is Mandarin and is proficient in English. His parents utilize a one parent-one language strategy (1P1L): before 1;01, Leo's mother would use Cantonese and his father Mandarin. After 1;01, Leo's mother switched between English and Cantonese every other day (Mai & Yip, under review). Leo's school

environment is also another important level, from 1;2 - 2;0 Leo attended one hour playgroup and tutoring sessions with native English speakers per week. Between the ages of 2;0 and 2;5, Leo attended an only English speaking nursery for three hours a day.

HK has three official languages: Cantonese, Mandarin and English. The HK government conducted a survey of 5.6 million citizens to better understand the linguistic landscape of the city. They found that of the people surveyed: Cantonese was the native language for 88.1%, 3.9% for Mandarin, 3.7% for another Chinese dialect, 1.4% for English, and 2.8% for other languages (Census and Statistics Department, 2016). Although Cantonese is the dominant native language, most people can speak at least two of three of the official languages fluently. This summary of Leo's home, school and societal environments demonstrate how each of his languages is being supported.

Coding

We had two main objectives when coding these transcripts. The first objective was to assess Leo's language development in all three languages across the eight-month span these transcripts were conducted in. We did not code utterances produced by the interlocutor as spontaneous or imitative, as they are full-grown adults. We first classified each of Leo's utterances as either spontaneous or imitations. Utterances were deemed as imitations if Leo mimicked a lexical term or the whole utterance from the produced speech immediately prior to when he spoke. We defined spontaneous speech as utterances that Leo produced by himself without being primed or without imitating the interlocutor's previously stated speech. Our coding scheme utilized spontaneous speech as an indication of increasing language capabilities, because he is instigating the speech himself, instead of simply mimicking.

The second objective was to examine and analyze Leo and the interlocutor's code mixing and code switching tendencies. Unlike the procedure we followed while examining Leo's language development, we coded the interlocutor's mixing and switching patterns to better understand other factors that may be related to Leo's mixing and switching tendencies.

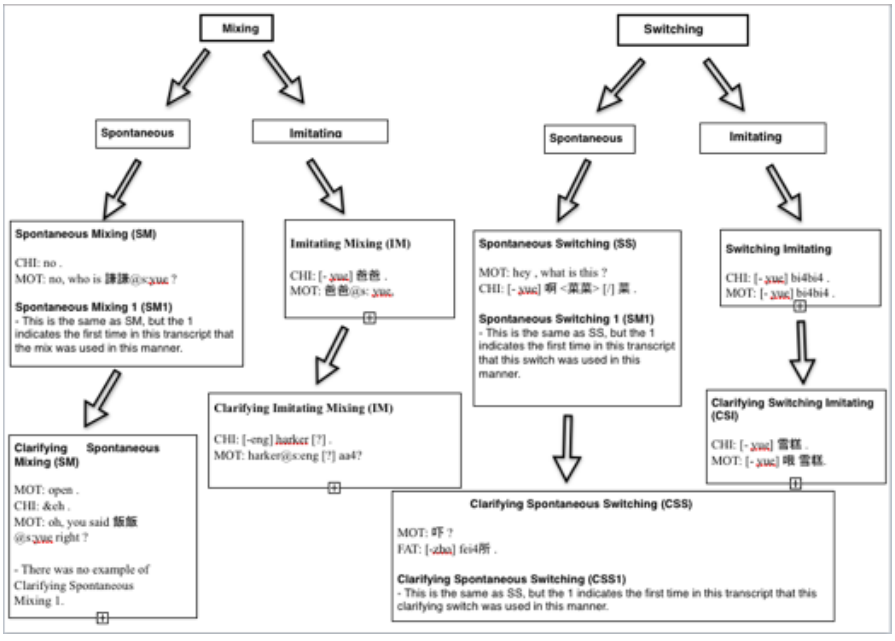

Figure 1

Our coding scheme included ten categories to track the type of mixing and switching Leo and the interlocutor produced (Figure 1). We first determined if each utterance included a mix or a switch into another language. We made a clear distinction between a mix and a switch because they have different functions, demonstrate different aspects of Leo's language usage, and show different ways his environment is influencing him, among other implications. The second category determined if the mix or switch was spontaneous or imitated. By doing this we could then determine if Leo was the one instigating such mixes or switches, or if he was imitating the interlocutor in the conversation. We furthered these categories by demonstrating when and who the first person in the transcript was to use that type of mix or switch. The last category indicated if the mix or switch was a clarification or not. In several cases, the only reason the speakers were mixing or switching was because they were taken off guard by the change in language, thus were mixing or switching to clarify.

Based on these classifications we created ten categories: Spontaneous Mixing (SM), Spontaneous Switching (SS), Switching Imitation (SI), Mixing Imitation (MI), Spontaneous Switching 1 (SS1), Spontaneous Mixing 1 (SM1), Clarifying Switching Imitation (CSI), Clarifying spontaneous switching/Clarifying spontaneous switching 1 (CSS/CSS1), Clarifying Spontaneous Mixing (CSM), and Clarifying Mixing Imitating (CMI) (Figure 1).

Inter-rater Reliability

To measure the inter-rater reliability, we tallied the total amount of utterances produced in each category for Leo and the interlocutor. For each transcript, we counted how many codes were given in total. Since there were disagreements between the first and second coders, we calculated the combined total amount of codes determined by both coders and the total agreed upon codes. For example, one coder coded a line of utterance as SM1, which is three codes: spontaneous (S), mixing (M), and as the first of this type of spontaneous mixing in this session (1). However the other coder determined it as clarification (C) and mixing (M). Thus the only code we agreed upon was mixing (M). There was a total of 4 codes given for this utterance (S, M, 1, C) and coders only agreed upon 1 out of the total 4 codes. For each page, we tallied the total amount of agreed upon codes and divided it by the total amount of given codes to determine inter-rater reliability. For the two transcripts in English the inter-rater scores were: .89 and .89, Cantonese: .88 and .8, and for Mandarin: .64 and .77. Most of the inter-rater scores are 80% and above, demonstrating good inter reliability rates.

Results

Leo's Language Development: Spontaneous and Imitated Speech

After tabulating all of Leo's spontaneous and imitated speech, we see a general increase in his production for the three languages (Table 2; Figure 2). Already at age 1;7 for each language, Leo's spontaneous utterances were greater than his imitations, this trend continues for all the transcriptions. Although the first transcription for all the languages took place when Leo was 1;7, he produced an exceptionally large amount of speech in Cantonese compared to the other two languages, especially spontaneous utterances. By 2;3 all three languages had similar amounts of produced utterances, with his Mandarin spontaneous speech exceptionally high (Table 2; Figure 2).

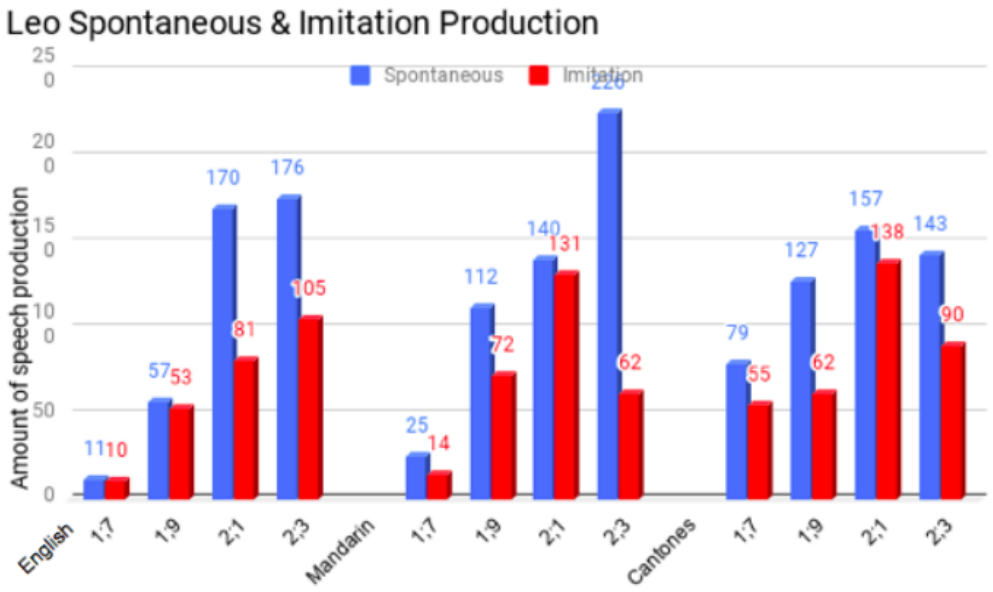

Figure 2

Leo's Age	Spontaneous	Imitation	Total Utterances
English transcriptions			
1;7	11	10	21
1;9	57	53	110
2;1	170	81	251
2;3	176	105	281
Total:	414	249	663
Mandarin transcriptions			
1;7	25	14	39
1;9	112	72	184
2;1	140	131	271
2;3	226	62	288
Total:	503	279	782
Cantonese transcriptions			
1;7	79	55	134
1;9	127	62	189
2;1	157	138	295
2;3	143	90	233
Total:	506	345	851

Table 2

According to our spontaneous and imitation coding scheme, in total, Leo produced 851, 782, 663 utterances in Cantonese, Mandarin, and English respectively (Figure 3). If we break down these total amounts into spontaneous and imitations, we find that Leo spontaneously produced the most speech in Cantonese (506 times), in Mandarin (503 times), and least amount in English (414 times). Leo's imitated speech was far less than his spontaneous utterances for all three languages: Cantonese (345 times), Mandarin (279 times), and English (249 times).

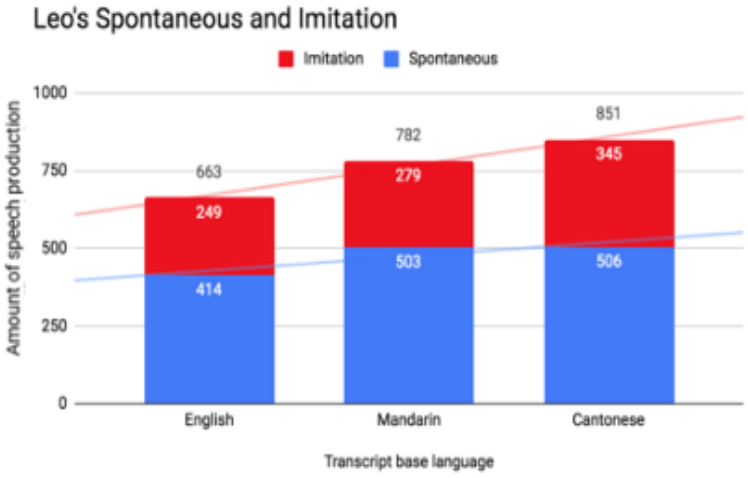

Figure 3

We compare Leo's spontaneous and imitated speech to his Mean Length of Utterance (MLU), which is a commonly used measure of children's language development (Yip & Matthews, 2016; Comeau et al., 2003). Researchers utilize MLU to demonstrate children's language abilities, as longer utterances point to more complex language capabilities. Figure 4 (see Appendix) shows Leo's MLU, borrowed from Mai and Yip's (under review) article about Leo, thus it includes Leo's MLU from other ages. The upward trend in both Figure 2, 3 and 4 across transcripts and languages demonstrate Leo's increasingly stronger language capabilities. Leo's MLU results show that his linguistic abilities across the languages were similar at age 1;7 and 1;9, but at 2;1 and 2;3 his MLU for English was lower than the other two languages. According to our coding system, there was already a discrepancy in the amount of produced speech between the three languages at age 1;7, but was at more similar rates by 2;1 and 2;3. Cantonese maintained the greatest amount of produced speech until 2;3 when Mandarin surpassed. Although different stories are depicted by these measurements, both show that Leo's language abilities were smoothly developing in all three languages across time.

Leo: Total Code Mixing and Code Switching

In general, across the transcripts and languages, Leo does not code mix or switch a large amount. In total, out of the 12 transcriptions across three languages, Leo only code mixes and switches 210 utterances. During Cantonese transcripts, Leo code mixed and switched the most into English with 43 times and 23 times into Mandarin (Figure 5). In Mandarin transcripts, Leo code mixed and switched into English and Cantonese both 39 times. Last, in English transcriptions, Leo code mixed and switched into Mandarin at a low rate of 13 utterances, whereas Cantonese was high with 53 utterances.

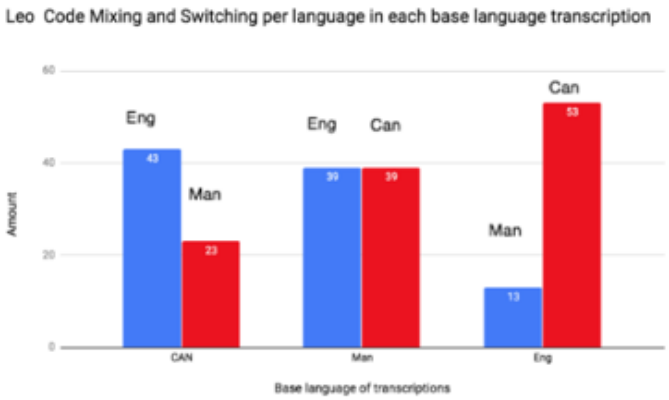

Figure 5

Based on this, in total, Mandarin was code mixed and switched into the least at 36 times, English had 82 productions, and Cantonese with 92 times (Figure 6).

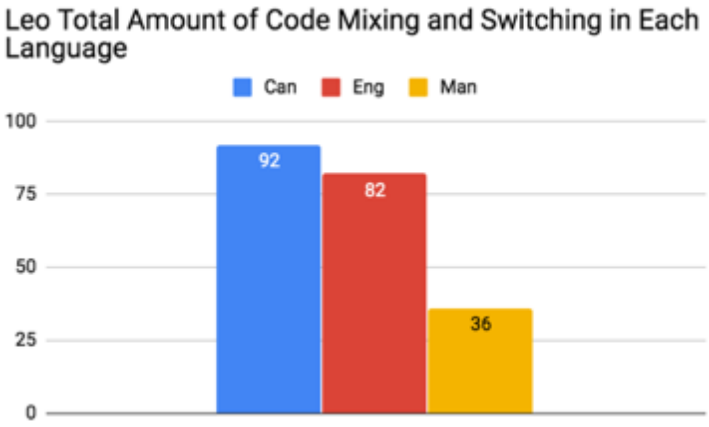

Figure 6

Leo and Interlocutor: Comparison of Code Mixing and Code Switching Tendencies

As the literature review above demonstrates, parental input is important not only in influencing a child's overall language development, but especially their code mixing and switching tendencies. Thus, to better understand Leo's patterns, examining how related his code mixing and switching is related to his parents and/or interlocutors in the transcriptions is crucial. We find a different pattern of code mixing and switching among the three languages between Leo and the interlocutor. Leo mixes and switches out of English and Cantonese 66 instances and Mandarin 78 times (Figure 7). Whereas, the interlocutor mixes and switches the least out of English (31 times), then Mandarin (112 times), and the most in Cantonese (125 times;Figure 7). However, since Leo and the interlocutor produced drastically different amounts of total utterances, utilizing percentages allows us to understand these numbers in each language context.

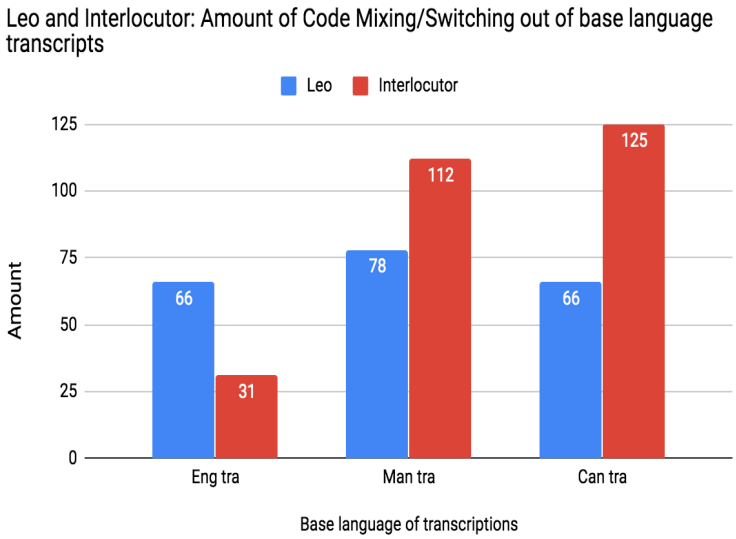

Figure 7

Regarding code mixing and switching out of the base language, Leo code mixed and switched the least out of Cantonese transcripts with 7.2%, Mandarin with 8.75%, and English with 9.05% of mixes and switches out of total produced utterances (Figure 8). The interlocutor code mixed and code switched out of English the least at 1.15%, Cantonese with 3.85%, and Mandarin with 5.59% (Figure 8).

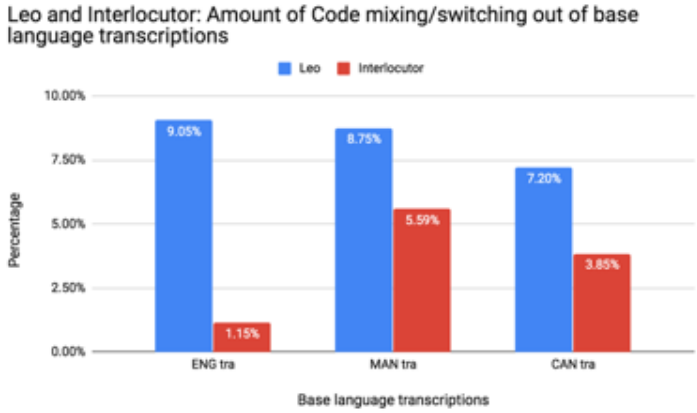

Figure 8

Unlike Figure 7 and 8 that describe Leo and the interlocutor's amount and percentage of code mixing and switching out of the base language, Figure 9 shows how much total

code mixing and switching is produced into each language. For Leo, Mandarin was code mixed and switched into the least at 36 times, English had 82 productions, and Cantonese with the greatest at 92 times. The interlocutor maintained the lowest amount of code mixing and switching into Mandarin (32 times), then Cantonese (63 times), and the largest was into English (173 times; Figure 9).

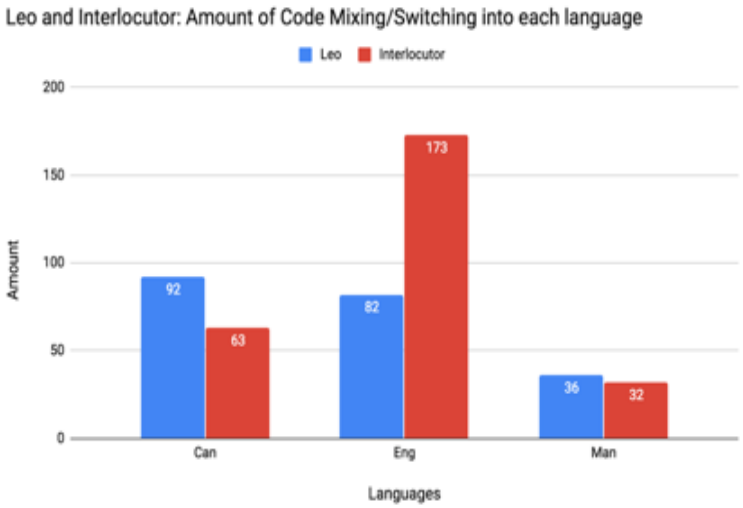

Figure 9

Leo and Interlocutor: Correlation tests

To understand the significance and meaning of the statistics presented above, two rounds of Pearson Correlation coefficient tests were calculated to examine the relationship between Leo and the interlocutor's rate of code mixing and switching. The first correlation compared Leo and the interlocutor's percentage of code mixing and switching that occurred within each transcription across the three languages (significance level of $p < .05$). The results demonstrated a strong positive relationship between the amounts of code mixing and switching between Leo and the interlocutor ($r(10) = .600$, $p = .039$). The second round of correlation tests we ran were to examine the relationship between Leo and the interlocutor's code mixing and switching amounts within each individual language (significance level of $p < .05$). The results demonstrated a strong positive relationship between the amount of code mixes and switches Leo and the interlocutor conducted into Mandarin and Cantonese during English transcriptions ($r(2) = .994$, $p = .006$) and also into English and Cantonese in Mandarin transcriptions ($r(2) = .993$, $p = .007$) . However for Cantonese ($r(2) = .297$, $p = .703$) no association between Leo and the interlocutor was found.

Leo: Code Mixing and Code Switching Coding Scheme

To further our qualitative analysis, we utilized our coding scheme to understand how Leo was code mixing and switching in all of the transcriptions across languages. In total, Leo code mixes and switches 210 times, and mostly code switched (167 times) with few mixes (42 times;Figure 10). Even more interesting, Leo is mainly spontaneously mixing (SM) and spontaneously switching (SS) with 180 such utterances. Of these 180 productions, Leo was the first to instigate 83 utterances (SS1) that had not been used in that transcript before. Out of all of Leo's code mixes and switches, he spontaneously switched (SS) the most (76 times), which accounted for 36.2% of all produced utterances in all of his transcriptions in all languages.

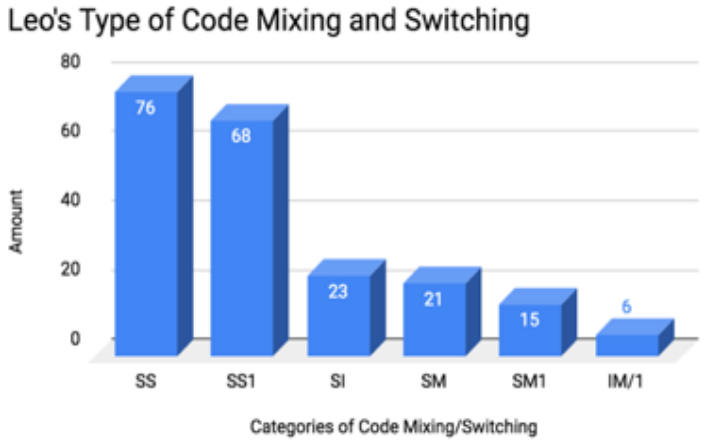

Figure 10

We furthered our analysis by examining the relationship between language and type of code mixing and switching Leo engages in. Figure 11 demonstrates that among all the codes, Leo produces the most spontaneous switches (SS;40 times) and SS1 (31 times) in Cantonese. For SS, English had the next largest amount (27 times), and SS was produced 9 times in Mandarin. Regarding SS1, Mandarin produced the second greatest amount with 19 utterances, with English following closely with 18 productions.

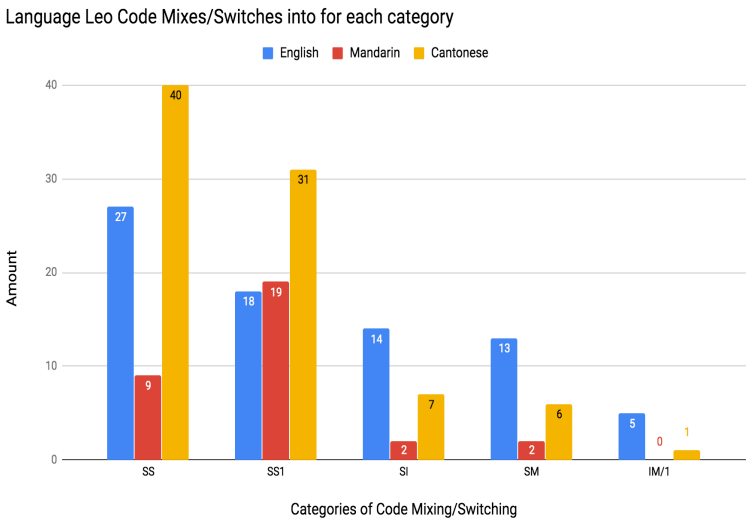

Figure 11

Experiment

Before beginning analysis of these twelve recordings, an experiment only for this study was conducted when Leo was 2;7, a year older than the first recording. This mini-experiment was conducted to evaluate how other sociolinguistic factors may impact Leo's mixing and switching tendencies. We specifically aimed to examine Leo's reaction to a sudden switch into another language, and especially how this switch may impact his code mixing and switching patterns. Three different RAs conducted one recording with Leo, 30-minutes long in duration, split into two 15-minute blocks. During the first 15-minute segment, the RA was asked to speak the most frequently used language they typically use with Leo. After 15 minutes of using that language, the RA was asked to spontaneously start speaking the least frequently used language they typically used with Leo.

Although we didn't transcribe this experiment section, we did tally up the total amount of utterances he produced for each recording. Leo produced the most speech in the three 15 minute English segments: 44, 58, and 68 total utterances. The next largest total amount was in Cantonese, with 29 and 32 total utterances (only two RAs spoke to Leo in Cantonese). Last, he only produced 22 lines in Mandarin (only 1 RA spoke to Leo in Mandarin).

During the three 30-minute recordings, there weren't many times that Leo code mixed and switched. Thus, there are only a couple examples, and each is only a phrase long. There were only two types of utterances that he switched into: "okay" and "奶奶" ("grandma" in Mandarin). More importantly, he only produced these code switches after the RA had first produced them.

The most fascinating aspect of this mini-experiment was observing Leo's reaction to the sudden switch in languages. Before doing this experiment, I predicted Leo would display some lag time between switching to the other languages, and to have higher rates of code mixing and switching. However, Leo had absolutely no lag time or reaction to the switch in languages, almost as if there was no change at all. This ability to switch from such different languages like, Cantonese to English, and Mandarin to English, without any reaction or lag time is remarkable and certainly points towards future avenues of research.

Discussion

Leo: Spontaneous and Imitation

Although our coding scheme and MLU

show Leo's language diverging at different times, they both show that in general, his language abilities were developing in all three languages across time. By the end of the transcriptions, there was no language extremely stronger than the others, suggesting that Leo is a relatively balanced simultaneous trilingual child.

Leo and Interlocutor: Code Mixing and Code Switching

When analyzing Leo and the interlocutor's patterns, examining the amount of code mixing and switching into and out of the languages provides a more holistic understanding of his tendencies. In general, both Leo and the interlocutor do not code mix and switch a large amount. Regarding code mixing and switching out of the languages, there isn't a distinct pattern seen between Leo and the interlocutor. Leo mixes and switches the most out of English, then Mandarin and last, Cantonese, percentage wise. However there wasn't a large discrepancy between the percentage amounts, they were all within 1-2% of the other languages. Whereas, the interlocutor code mixes and switches the most out of Mandarin, Cantonese, then English, percentage wise. Unlike Leo, there is a large discrepancy between the percentages, with Mandarin being code mixed and switched 4% more than English. Regarding code mixing and switching into these languages, there is a similar pattern between Leo and the interlocutor. Leo mixes and switches the most into Cantonese, then English and last Mandarin. The interlocutor mixes and switches the most into English, Cantonese, then Mandarin. For both Leo and the interlocutor, the amount of code mixes and switches into Mandarin was much less than the other two languages. To understand the underlying reasoning for such patterns, the following paragraphs will analyse the influence of parental input, language dominance, and sociolinguistic factors.

Language dominance

It is difficult to specifically determine Leo's language abilities at such a young age, but regardless using our spontaneous/imitated coding scheme or MLU, over time his language abilities were getting stronger. Another commonality found between both measurements was that at some point his English abilities were not as strong as his other languages. If language dominance is the factor completely influencing Leo, then he should be producing more mixes and switches much more out of his weakest language because he would need to rely on his other languages. Thus, we would expect to see Leo code mixing and switching much more out of English than for his other languages, and that he wouldn't mix and switch much into English during the other language transcripts. Although he does code mix and switch out of English the most, there is only a small discrepancy between English (9.05%) and Mandarin (8.75%), with Cantonese following closely behind (7.20%). Regarding the amount of mixing and switching into these languages Leo engages in, he mixes and switches the most into Cantonese with 92 times, English at 82 times, and much less into Mandarin 36 times. Leo's pattern in and out of these languages do not provide evidence that he is mixing and switching because of lack of language control.

Parental input

In most of the transcriptions, the interlocutor was a family member, thus examining the significance of the association between Leo and the interlocutor's code mixing and code witching tendencies may deepen our understanding of influence of parental input on such patterns. From the

descriptive statistics described in the Results section, there appears to be a similar pattern in amount of code mixing and switching between Leo and the interlocutor. To examine the significance of the relationship between Leo and the interlocutor, we conducted two rounds of Pearson correlation tests. The first tested the association between percentages of code mixing and switching of Leo and the interlocutor, which demonstrated a strong positive relationship. Regarding the second round of Pearson correlations, we examined how correlated Leo and the interlocutor's mixing and switching was for each specific language. The results showed a strong positive correlation between Leo and the interlocutor's mixing and switching amounts out of English, and Mandarin, but not for Cantonese. Thus there is not just an association between Leo and the interlocutor's general mixing and switching pattern, but also regarding the amount for each specific language. Although this doesn't provide causation, it strongly validates the relationship between Leo and the interlocutor, and specifically points to the role of parental input on children's code mixing and switching tendencies.

Sociolinguistic factors

The descriptive statistics and correlation tests presented above demonstrate a relationship between Leo and the interlocutor; however, not everything can be explained by the role of the interlocutor/parent. There are three main pieces of evidence that demonstrate sociolinguistic factors may play a role, in addition to parental input. First, Leo and the interlocutor's code mixing and switching for English and Mandarin transcripts were strongly positively correlated, but not for Cantonese. Second, Leo and the interlocutor both code mixed and switched the most into English or Cantonese, and both engaged in mixes and switches the least into Mandarin (36 and 32 times, respectively). Last, the results from our coding scheme indicate that Leo is engaging the most in SS and SS1 types of code mixing and switching, and specifically producing highest amounts of SS and SS1 in Cantonese. Leo's high production in SS and SS1 shows that he is not only spontaneously switching (SS) instead of simply imitating the interlocutor, he is also instigating new types of switches (SS1) in the transcriptions completely by himself. These reasons demonstrate that we need to examine other sociolinguistic factors, and specifically the relationship between base language, language being mixed and switched into, and type of mixing/switching. Moreover, there may be a unique aspect about Cantonese that enables such code mixing and switching. Based on HK's history, code mixing and switching is an extremely common phenomenon in Cantonese, typically adding English. Thus, with Leo and the interlocutor code mixing and switching the most into Cantonese, with English following, may speak to the linguistic and cultural normalisation of such behaviour. In general, code mixing and switching from Mandarin and into Mandarin is a less commonly observed phenomenon than the situation with Cantonese. Thus, it is not surprising that Leo and the interlocutor code mix and switch the least into Mandarin. Even at the young age of 2 years old, the linguistic and sociolinguistic perceptions appear to have some influence on Leo's code mixing and switching tendencies.

Experimental Design

This study predominantly utilized a naturalistic observation research design; however, an experimental component was also employed. In general, Leo code mixed and switched very minimally in these experimental recording sessions. Leo code switched only once into Mandarin, saying "

奶奶" but he did so several times for "okay" in Cantonese settings. In Cantonese, using terms like "okay" is especially normal in HK and is seen as part of the language, though it technically is an English term (Leung & Chan, 2016). The most impressive aspect of this experiment was that Leo switched into the language the interlocutor changed into very naturally, with no lag time between the changing of the languages. One way to interpret Leo's lack of reaction is that because he is a relatively balanced trilingual he is able to swiftly change into the other languages with no problem. It also may be because his daily environments consist of many languages, socializing him to smooth swiftly between languages.

Limitations and Future Directions

The findings from this study provide more evidence of the influence of parental input and sociolinguistic factors, thus it would be useful to collect more extensive data on these areas. Due to the nature of the variable of parental input, most studies have small sample sizes. Thus, a study with a larger sample size (such as N = 100) would allow us to gain more generalizable results and could conduct more statistical tests. In addition, much of the current research examines children at preschool ages and above. However, as this study has shown, we are able to study code mixing and switching in children as young as toddlers (1 - 3 years old). Examining as young a population as possible would provide us with a stronger foundation to better understand the code mixing and switching tendencies of preschoolers, adolescents, young adults, and other age groups.

The first half of this study employed a naturalistic observational approach, this qualitative design gives us a general snapshot of the child's code mixing and switching experience. Although this type of research design is essential to inform us on how to create more studies, it can't claim generalizability. Moreover, it doesn't allow us to manipulate a certain variable, which can help lead us to a specific answer about mixing and switching. Based on the findings of this study, employing more participants at a younger age utilizing an experimental design may be beneficial to pinpoint the specific sociolinguistic factors impacting speakers of these three languages. This may provide deeper understanding of code mixing and switching tendencies for such speakers, and also can help us understand mixing/switching in general. Another direction could be to study young children's reactions to a spontaneous language switch across vastly different languages in an experiment. Examining their reactions gives us the opportunity to see their natural instincts towards each of the languages, reactions of such switches, and perhaps underlying reasons for code mixing and switching.

Conclusion

This study has provided a foundation for other studies and experiments to further analyze these findings and interpretations. The employed naturalistic observational design can inform us of such code mixing and switching behaviors, which can enable us to run other types of studies, like the experiment conducted with Leo. It is suggested that more experimental designs are utilized to better understand code mixing and switching for different languages and age groups. In all, this study helped us better understand a two-year-old's trilingual experience with code mixing and switching, which can inform us of such tendencies and can help us create future experiments.

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Appendix

Table 1

Transcripts	Leo's age	English	Mandarin	Cantonese
1	1 year 7 months	2016.08.20	2016.08.21	2016.08.27
2	1 year 9 months	2016.10.30	2016.10.29	2016.10.29
3	2 year 1 month	2017.03.03	2017.02.25	2017.02.25
4	2 year 3 months	2017.04.30	2017.04.22	2017.05.07

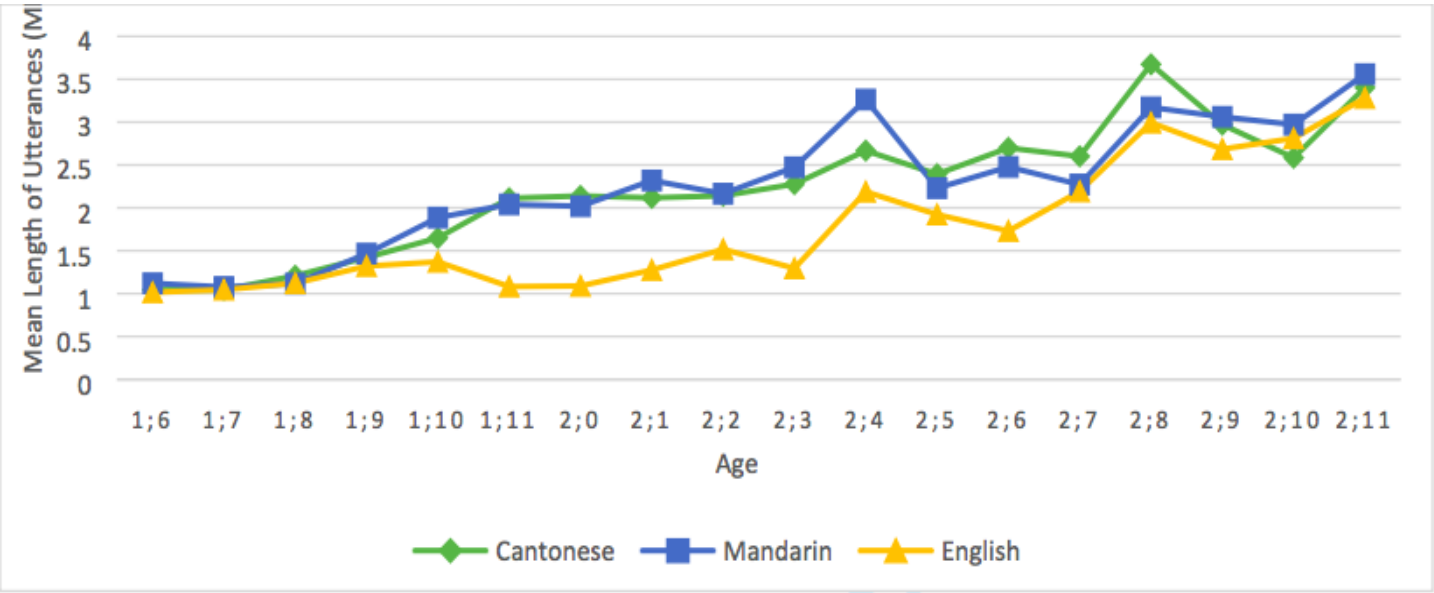

Figure 4: *Leo's MLU for the three languages. Reference: Mai, Z. & Yip, V. (under review) Trilingual first language acquisition: the Leo Corpus.

Response to Punctuation Differences in Text-Based Communications as a Function of Recipient Self-Esteem

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Previous research has shown that low self-esteem (LSE) individuals are more likely than high self-esteem (HSE) individuals to interpret ambiguous verbal cues as negative (Koch, 2002), and that text message recipients rely on punctuation to interpret the sender's emotions (Hancock, Landrigan, & Silver, 2007). This study explores whether individuals with LSE respond differently to different punctuation types within text-based communication, as compared to individuals with HSE. LSE individuals were expected to report lower state self-esteem and more negative feelings toward an interaction partner than HSE individuals after an unpunctuated conversation via online messaging. Both HSE and LSE individuals were expected to report high state self-esteem and positive feelings toward their partner after a conversation punctuated with exclamation points only. Additionally, both HSE and LSE individuals were expected to report lower state self-esteem and more negative feelings toward their partner after a conversation punctuated with periods only. The results indicated that there was a significant interaction between trait self-esteem and punctuation type in state self-esteem scores for LSE individuals. LSE individuals also reported significantly lower self-esteem after an unpunctuated conversation than HSE individuals. However, LSE individuals had significantly higher state self-esteem scores after a conversation punctuated with periods only rather than after a conversation punctuated with exclamation points only, or after a conversation with no punctuation.

Keywords: self-esteem, text messaging, punctuation, online messaging, technological communication

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Low Self-Esteem and Interpersonal Interactions

Trait self-esteem, or the stable characteristic of negative or positive self-evaluation that remains consistent over time, can affect how an individual responds to social cues in a myriad of ways. Individuals with low trait self-esteem (LSE) are extremely sensitive to potential rejection and can interpret ambiguous cues as negative (DeHart, Pelham, & Murray, 2004; Koch, 2002). People with LSE tend to pay more attention to possible rejection cues than people with high self-esteem (HSE). This potentially leads to self-isolation due to fear of rejection or attempts to make others like

and accept them (Nezlek, Kowalski, Leary, Blevins, & Holgate, 1997; DeHart et al. 2004; Schuetz, 1998). Koch (2002) found that LSE participants responded more quickly to rejection target words in a lexical decision task when primed with both rejection-related and ambiguous words in comparison to HSE participants. This finding suggests that LSE individuals associate ambiguous cues with rejection-related thoughts, while HSE individuals do not. People with LSE are more sensitive to and aware of potential rejection than those with HSE and are much more likely to expect rejection than acceptance in future interactions (Leary, Tambor, Terdal, & Downs, 1995).

While an individual's trait self-esteem can influence how they respond to or interpret situations, a situation itself can impact an individual's state self-esteem, or how they evaluate themselves at that moment. Research by Leary, Haupt, Strausser, and Chokel (1998) shows that both LSE and HSE individuals experience lower state self-esteem following rejection, and higher state self-esteem after an acceptance. However, people with LSE have a lower threshold for what constitutes rejection than people with HSE (Leary, Haupt, Strausser, & Chokel, 1998).

This heightened expectation of rejection can impact how an individual with LSE views herself in relation to others. For adolescents with low self-esteem, the perception of others' acceptance can more strongly influence their feelings of loneliness than how others actually perceive them (Van Halst, Luyckx, Scholte, Engels, & Gossens, 2013). Furthermore, those with LSE are less likely to want to interact with people who judge them harshly compared to those with HSE (Rudich, Sedikides, & Gregg, 2007) and will often withdraw from relationships with others as a preemptive measure to avoid future rejection (DeHart et al., 2004).

However, text-based online communications, an increasingly common method of interaction, lack many of the social cues present in face-to-face conversations. Considering this, researchers have demonstrated that punctuation is a useful cue for interpreting emotion in text messages and that different types of punctuation convey different emotions (Hancock, Landrigan, & Silver, 2007; Byron, 2008). In turn, people with LSE may rely on written cues like punctuation to provide context for interpreting a message they receive and, expecting rejection, place a high weight on any cues they interpret as negative.

The Role of Punctuation in Technological Communication

Due to the relative lack of cues in text-based technological communication compared to face-to-face communication, recipients of an online message may perceive the message as more negative than the sender intends. Byron (2008) wrote a paper on the miscommunication of emotion in emails, and dubbed this phenomenon the "Negativity Effect." This "Negativity Effect" could be due to the predominant use of periods in email messages, which may cause them to appear curt or insensitive. According to Gunraj, Drumm-Hewitt, Dashow, Updhyay, and Klin (2016), periods are a form of punctuation that text message viewers associate with the sender's insincerity. When given a booklet containing printed records of text messages, participants rated the sincerity of a recipient's response significantly lower if the responses ended in a period rather than with no punctuation at all. This perception of insincerity is bound to message format. Additionally, Gunraj et al. (2016) found that participants' likelihood to interpret a concluding period as indicative of an insincere sender disappeared when presented

with the same messages in a handwritten format. Their finding suggests that the presence of periods in handwritten notes may not provide any meaningful emotional cues, perhaps because concluding handwritten sentences with a period is standard. However, the use of periods to conclude a sentence in a text message may not be the norm and instead be an important interpretive cue.

Lack of punctuation in a text message may be a cue of its own. In their study of general punctuation trends in text messaging at a public university, Baron and Ling (2011) found that more than half of sentences sent over text message ended with no punctuation at all. The predominance of unpunctuated sentences suggests that a sentence without punctuation is more likely to be viewed as neutral by text message readers, while rarer sentences ending in a period are more likely to be viewed as negative, insincere, or unfriendly.

While periods could be interpreted as insincere and lack of punctuation could be interpreted as neutral, Hancock and colleagues (2007) identified that exclamation points indicate positive feeling in text messages. In their study, two participants engaged in a 30-minute online chat conversation. One participant was told either to act as though they were experiencing positive emotions or to act as though they were experiencing negative emotions, while the other participant was blind to this instruction. Participants who received the positive affect manipulation punctuated their sentences significantly more often than those in the negative affect condition, and the punctuation they used most frequently was exclamation points. In the same study, Hancock and colleagues (2007) found that recipients of a text message tend to utilize punctuation as a tool to understand the emotions of the sender. The uninformed participants were able to identify the other participant's assigned emotion to a significant degree, suggesting that these participants used the other participants' punctuation patterns to interpret their mood accurately. This finding further supports the theory that punctuation operates as a contextual cue in text-based technological communication.

Though extensive research has been conducted on how LSE individuals react differently than HSE individuals to neutral or ambiguous verbal cues, research has not been extended to technological communication. The research on technological communication suggests that punctuation plays a crucial role in how individuals interpret electronic messages; perhaps punctuation type may affect individuals possessing varying levels of self-esteem differently. The present study attempts to fill the gap in the current research by examining the effects of punctuation type within online text-based messages upon LSE and HSE individuals. Specifically, we aim to explore whether the punctuation type found in incoming messages impacts an individual's state self-esteem differently based on their trait self-esteem. We also hope to ascertain whether a recipient's perceptions of an online message sender are affected by the punctuation type used as a function of the recipient's trait self-esteem.

In this study, we examine whether LSE participants differ from HSE participants in their response to differently punctuated online messages, based on their positive or negative interpretation of the punctuation type used. We hypothesize that when presented with no punctuation in an online chat message from a co-participant, individuals with LSE will be more likely to report negative self-feelings and a lower interest in continued interaction with the co-participant than participants with HSE, as would follow from Koch's (2002) research. After an online text-based conversation

including exclamation points only, both HSE and LSE participants are expected to report positive self-feelings and a high interest in continued interaction with the co-participant. Finally, after a conversation including only periods, both HSE and LSE participants will be expected to report negative self-feelings and a low interest in continued interaction.

Methods

Participants

The participants in this study were 65 college students from the general Hillsdale College population who volunteered to participate. Participants were recruited through flyers, announcements in Introduction to Psychology classes, and word of mouth. Five participants completed the online questionnaire but did not complete the lab assessment, leaving a total of 60 participants. The participants' ages ranged from 18-28 (M = 20, SD = 2). 77 percent of participants were female (SD = .43), 97 percent of participants were Caucasian (.28), 1.5 percent of participants were African American, and 1.5 percent of participants were Asian. The participants were separated into two groups: 30 participants with high self-esteem (HSE) and 31 participants with low self-esteem (LSE) as determined by the Rosenberg Self-Esteem Scale. The Rosenberg Self-Esteem Scale (1965) was administered with an online questionnaire emailed to the participants before they completed the lab portion of the study. Participants scoring 18/30 or lower on the Rosenberg Self-Esteem Scale were classified as LSE. The participants were further divided into six groups of ten participants each, with LSE and HSE participants randomly assigned with an Excel formula to one of three conditions: 1. conversation with no punctuation, 2. conversation punctuated with exclamation points dominantly, and 3. conversation punctuated with periods dominantly. In each condition, two out of the three sentences in each scripted response phrase were punctuated with the target punctuation. To prevent the conversation from looking unrealistic, the remaining sentence was left unpunctuated.

Materials

The Rosenberg Self-Esteem Scale and the Downey and Feldman 8-item Rejection Sensitivity Questionnaire were administered in the online questionnaire. Distraction materials were administered in the lab before the scripted conversation took place. Scripted questions and answers were used during the online conversation with the participant. The State Self-Esteem Scale, the Single Item Self-Esteem Scale, the Interaction Partner Feeling scale, and the Continued Interaction scale were administered in the lab following the conversation (See Appendix A for sample items). All materials are explained in greater detail below.

Rosenberg Self-Esteem Scale

We used the Rosenberg Self-Esteem Scale to separate participants by trait self-esteem (TSE) into LSE or HSE groups (Rosenberg 1965). The scale contains 10 items (e.g "I certainly feel useless at times") scored on a four-point Likert scale, ranging from 0 = strongly agree to 3 = strongly disagree.

Downey and Feldman 8-item Rejection Sensitivity Questionnaire

The Downey and Feldman Rejection Sensitivity Questionnaire measures rejection sensitivity (Downey & Feldman, 1996). This scale was included for exploratory purposes, and the data from this measure was not used in the later part of the experiment or evaluated. The scale contains eight items with each item containing two sub-items,

scored on a six-point Likert scale, ranging from 1 = very unconcerned to 6 = very concerned for the first sub-item and ranging from 1 = very unlikely to six = very likely for the second sub-item.

Distraction Materials

To obscure the intent of the study, we included a seven-question adaptation of the Myers-Briggs Type Indicator (Briggs & Briggs-Myers, 2015). The data was not evaluated. The scale was scored on a five-point Likert scale, ranging from 1 = not at all to 7 = extremely. Three open-ended personal questions were also administered to obscure the purpose of the study; data from this measure was also not evaluated.

Scripted questions and scripted answers

Seven questions adapted from the small-talk condition of Aron, Melinat, Aron, Vallone, and Bator's 1997 study, "The Experimental Generation of Interpersonal Closeness," were given to participants to send to their interaction partner via online messaging over Google Chat. Seven answers to the previously mentioned questions, composed of three phrases each, were created for this study to send to the participants. These answers were punctuated differently based on the participant's experimental group. (See Appendix B for all scripted questions and answers).

State Self-Esteem Scale

To evaluate participants' feelings about themselves after the conversation, we measured state self-esteem with Heatherton and Polivy's State Self-Esteem Scale (1991). The scale contains 20 items evaluating three components of self-esteem at the current moment (performance, social, and appearance) scored on a five-point Likert scale ranging from 1 = not at all to 5 = extremely.

Interaction Partner Feeling Scale

To provide an indication of how participants perceived their interaction partner after conversing, participants evaluated their interaction partner. They did this by rating how much certain negative or positive adjectives applied to their partner when placed in the sentence: "I feel that my interaction partner was ____ to me." The scale contains seven items scored on a five-point Likert scale ranging from 1 = not at all to 5 = extremely.

Continued Interaction Scale

A participant's desire to continue interacting with their interaction partner was evaluated with a seven-point Likert scale answering the question: "Would you like to continue interacting with this partner for the next part of the experiment?" The scale ranged from 1 = not at all to 7 = very much.

Single Item Self-Esteem Scale

To further evaluate state self-esteem, a modified version of the Single Item Self-Esteem Scale was used (Robins, Hendin, & Trzesniewski, 2001), and to verify the results of the State Self-Esteem Scale. The scale contains one item scored on a five-point Likert scale, ranging from 1 = not very true of me to 5 = very true of me.

Procedures

The experiment consisted of a 2x3 between-subjects design. The independent variable was the type of punctuation used in conversation with the additional quasi-independent variable of participant trait self-esteem. The dependent variables were the participants' post-conversation self-feeling, state self-esteem, and the participants' evaluation of and willingness to continue interacting with their conversation partner.

Participants were separated into LSE and HSE groups based on their answers to the

Rosenberg Self-Esteem Scale measuring trait self-esteem (TSE). LSE participants scored 18 or lower on the RSES, while HSE participants scored 19 or higher. A score of 15 or lower on the RSES indicates problematically low self-esteem, while a score of 25 or higher indicates unusually high self-esteem. The researchers chose to increase the cut-off point for LSE to a score of 18 to capture participants who had relatively low self-esteem as well. Punctuation groups were randomly assigned for HSE and LSE participants. Based on punctuation group, participants were sent scripted online messages concluding with either exclamation points, periods, or no punctuation at all.

During the laboratory session, participants were told that they were participating in a study about the effects of one-way interactions on perceived closeness as compared to two-way interactions. All participants were told that they were in the one-way condition and that they would be given a set of scripted questions to ask an anonymous interaction partner. This was necessary to justify why participants needed to ask pre-written questions and to ensure the consistency of each online conversation. Participants were guided to a private lab room with a computer and provided with a personal profile to complete consisting of the shortened Myers-Briggs test and the open-ended personal questions. This was done under the pretense of matching scripted questions to them based on their personality.

After completing the personal profile, participants were given the scripted question sheet and instructed to log on to a Gmail account. They were then asked to wait for their interaction partner to contact them via Google Chat. Furthermore, participants were instructed to interact with their partner only using the scripted questions, and, once they were finished asking the questions, to log out of the account after saying goodbye. After giving these instructions, the experimenter logged onto a separate Gmail account and greeted the participant. Using the scripted answer sheet, the experimenter answered the scripted questions the participant asked with the punctuation type dictated by the participant's experimental group. The participant said goodbye after answering all the scripted questions; and the experimenter responded with the word "Bye" along with the punctuation method of the participant's group, before logging out of the account. Finally, the participant was given a post-experiment questionnaire that contained the State Self-Esteem Scale, the Interaction Partner Feeling scale, the Continued Interaction scale, and the Single Item Self-Esteem Scale. The laboratory session took 30 minutes to complete.

Results

When presented with no punctuation in a text message from a co-participant, individuals with LSE were expected to report more negative self-feeling and a lower interest in continued interaction with the co-participant than participants with HSE. Furthermore, after a text-based conversation including exclamation points dominantly, both HSE and LSE participants were expected to report positive self-feeling and a high interest in continued interaction with the co-participant. Finally, after a conversation including mostly periods, both HSE and LSE participants were expected to report negative self-feeling and a low interest in continued interaction. The hypothesis was tested using a 2x3 between-subjects ANOVA, with separate analyses conducted for each target variable. A two-way ANOVA tests whether two factors have significant separate or uniquely combined effects on another variable. Specifically, we chose a two-way ANOVA to evaluate whether state self-

esteem post-conversation varied significantly due to an interaction between trait self-esteem and our three punctuation manipulations.

State Self-Esteem

To assess state self-esteem after the online conversation, a two-way between-subjects ANOVA was conducted to evaluate State Self-Esteem (SSE) as a function of TSE and the punctuation group, $F(2, 58) = 5.98$, $p < .01$. The main effect of punctuation indicated a significant impact of punctuation group on state self-esteem, $F(2, 58) = 15.96$, $p < .001$, between the LSE ($M = 3.32$, $SE = .085$) and HSE ($M = 4.08$, $SE = .087$) groups. Trait self-esteem also had a significant main effect on post-conversation self-esteem, $F(1, 59) = 37.78$, $p < .001$, and the main effects of state self-esteem and punctuation conditions were qualified by an interaction (Fig. 1). A one-way ANOVA was conducted for both the LSE and HSE groups to clarify the interaction between punctuation group and trait self-esteem, and identified a significant difference between punctuation groups in the LSE, $F(2,28) = 13.95$, $p < .001$, and HSE, $F(2, 27) = 3.66$, $p < .05$, conditions, supporting our hypothesis.

The mean difference between the exclamation, period, and no punctuation groups was evaluated with multiple comparisons at each level of TSE. Within the LSE group, the SSE score for the exclamation group ($M = 2.80$, $SD = .63$) was significantly lower than the period group ($M = 4.06$, $SD = .53$), $t = 5.12$, $p < .001$, contradicting the hypothesis that SSE score would be significantly higher for LSE participants in the exclamation group as compared to other punctuation groups. The SSE score for the no punctuation group ($M = 3.12$, $SD = .52$) was also significantly lower than the period group, $t = 3.75$, $p < .005$, indicating that, contrary to the hypothesis, LSE participants had higher SSE following a conversation punctuated with periods than with no punctuation at all. LSE participants did not react differently to use of exclamation points than to lack of punctuation use, $t = 1.28$, $p > .05$.

For HSE participants, the exclamation group ($M = 3.84$, $SD = .24$) reported significantly lower SSE post-conversation than the period group ($M = 4.23$, $SD = .33$), $t = 2.66$, $p < .05$, again contradicting the hypothesis that SSE would be highest for all participants assigned to the exclamation group. The HSE no punctuation group did not report significantly different scores than the period group, $t = .78$, $p > .05$, and the same was true of the comparison of the exclamation and no punctuation groups, $t = 1.94$, $p > .05$, as hypothesized. See Table 1 for all means and standard deviations by TSE and punctuation group. Post hoc analyses were conducted with a Bonferroni adjustment to control for type one error rate, ensuring that the null hypothesis was not wrongfully rejected.

Independent samples t-tests were conducted for HSE and LSE at each level of punctuation to ascertain whether self-esteem mean scores differed significantly between HSE and LSE participants. HSE participants reported significantly higher levels of state self-esteem than LSE participants in the exclamation condition, $t(13.51) = -5.05$, $p < .001$, and in the no punctuation condition, $t(15.39) = -5.25$, $p < .001$, supporting the hypothesis. However, HSE and LSE participants did not report significantly different state self-esteem following the period condition $t(14.99) = -.91$, $p > .05$, demonstrating that both HSE and LSE participants reacted in a similarly positive manner to the use of periods. Equal variances were not assumed, and α was adjusted to accommodate the three comparisons made.

Single Item Self-Esteem

We conducted an additional evaluation of state self-esteem to evaluate in comparison to the SSE measure. Responses to the Single Item Self-Esteem scale (SISE) were evaluated by a two-way between-subjects ANOVA as a function of TSE and punctuation group, $F(2, 58) = 2.26$, $p > .05$. Punctuation group did not display a significant main effect on single item self-esteem score for the LSE ($M = 4.49$, $SE = .21$) and HSE ($M = 5.97$, $SE = .22$) groups, $F(2, 58) = 2.32$, $p > .05$. However, TSE demonstrated a significant main effect on SISE score, $F(1, 59) = 22.7$, $p < .001$, and the main effects of single item self-esteem and punctuation conditions were qualified by an interaction (Fig. 2). To clarify the interaction between punctuation group and self-esteem, one-way ANOVA was conducted for both the LSE and HSE groups. The ANOVA identified a marginally significant difference between punctuation groups in the LSE condition, $F(2, 28) = 3.17$, $p = .057$, and no significant difference between punctuation groups in the HSE condition, $F(2, 27) = 1.12$, $p > .05$.

Multiple comparisons were used to evaluate the mean difference between levels of punctuation at each level of TSE and indicated no significant influences of punctuation on SISE score other than between the LSE exclamation and LSE period groups. Within the LSE group, SISE scores in the exclamation group ($M = 3.73$, $SD = 1.68$) were marginally lower than the period group ($M = 5.20$, $SD = 1.14$), $t = 2.52$, $p = .053$, contradicting the hypothesis that exclamation use would result in higher state self-esteem, but confirming the results of the SSE analyses. However, SISE scores in the no punctuation group were not significantly different from the period group, $t = 1.34$, $p > .05$. The same was true of the comparison of the no punctuation and exclamation conditions, $t = 1.15$, $p > .05$, indicating that LSE participants did not experience lower state self-esteem following an unpunctuated conversation as hypothesized.

Within the HSE group, none of the punctuation conditions differed significantly on the SISE measure. The exclamation condition was not significantly different from the period condition, $t = .13$, $p > .05$, nor was the no punctuation condition from the period condition, $t = 1.38$, $p > .05$, nor the no punctuation condition from the exclamation condition up, $t = 1.14$, $p > .05$. All post hoc analyses were conducted with a Bonferroni adjustment to control for type one error rate.

Independent samples t-tests conducted for HSE and LSE at each level of punctuation revealed that HSE and LSE participants reported no significant difference in SISE following period-punctuated conversations. Excepting the period condition, $t(18.90) = -1.23$, $p > .01$, HSE participants reported significantly higher levels of state self-esteem than LSE participants in both the exclamation condition, $t(15.41) = -3.67$, $p < .017$), and the no punctuation condition, $t(14.88) = -4.96$, $p < .001$). Equal variances were not assumed, and α was adjusted to accommodate the comparisons made.

Interaction Partner Feeling

To assess how participants felt about their interaction partner after their online conversation, a two-way ANOVA was conducted to evaluate responses to the Interaction Partner Feeling scale (IPF) as a function of TSE and punctuation group, $F(2, 58) = .09$, $p > .05$. This measure was gathered as it is important to identify whether participants experienced negative feelings about their interaction partner in conjunction with any negative feelings about themselves. A main effect of TSE on interaction partner feeling was found, $F(1, 59) = 4.38$, $p < .05$, and punctuation group had a significant main

effect on interaction partner feeling for the LSE ($M = 3.68$, $SE = .10$) and HSE ($M = 3.99$, $SE = .11$) groups, $F(2, 58) = 4.13$, $p < .05$, supporting the idea that hypothesis that TSE would influence how participants perceived their conversation partner.

However, the main effects of interaction partner feeling and punctuation conditions were not qualified by an interaction (Fig. 3), and the main effects of punctuation type were not confirmed by a one-way ANOVA conducted for both the LSE and HSE groups. The ANOVA did not identify a significant difference in IPF scores between the exclamation, no punctuation, or period groups in the LSE condition, $F(2, 28) = 2.03$, $p > .05$, contradicting the idea that IPF would vary based on punctuation type used. In the HSE condition, the ANOVA also did not identify a significant difference in IPF scores between the exclamation, no punctuation, or period groups, $F(2, 27) = 1.97$, $p > .05$.

Continued Interaction

Researchers administered the Continued Interaction (CI) scale to assess whether participants would like to continue interacting with their online conversation partner. Responses to the CI scale were evaluated with a two-way ANOVA as a function of TSE and punctuation group, $F(2, 58) = .9$, $p > .05$. TSE did not have a significant main effect on CI score, $F(1, 59) = 1.43$, $p > .05$, though a main effect of punctuation group on CI was identified for the LSE ($M = 3.68$, $SE = .26$) and HSE ($M = 3.99$, $SE = .27$) groups, $F(2, 58) = 3.4$, $p < .05$.

A One-Way ANOVA was conducted to clarify the main effect of punctuation group on CI, but the ANOVA did not identify a significant difference in CI scores between exclamation, no punctuation, and period groups in the LSE condition, $F(2, 28) = .76$, $p > .05$, or between CI scores in the exclamation, no punctuation, and period groups in the HSE condition, $F(2, 27) = 3.09$, $p > .05$, opposing the hypothesis that punctuation type used would affect participant desire to interact with their conversation partner based on participant TSE. The main effects of the continued interaction scale and punctuation conditions were not qualified by an interaction (Fig. 4).

Discussion

Following the hypothesized pattern, LSE participants had significantly lower state self-esteem (SSE) and single item self-esteem (SISE) scores than HSE participants after interacting with a partner who used no punctuation. However, the self-esteem scores in the exclamation and period conditions contradicted our hypothesis, with both LSE and HSE participants reporting the highest SSE scores in the period condition, and with LSE participants reporting significantly lower SSE scores than HSE participants in the exclamation condition. These results indicate that use of an exclamation point in an online conversation may cause recipients to experience lower self-esteem after the conversation. Experiencing a negative mood can promote recall of other negative events, especially for individuals with LSE (Smith & Petty, 1995). After engaging in a conversation with predominantly exclamation points, a person could find the decrease in state self-esteem affecting their mood and judgement negatively throughout the day. Conversely, the use of periods in online conversation may have a positive influence on recipient self-esteem, regardless of trait self-esteem. The increase in positive self-feeling may help individuals to remember other positive events, improving their mood and prosocial behavior.

Our analyses revealed a significant interaction between trait self-esteem and punctuation type for the SSE measure. LSE

participants displayed significantly lower state self-esteem in the exclamation and no punctuation conditions than LSE participants in the period condition, and HSE participants had significantly lower SSE in the exclamation condition than in the period condition. This implies that LSE individuals' self-esteem may be affected more negatively by the use of exclamation points or no punctuation in online conversations and affected more positively by the use of periods. Similarly, HSE individuals' self-esteem may either decrease when engaging with an online conversation punctuated with exclamation points or increase if the conversation is punctuated with periods.

Though the results of the single item self-esteem measure (SISE) did not display a significant interaction between punctuation type and TSE score, the post-hoc tests confirm the results of the SSE. Furthermore, LSE participants in both the exclamation condition and the no punctuation condition had significantly lower SSE and SISE scores than participants in the HSE group. This meant that the use of both of these punctuation types may especially impact the self-esteem of LSE participants, as hypothesized for the no punctuation condition but not for the exclamation condition.

Participants' feelings about their interaction partner and continued interaction with that partner were not significantly influenced by participants' self-esteem or the manipulation, implying that trait self-esteem may not affect an individual's desire to interact with someone, regardless of punctuation type used. However, punctuation type had a significant main effect on participants' feelings about their interaction partner and whether they wished to continue interacting with that partner: namely, participants described their interaction partner most negatively after a conversation with periods only, and they described their interaction partner most positively after a conversation with exclamation points only. Trait self-esteem also had a significant main effect on how the interaction partner feels, indicating that HSE individuals may be more likely to perceive their interaction partner as positive and accepting than LSE individuals. These main effects supported our hypothesis, though no significant differences between punctuation groups were identified.

The results of this experiment imply, at least to some extent, that our perceptions of punctuation in online and/or text messaging are misleading. Though exclamation points have been demonstrated to indicate positive feeling in text-based electronic communication, and perception of others' acceptance is extremely important to LSE individuals. LSE participants in our study reported significantly lower SSE after talking to a partner who only utilized exclamation points (Van Halst et al., 2013, Hancock, Landrigan, & Silver, 2007). Perhaps the enthusiasm conveyed by an overused exclamation point imparts more insincerity than a neutral cue, like no punctuation whatsoever. Our research supports Baron and Ling's (2011) research that suggests lack of punctuation can be interpreted as a neutral cue: LSE and HSE participants reported significantly different SSE after non-punctuated conversations, demonstrating that LSE individuals may interpret lack of punctuation more negatively than HSE individuals as hypothesized.

Byron's (2008) period-related "Negativity Effect" did not manifest in this experiment; both LSE and HSE participants reported the highest SSE after interacting with a partner who punctuated with periods only. Use of periods did not make the interaction partner appear insincere, as posited by Gunraj et al. (2016), neither HSE or LSE participants attributed any significant negative qualities to their interaction partner

in the period condition. The positive effects of period use on SSE transcended trait self-esteem; LSE and HSE participants did not differ significantly in SSE after a conversation punctuated with periods only.

Thus, periods may signify a person's sincere interest in whomever they are talking to, especially when coupled with personal disclosure as in this experiment. People who use text or online messaging may consider using periods to end their long, more detailed sentences while saving the exclamation mark for sentences that truly deserve the emphasis. Likewise, electronic message recipients should be aware of how their self-esteem may impact the way they interpret cues in a message and be mindful of the cues they may send in return. Future research in this area could clarify whether other text-based cues, such as other punctuation type and emojis or emoticons, impact message interpretation or the recipient's perception of the message sender.

Limitations

There were several limitations to the study. The sample size was small and lacked diversity in age and cultural background, as it only consisted of college students attending the same university. Participants also volunteered to participate, so the sample was not randomly selected from the university population as a whole. Furthermore, due to limited sample size, we were unable to compare participants with very low trait self-esteem per the RSE (score 15 or below) to participants with very high self-esteem (score 20 or above) and instead split the sample down the middle with a score of 18 as our cut-off point.

Additionally, one reason why some of our results did not support current research is that the scripted answers may have been too long and detailed. This could have nullified any negative effects a period would have provided and attenuated the affirming effects of an exclamation point. If the interaction partner seemed very interested in the participant due to their involved answers to the script questions, the participant would be unlikely to describe their partner as cold or uninterested in talking to them. A better method for future research would be to ask participants scripted questions, and respond to their answers with punctuation-manipulated short phrases such as, "Okay" or, "That's good." This approach would eliminate the need for a detailed script and would allow the punctuation to conclude a shorter phrase.

Conclusion

Based on prior research, we expected participants with HSE to report more positive self-feelings than LSE participants following an online chat conversation with no punctuation. Additionally, we expected HSE and LSE participants to report high levels of positive self-feeling following a conversation punctuated with exclamation points only, and significantly lower positive self-feeling after a conversation punctuated with periods only. Though our study supported previous hypotheses on lack of punctuation, our findings contradicted current literature on the use of exclamation points and periods. Both HSE and LSE participants reported significantly lower state self-esteem following an online chat conversation punctuated with exclamation points only, and significantly higher state self-esteem following a conversation punctuated with periods only. Desire for continued interaction, as well as feeling toward one's interaction partner, did not vary by self-esteem, but the main effects of punctuation supported our hypothesis. Thus participants described their partner more positively when the conversation was punctuated with exclamation points, and more negatively when the conversation was punctuated with

periods.

As text-based electronic communication has become an integral part of many peoples' lives, the emotional and esteem effects of online or text messaging is a relevant area for further research. Further research with a more diverse sample should be conducted to determine whether sentence length and amount of disclosure impact the effects of punctuation used, and to support our findings related to usage of periods and exclamation points in online messaging. For example, a message recipient's age may impact how they interpret the punctuation used. Additionally, future research could examine how other types of punctuation, such as the ellipsis or text-based images like emojis or emoticons, impact the interpretation of online or text messages. Use of "textspeak" and acronyms, like "brb" or "k," in electronic messages may also have an impact on recipient self-esteem: Fullwood and colleagues (2015) found that the use of textspeak in online bios impacts how readers perceive the author. Writers who used textspeak were perceived to have lower levels of self-esteem than writers who used a more formal writing style, and were perceived to be less conscientious and less open. Research exploring whether the use of textspeak in an electronically mediated message affects the recipient's self-esteem or emotions, in addition to how they feel about the sender, would bring more clarity to this research area.

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Tables

Table 1: *Means and Standard Deviations on all Measures by Punctuation Group and TSE*

	Exclamation				Period				No Punctuation			
	LSE		HSE		LSE		HSE		LSE		HSE	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
SSE	2.80	.63	3.84	.24	4.06	.53	4.23	.33	3.12	.52	4.13	.34
SISE	3.73	1.68	5.88	.84	5.20	1.14	5.82	1.17	4.40	1.08	6.36	.67
IPF	4.01	.50	4.21	.44	3.49	.75	3.87	.34	3.61	.62	3.83	.17
CI	5.82	1.60	6.38	.92	5.20	1.62	4.91	1.14	5.00	1.56	5.55	1.57

Figures

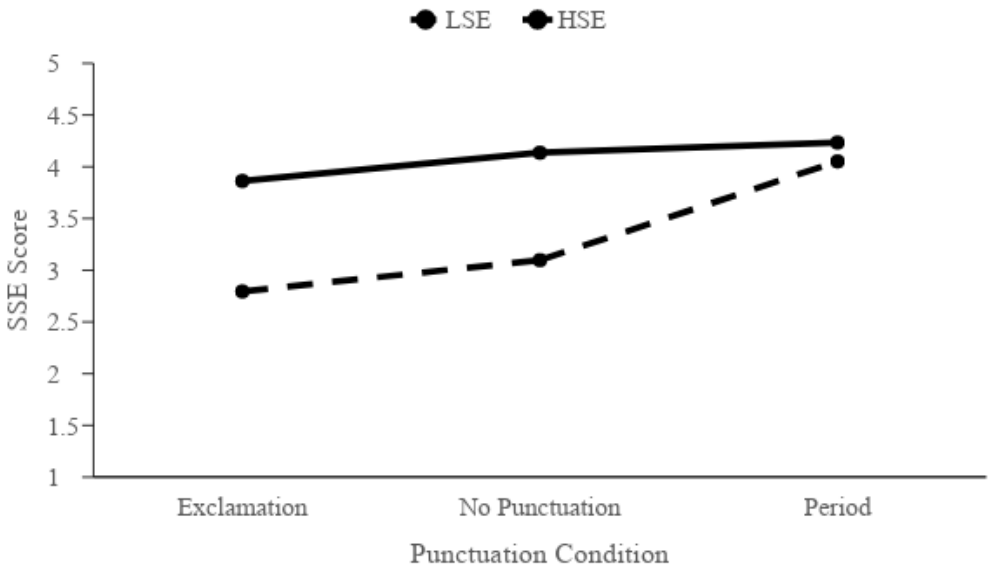

Figure 1. Estimated marginal means for state self-esteem by punctuation condition.

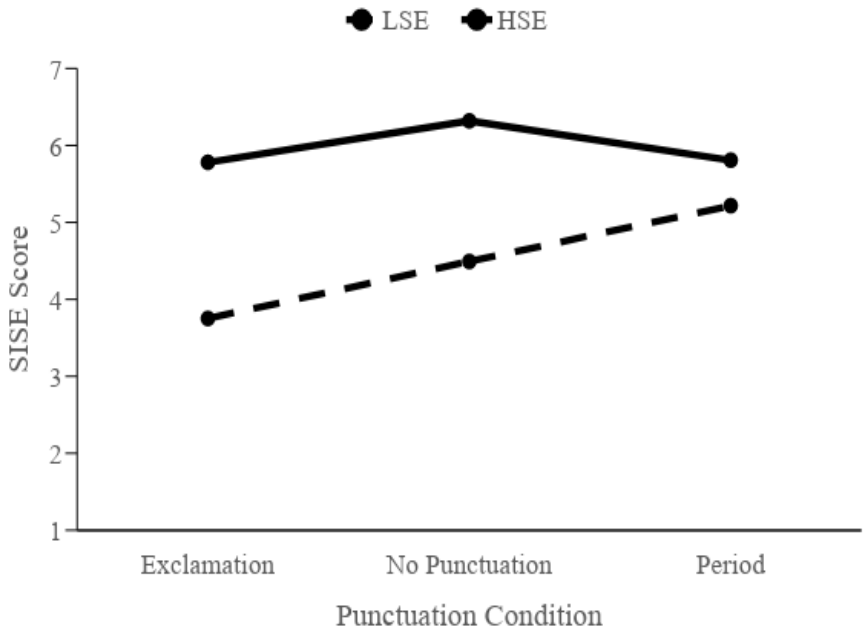

Figure 2. Estimated marginal means for single item self-esteem by punctuation condition.

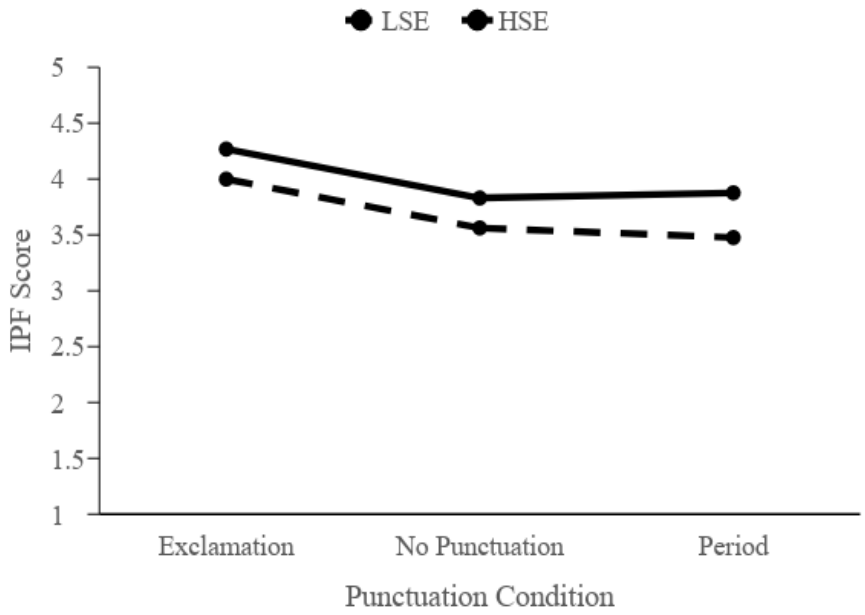

Figure 3. Estimated marginal means for interaction partner feeling by punctuation condition.

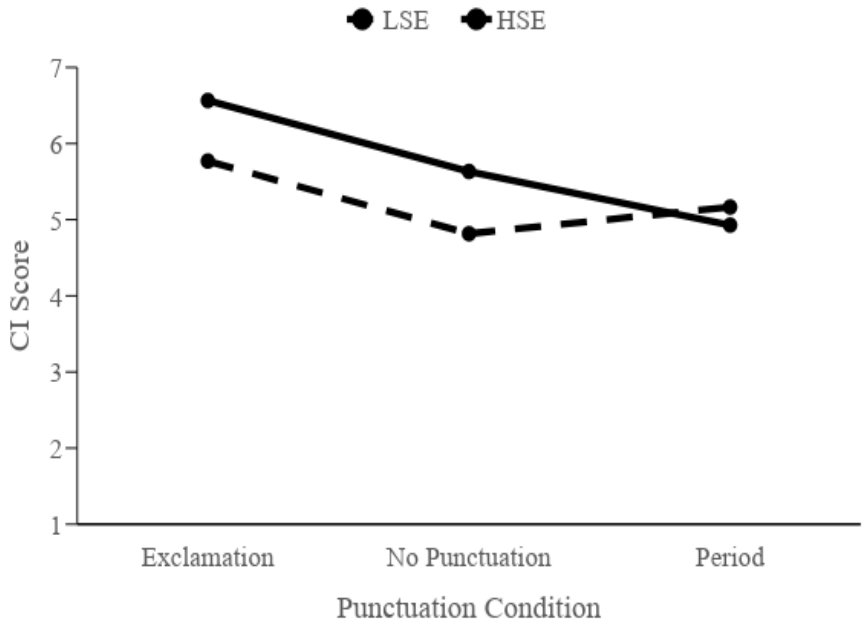

Figure 4. Estimated marginal means for continued interaction by punctuation condition.

Appendix A

Sample Items for Scales Used

Rosenberg Self-Esteem Scale. A sample item reads: "I feel that I have a number of good qualities."

Downey and Feldman 8-item Rejection Sensitivity Questionnaire. A sample item reads: "You ask your friend to do you a big favor" and sample sub-items read: "How concerned or anxious would you be over whether or not your friend would do this favor?" and "I expect that he/she would willingly do this favor for me."

State Self-Esteem Scale. A sample item reads: "I am worried about whether I am regarded as a success or failure." Chronbach's alpha for the scale was .77.

Interaction Partner Feeling Scale. Adjectives or phrases used were: "unfriendly," "warm," "open," "liked talking to me," "comfortable talking to me," "did not want to talk to me," and "aloof." Chronbach's alpha for this scale was .73.

Single Item Self-Esteem Scale The item reads: "At this moment, I have high self-esteem."

Appendix B

Scripted Questions and Scripted Answers

1. What is the best gift you ever received and why?
    a. When I was little I wanted a pet, and on my birthday as a surprise my parents took me to the pet store and let me pick out a hamster
    b. His name was Chippy and he was fuzzy
    c. I was surprised that my parents listened to me and actually let me get a pet
2. If you had to move from Michigan where would you go, and what would you miss the most about Michigan?
    a. I'd probably move to Northern California, I like the weather there and the people
    b. Uh, if I left Michigan I'd miss the lakes and the trees, maybe the snow a little bit
    c. I'd miss my friends too
3. Describe the last pet you owned.
    a. My family has a tiny white terrier named Snowball
    b. We got him as a puppy and I miss him during the semester
    c. He's 10 now and getting old but he still likes to play
4. What is your favorite holiday? Why?
    a. I like New Year's
    b. I like how I can have a fresh start and it motivates me to do better *
    c. Staying up to watch the ball drop has always been something my family does
5. Do you like to get up early or stay up late? Is there anything funny that has resulted from this?
    a. I usually stay up late, especially when I don't have to wake up the next morning

b. I've slept into the afternoon before

c. One time freshman year my friends and I were working on essays in Lane and ended up pulling an all-nighter, my one friend tried to make easy mac with hot water from a bathroom faucet because he was hungry but had no way to cook it

6. What did you do this summer?

a. Stayed home and worked mostly

b. I work near my house and I don't have a car so I don't have much to do other than that

c. My family and I took a vacation to the beach, that was nice

7. What foreign country would you most like to visit? What attracts you to this place?

a. I'd want to go to Italy

b. There's so much history and culture there, you can go to the city and see old buildings

c. I don't know the language but it would be a great experience

The Effects of Physical Attractiveness and Crime Severity on the Attractiveness-Leniency Effect in Mock Juror Decision Making

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Past empirical research of the attractiveness-leniency effect, the greater tendency for attractive individuals to receive more lenient punishments for negative behaviors, found defendants rated higher in levels of conventional attractiveness received more lenient punishments for criminal acts compared to lower rated defendants (Abwender & Hough, 2001). Individuals who score higher on scales of judicial-fairness – those who strive for nonpunitive decision-making – were more likely to find a defendant who they perceived untrustworthy not guilty but less likely to find a defendant who they perceived trustworthy not guilty (Dion, Berscheid, & Walster, 1972). It was hypothesized that, after controlling for justice motives, there will be a significant effect of defendant attractiveness and crime severity on sentencing. A sample of 393 participants viewed a photo of either an attractive or unattractive female defendant and read a brief vignette describing a high severity or low severity crime. Participants provided a hypothetical sentence for the defendant and rating of the defendant on several character traits. The attractive subject was rated significantly higher on positive character traits and lower on unfavorable character traits compared to the unattractive subject. In contrast to the hypothesis, the unattractive and attractive defendants did not differ in verdict or length of assigned punishment, indicating no attractiveness-leniency effect. The current study is important to the field if research, expanding on the literature examining the attractiveness-leniency effect while offering a new direction of research investigating appearance in association to different probabilities and justifications of committing specific types of crimes. The findings may have resulted from the nature of the crime, theft; the defendant's appearance may have been analyzed in congruence with the crime, leading participants to believe the defendant used their appearance to commit the crime. This observation proposes a new research question for research of the attractiveness-leniency effect in a legal setting that has yet to be researched fully..

Keywords: mock jury, attractiveness-leniency effect, female defendant, vignette

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Power of Physical Attractiveness

Research relating to the effects of physical attractiveness has illustrated that attractive people are thought to gain more advantages within society (Abwender & Hough, 2001; Dion, Berscheid, & Walster, 1972). An individual's physical attractiveness plays a crucial role in influencing how they are perceived. In accordance with the "what is beautiful is good" phenomenon, those viewed as more attractive are thought to live happier and more socially desirable lives than those

viewed as unattractive (Dion et al., 1972). Support for the "what is beautiful is good" phenomenon has come from research examining attractiveness and facial stereotyping. Willis and Todorov (2006) highlighted how simply being exposed to a face results in instantaneous and durable character assumptions; prior to any interpersonal interaction, when exposure to a face increased from 100 milliseconds to 500 milliseconds, confidence in attributed trait impressions increased, but there was no significant increase in confidence when exposure increased beyond 500 milliseconds. This revealed that the evaluator became confident in their own judgment instantly and additional facial exposure did not impact correlations with attributed character traits. This tendency to evaluate attractive individuals more positively has repercussions for decision making in our legal system. Individuals of a jury can make rash and lasting decisions in a trial based on a first impression alone, regardless of future evidence that may be presented. In the legal system this can cause unfair and potentially biased verdicts.

Attractiveness-Leniency Effect

Research has highlighted that defendants' physical attractiveness can mitigate jurors' assessments of them, a phenomenon known as the attractiveness-leniency effect. The attractiveness-leniency effect is the greater tendency for attractive individuals to receive more lenient punishments for negative behaviors, such as criminal acts (Abwender & Hough, 2001). A study by Shechory-Britton and Zvi (2015) found that when no description or image of a defendant's physical appearance is given, more blame is attributed to a defendant than when physical information allowing assessment of attractiveness is given, indicating that one's physical attractiveness may play a role in jury sentencing. Empirical research shown that smiling, having a trustworthy or innocent-looking face, and being perceived as more sociable, likable, and intelligent all increased the likelihood of an individual being labeled as attractive. This was seen to lead to fewer guilty sentences and more lenient punishment (Abel & Watters, 2005; Darby & Jeffers, 1988; Dumas & Testé, 2006; Korva, Porter, O'Connor, Shaw, & ten Brinke, 2013; Wilson & Rule, 2015). Wilson and Rule (2015) found that when participants rated a defendant's face more trustworthy, it correlated with more lenient punishments granted to the defendant, indicating that character traits associated with a defendant's physical appearance may influence juror judgments. Furthermore, those considered attractive are more likely to be seen as having more positive character, creating positive biases for attractive defendants (Abwender & Hough, 2001; Efran, 1974).

Research conducted by Ahola, Christianson, and Hellström (2009) found that female defendants considered more attractive were also more likely to be considered trustworthy and less likely to be rated as insensitive or disagreeable, although no similar associations were found for attractive male defendants. The attractiveness-leniency effect may be more robust for female defendants than male defendants (Abwender & Hough, 2001; Ahola et al., 2009; Ahola, Hellström, & Christianson, 2010).

Effect of Crime Severity on Sentencing

It is not just characteristics of the defendant that may influence judgments, but also the jurors' beliefs about the justice system. Circumstances of the crime (e.g., type of crime, crime severity, the defendant's justification) and an individual's' perception of the justice system have been found to mitigate the attractiveness-leniency effect.

An older study by Efran (1974) found that 79% of surveyed individuals believed that a defendant's character and history should influence jury decisions, and 93% believed that a defendant's physical attractiveness should not influence those decisions. Research controlling for participants' judgment making strategies found that regardless of the way in which people process the information about a case, either rationally through intentional and effortful analysis or experientially through emotions and stereotypes, the rate at which attractive and unattractive individuals were sentenced did not differ (Gunnell & Ceci, 2010). Research conducted by Sigall and Ostrove (1975) emphasized that the nature of the crime can mitigate the attractiveness-leniency effect. When a defendant used their appearance to manipulate others to commit the crime, such as swindling (i.e., actively using one's attractiveness to avoid negative punishments), an attractive defendant was sentenced to a harsher punishment, but when a crime was unrelated to attractiveness, such as burglary, the attractive defendant was sentenced to a more lenient punishment. Similarly, when the details of a case involved a high priority crime (homicide) or involved a severe punishment (possibility of death penalty), attractiveness did not influence conviction (Beckham, Spray, & Pietz, 2007; Downs & Lyons, 1991).

Belief in Justice Mitigating Attractiveness-Leniency Effect

Participants' evaluation of judicial-fairness, referring to confidence in and desire for a fair or just legal system, and how important they perceive their influence in sentencing to be has been shown to impact jury decisions (Downs & Lyons, 1991; Korva et al., 2013; Shechory-Britton & Zvi, 2016; Wilson & Donnerstein, 1977). However, limited research has explored the power of opinions regarding the objectiveness of the current justice system on extraneous variables like attractiveness. When individuals are instructed to objectively examine evidence and the defendant's external justification or personal reasoning for committing the crime, the attractiveness-leniency effect has been shown to be reduced (Izzett & Fishman, 2001; Sigal, Braden, & Aylward, 1978). Individuals with a stronger need for judicial-fairness gave fewer guilty verdicts to defendants with untrustworthy faces than those with more trustworthy faces s (Korva et al., 2013). Given that more attractive faces are often rated as more trustworthy, there is a need to directly explore whether the need for judicial-fairness mitigates the attractiveness-leniency effect (Korva et al., 2013; Wilson & Rule, 2015).

Current Study

The current study examined the relationship between defendant attractiveness and the participant's individual level of desire for nonpunitive judicial proceedings, those based on facts and evidence rather than opinions and assumptions, in relation to mock juror sentencing. Also examined, was the possible relationship between the attractiveness ratings given to the defendant and attributed ratings of positive and negative character traits, which could explain the presence or absence of the attractiveness-leniency effect. Because previous research found that the attractiveness-leniency effect is more powerful among female defendants than male defendants, this study manipulated the attractiveness of female defendants only (Ahola et al., 2010). It was hypothesized that after controlling for justice-vengeance motives, (1a) a defendant accused of a high severity crime would receive more severe sentencing recommendations than a defendant accused of a low severity crime,

(1b) an unattractive defendant would receive more severe sentencing than an attractive defendant, and (1c) there would be no significant interaction between defendant attractiveness and crime severity. It was also hypothesized that an unattractive defendant would be more likely to receive a guilty verdict than an attractive defendant, regardless of the severity of the crime. Finally, it was proposed that an attractive defendant would be rated as possessing more favorable character traits – credibility, reliability, and trustworthiness – and rated as possessing less unfavorable character traits – aggressiveness and disagreeableness – compared to an unattractive defendant.

Methods

Participants

A convenience sampling procedure was used; participants were recruited from a liberal arts university through SONA, an online system designed for students to sign up for research studies to receive extra credit, and an online advertisement posted on Reddit. To be eligible for participation, participants must have been at least 18 years of age and currently residing in the United States. Participants received either course credit for participating or entry into a lottery to win one of two $25 Amazon gift cards. Approval to perform this study was obtained from the university's institutional review board.

Research Design

This experiment was a 2 by 2 independent groups factorial design. The independent variables were subject attractiveness (attractive or unattractive) and severity of crime (high severity/burglary or low severity/shoplifting). There were two dependent variables: the verdict assigned to the defendant (guilty or not guilty) and the recommended sentence length for the crime. Participants were randomly assigned to one of four conditions using block randomization: attractive defendant with low severity crime, unattractive defendant with low severity crime, attractive defendant with high severity crime, or unattractive defendant with high severity crime. Judicial motives were investigated as a potential covariate. Character traits associated with the defendant were also examined in relation to the attractiveness to determine whether the "what is beautiful is good" phenomenon was upheld in the study manipulation.

Materials

Two photos were used for this study, one for each level of attractiveness (see Figures 1 and 2). The photos were chosen based on a pilot study in which 80 individuals were recruited through an online advertisement on Reddit. The pilot sample contained 50 men (62.5%), 27 women (33.8%), and 3 (3.8%) identifying as other. Participants ranged in age from 18-56 years ($M = 25.75$, $SD = 7.41$). Fifty-nine participants (73.8%) were White, 1 was Black (1.3%), 1 was Hispanic (1.3%), 6 were Asian (7.5%), 11 were Multiracial (13.8%), and 2 identified as Other (2.5%). The majority, 52 participants, were heterosexual (65%), 18 were bisexual (22.5%), 4 were homosexual (5.0%), and 6 identified as other (7.5%). The participants of the pilot study rated 10 photos (five considered attractive and five considered unattractive) featuring five women who posed for two separate photos, one attractive and one unattractive. Photos were in full color and depicted a Caucasian woman approximately 35 years old, shown from the neck up wearing a black shirt against a plain white background. Attractiveness of the individuals was manipulated using cosmetics, as that has been shown to yield the best results for the manipulation of attractiveness (Ahola et al., 2009; Sigall &

Ostrove, 1975). Participants rated the photos on a 6-point scale with higher scores indicating greater attractiveness. For the unattractive photo condition, Mauchly's test indicated that the assumption of sphericity had been violated, $\chi2(9) = 25.12$, $p < .001$, therefore Greenhouse-Geisser corrected tests are reported ($\varepsilon = .86$). There was a significant effect of photo condition on attractiveness, $F(3.42, 270.05) = 12.26$, $p < .001$; mean photo ratings ranged from 3.05 to 3.83, with the photo rated the lowest at 3.05 (SD = 1.07) chosen for the unattractive photo condition in the main study. For the attractive photo condition, Mauchly's test indicated that the assumption of sphericity had not been violated, $\chi2(9) = 14.35$, $p = .11$. There was a significant effect of photo condition on attractiveness, $F(4, 316) = 12.26$, $p < .001$; mean photo ratings ranged from 3.18 to 4.33, with the photo rated the highest at 4.33 (SD = 1.09) chosen for the attractive photo condition in the main study.

Figure 1: *Photo for Attractive Condition*

Figure 2: *Photo for unattractive condition*

Two vignettes were created for this study (see Table 1). The vignettes varied based on the severity of the crime being committed (shoplifting or burglary); all other aspects of the case vignette and defendant were held constant. Shoplifting was defined as a low severity crime, as opposed to burglary being defined as a high severity crime. The vignette described the defendant committing either a misdemeanor, stealing $100 worth of merchandise from a store during normal business hours, or a felony, breaking into a store causing property damage and stealing the same $100 in merchandise.

Measures

Participants completed the justice-fairness and justice-legal subscales from the Justice-Vengeance Scale (JVS) (Ho, FosterLee, FosterLee, & Crofts, 2002). The justice-fairness (four items; e.g., "In deciding a criminal case, it is important to be objective when considering the evidence") and assesses desire for fairness of a trial and use of evidence. The justice-legal (three items; e.g., "In deciding a criminal case, it is important to make your decisions according to legal principles") and assesses how much a participant believes a trial should follow legal principles. Both evaluate the degree to which the individual believes the defendant should be judged and sentenced in a fair and just manner. Each item is rated on a 6-point scale, 1 (Highly Disagree), 2 (Moderately Disagree), 3 (Barely Disagree), 4 (Barely Agree), 5 (Moderately Agree), and 6 (Highly Agree); the average of all ratings was calculated for analyses. Higher average scores indicate the individual's decisions are more strongly motivated by a need for justice. The scale had an acceptable level of internal reliability in the current study (Cronbach's $\alpha = .74$).

Participants rated the attractiveness of the subject on a 6-point Likert-Type scale from 1 (Highly Unattractive) to 6 (Highly Attractive). They were also asked to rate how

much the individual possessed five character traits (credibility, reliability, aggressiveness, disagreeableness, and trustworthiness) on a 6-point scale from 1 (Strongly Disagree) to 6 (Strongly Agree).

Participants indicated whether they believed the defendant was guilty or not guilty. Regardless of their given verdict, all participants were then asked to recommend a jail sentence in months if the defendant was found guilty. A possible range provided based on the type of crime, from 0 to 12 months for shoplifting or 0 to 84 months for burglary) The recommended sentences were standardized for analysis by dividing the sentence by the maximum possible sentence in months for each condition.

Participants also reported demographic information, including sex, race, age, sexual orientation, and highest level of education. In order to control for any bias due to an individual's familiarity with the legal system, participants were also asked two yes/no questions regarding whether they plan to or currently work in the legal field and if they have ever served on a jury at any time in their life.

Procedure

After providing informed consent, participants completed an online survey created using Qualtrics. Participants were informed that they would be evaluating how factors of a defendant, a crime, and their own need for fair legal proceedings relates to mock jury decisions. They were unaware of any manipulation to the independent variables in the study. Participants were first shown the photo they had been randomly assigned to and then rated the subject's attractiveness and how much they appeared to possess each of the five character traits. Next, participants were presented with a photo of the same subject with additional information claiming that the person is a current defendant. The case vignette the subject had been randomly assigned to was also included and participants were asked to read through it thoroughly. They were then instructed to indicate whether they believed the defendant was guilty or not guilty of committing the crime described in the vignette and were asked to provide the length of a recommended sentence if they provided a guilty verdict. Participants completed the two subscales of the Justice-Vengeance Scale and provided demographic information. Participation took between 10 and 15 minutes to complete. Participants were then debriefed by being made aware of the manipulation used and purpose of the study. They were informed that the defendant pictured was a paid model, all information about the crimes were fictional, and that they could have been placed into one of four conditions as a result of the manipulation of attractiveness and crime severity. In addition, they were provided with links to seminal research to further explain the purpose of the study and the manipulation.

Data Analysis

All statistical analyses were conducted using IBM SPSS Statistics version 24. Preliminary screenings were performed regarding eligibility criteria and attention checks; if one attention check (3 were included) were incorrectly answered, that participant's responses were excluded from the final sample. As an attention check and to ensure eligibility requirements were fulfilled, participants were asked if they currently lived in the United States. In addition, two more attention checks were provided asking participants to purposely leave a question blank and to provide the name of the defendant mentioned in the case vignette. Seventeen participants were excluded for failing to meet eligibility requirements, and

83 participants were excluded due to failed attention checks.

Two independent t-tests were performed to ensure the mean ratings of both the unattractive and attractive defendant photos are not significantly different from the respective ratings of the pilot study. As a manipulation check, an independent t-test was performed to ensure that the attractive subject was rated significantly more attractive than the unattractive subject in the main study. Five independent t-tests were performed to determine whether the "what is beautiful is good" phenomenon is supported in the study by evaluating whether the attractive defendant is rated as possessing more favorable character traits and rated as possessing less unfavorable character traits compared to an unattractive defendant. A factorial ANCOVA was considered to test if there is a main effect of attractiveness or crime severity. Also, to examine an interaction on sentence recommendations when controlling for justice motives. However, judicial-fairness was not significantly related to sentencing ($r = .04$, $p = .49$), requiring a factorial ANOVA to be performed instead. To evaluate whether unattractive defendants would be more likely to receive a guilty verdict than attractive defendants, regardless of severity of the crime, three chi square tests were performed.

Results

Sample Description

The final sample consisted of 393 participants. They ranged in age from 18-53 years ($M = 22.22$, $SD = 5.48$). A majority ($n = 288$, 73.3%) identified as female, 97 (24.7%) identified as male, and 5 (1.3%) identified as other. Most participants were White ($n = 288$, 73.3%); the sample also contained 15 (3.8%) Blacks, 25 (6.4%) Hispanics, 18 (4.6%) Asians, 2 (0.5%) Pacific Islanders, 1 (0.3%) Alaskan Native, 34 (8.7%) Multiracial, and 7 (1.8%) identifying as some other race. A majority ($n = 280$, 71.2%) identified as heterosexual, 22 (5.6%) identified as homosexual, 66 (16.8%) identified as bisexual, and 22 (5.6%) identified as other. Approximately half ($n = 184$, 46.8%) had some college with no degree as their highest level of education, 21.6% ($n = 85$) had a high school diploma, 7.9% ($n = 31$) had an Associate's degree, 15.8% ($n = 62$) had a Bachelor's degree, 6.9% ($n = 27$) had a graduate degree, and 0.3% ($n = 1$) had some high school with no degree. Fifty-one (13%) participants had or currently have a job in the legal justice field, and 339 (86.3%) participants did not work in the legal field. Nearly all the participants ($n = 378$, 96.2%) had never served on a jury; only 12 had served on a jury.

Subject Attractiveness

The manipulation of attractiveness was successful. There was a significant difference between the conditions for attractiveness ratings, $t(390) = 7.56$, $p < .001$, $d = 0.77$. Those in the attractive condition ($M = 4.59$, $SD = 0.84$) rated the subject as more attractive than those in the unattractive condition ($M = 3.84$, $SD = 1.08$). Due to the photos being chosen through a pilot study, regression to the mean was evaluated as a possible threat to validity. Regression from the mean was not violated for the attractive condition; there was no significant difference between participant ratings in the pilot study ($M = 4.33$, $SD = 1.09$) and the main study ($M = 4.59$, $SD = 0.84$), $t(117.28) = 1.92$, $p = .06$, $d = 0.27$. Regression from the mean was violated for the unattractive condition; participants in the pilot study ($M = 3.05$, $SD = 1.07$) rated the subject as less attractive than those in the main study ($M = 3.84$, $SD = 1.08$), $t(267) = 5.50$, $p < .001$, $d = 0.74$.

What is Beautiful is Good

The attractive subject was rated as possessing significantly more of the positive characteristics and less of the negative characteristics. Participants rated the attractive subject (M = 4.24, SD = 1.06) significantly more credible than the unattractive subject (M = 3.96, SD = 1.06), t(391) = 2.63, p < .009, d = 0.27. They rated the attractive subject (M = 4.18, SD = 1.09) significantly more reliable than the unattractive subject (M = 3.81, SD = 1.06), t(391) = 3.47, p < .001, d = 0.35. They also rated the attractive subject (M = 3.89, SD = 1.08) significantly more trustworthy than the unattractive subject (M = 3.66, SD = 0.94), t(391) = 2.18, p < .001, d = 0.22. Participants rated the attractive subject (M = 2.44, SD = 1.14) as significantly less aggressive than the unattractive subject (M = 2.85, SD = 1.13), t(391) = 3.52, p < .001, d = 0.36. They also rated the attractive subject (M = 2.76, SD = 1.15) significantly less disagreeable than the unattractive subject (M = 3.35, SD = 1.12), t(391) = 5.16, p < .001, d = 0.52. (See Table 2 and Table 3) Comparatively, the more beautifully rated photo subject was rated higher in positive character traits and lower in negative character traits than the less beautifully rated photo subject. Thus, the data supports the "what is beautiful is good" phenomenon, showing that individuals are attributed more positive characteristics and less negative characteristics when they are perceived as attractive.

Attractiveness-Leniency Effect

A violation of the assumption of homogeneity for the Factorial ANOVA required caution in interpreting the results, F(3, 347) = 3.99, p =.008. There was a non-significant main effect of attractiveness on the length of the criminal sentence, F(1, 347) = 0.03, p = .54, f = .25. Participants who characterized the subjects as attractive t(M = 0.18, SD = 0.21) recommended roughly the same length of sentences compared to the participants who characterized the subjects as unattractive group (M = 0.20, SD = 0.35). There was a significant main effect of crime severity on sentence length, F(1, 347) = 1.74, p < .001. Contrasts revealed that the participants who sentenced the defendant who committed the low severity crime (M = 0.26, SD = 0.35) recommended longer sentences compared to the participants who sentenced the defendant who committed the high severity crime(M = 0.12, SD = 0.18).

Table 2

Average Character Ratings for the Attractive Defendant

Character Trait	*n*	*M*	*SD*
Attractiveness	203	4.58	.84
Credibility	203	4.24	1.06
Reliability	203	4.18	1.09
Trustworthiness	203	3.89	1.08
Aggressiveness	203	2.44	1.14
Disagreeableness	203	2.76	1.15

Note. Maximum rating is 5.

Table 3

Average Character Ratings for the Unattractive Defendant

Character Trait	*n*	*M*	*SD*
Attractiveness	189	3.84	1.08
Credibility	190	3.96	1.06
Reliability	190	3.81	1.06
Trustworthiness	190	3.66	.94
Aggressiveness	190	2.85	1.13
Disagreeableness	190	3.35	1.12

Note. Maximum rating is 5.

There was no significant interaction between crime severity and attractiveness on recommended sentence length, $F(1, 347) = 0.01$, $p = .67$. Examination of the effects of each condition on the verdict provided that there was no significant association between attractiveness and verdict, $\chi2(1) = 0.04$, $p = .84$. There was no significant association between crime severity and verdict, $\chi2(1) = 1.13$, $p = .29$. Finally, there was no significant association between all experimental conditions and verdict, $\chi2(3) = 1.15$, $p = .77$.

Discussion

The purpose of the current study was to examine the attractiveness-leniency effect or whether a hypothetical defendant's attractiveness influenced the sentence they received . It was hypothesized that after controlling for justice-vengeance motives, (1a) a defendant accused of a high severity crime would receive a more severe sentence than a defendant accused of a low severity crime, (1b) an unattractive defendant would receive more severe sentencing than an attractive defendant, and (1c) there would be no significant interaction between defendant attractiveness and crime severity. Overall, the justice motives for the participants were high ($M = 5.54$, $SD = 0.62$), meaning that the participants had strong needs for fair and legal court proceedings. However, justice motives were not found to be a covariate for sentencing with either crime severity or attractiveness; that is, participants' need for fair legal proceedings were not correlated with their mock jury decisions.

It was also hypothesized that an unattractive defendant would be more likely to receive a guilty verdict than an attractive defendant, regardless of severity of the crime. However, the counterintuitive finding was that attractiveness did not affect either the verdict nor length of sentence that assigned by participants. Regardless of the participants' opinions of the subject's attractiveness and character, the unattractive and attractive defendants did not differ in the severity of the punishment given. This finding is not in line with prior research that has found evidence for the attractiveness-leniency bias, in which attractive defendants are treated with greater leniency (Abwender & Hough, 2001; Ahola et al., 2009). Regression to the mean for the unattractive condition could have resulted in the absence of the attractiveness-leniency effect in the current study. This could have been because the subject for the unattractive condition was rated as more attractive in the main study than the pilot study. Though the manipulation of attractiveness was successful in the main study, the unattractive subject may not have been perceived as unattractive enough by participants for significant results to be found.

The current finding could have also been a result of the nature of the crime used in this study, namely shoplifting. Research has suggested that the nature of a crime can play a key role in diminishing the effects of the attractiveness-leniency effect when the defendant's appearance is congruent with the crime being committed (Sigall & Ostrove, 1975). Participants may have believed that that defendant was using their looks to get away with the crime. Consequently, the attractiveness-leniency effect was absent in the current study. To expand upon this finding, future research should focus on evaluating what crimes are associated with certain character traits of a defendant. Attractiveness has been correlated to defendants being more likable, intelligent, or trustworthy. However, few findings have shown in what circumstances do these characteristics lead an individual to believe the defendant is using their looks in relation to the crime (Abel & Watters, 2005; Darby &

Jeffers, 1988; Dumas & Testé, 2006; Korva, Porter, O'Connor, Shaw, & ten Brinke, 2013; Wilson & Rule, 2015). Crimes that have not been considered in this area of research are victimless crimes, those that involve illegal acts that do not affect another individual. Crimes that involve a victim being wronged, such as swindling, have been examined, but none that focus solely on the defendant's actions in the absences of wronging another individual. Offences such as illegal substance possession, trespassing, or traffic violations could be considered because the defendant could not be using their looks to wrong another individual, as there is no victim in these crimes.

Another possible explanation for the current finding comes from the counter-argument to the attractiveness-leniency effect suggesting that attractive defendants may be held to higher standards for their behavior and could be treated more harshly when they do not live up to those standards (Mazzella & Feingold, 1994). Thus, individuals who are presumably using their looks to get ahead are abusing their attractiveness and treated the same as an unattractive individual. Just as attractiveness has been linked to swindling, attractiveness may also be linked to shoplifting, a possible factor that can eliminate the strength of the attractiveness leniency effect. When defendants use their looks to commit the crime, their attractiveness is no longer a positive characteristic. Further research could be conducted to see if there is a correlation between how attractive a defendant is and how lenient their punishments are to see if there is a threshold where increased attractiveness begins to have no effect on leniency or inversely decrease leniency.

Though the nature of the crime and the use of the female defendants countered the attractiveness-leniency effect, there was a main effect of crime severity on sentencing. The low severity crime condition received more harsh sentences than the high severity crime condition. Because the high severity condition included the description of the defendant breaking into the store after hours, there may have been more perceived justification for their actions due to the additional effort that goes into breaking into the store. Izzett and Fishman (1976) found that more lenient sentencing was recommended for defendants when their actions were seen as justified than when their actions did not have justification, despite all defendants being rated as equally guilty. The participants may have rationalized that the extra effort that goes into breaking into a building meant the defendant had more reason to risk getting caught. Whereas the low severity crime may have been viewed as more opportunistic and done on a whim without justification. The current study did not examine the participants' opinions on whether the defendant's actions were justified. Future research should include ratings of the defendant's justification for the crime as another possible covariate to the decisions being made about guilt and sentencing. Future studies should include free-response questions along with the standardized surveys to get a better idea of why participants make the choices they do when sentencing a defendant. Examining qualitative data may reveal different motives that individuals express in their reasoning and justification for sentencing defendants.

The scope of this study did not take jury deliberation procedures into consideration; future research could also examine the effects of deliberation as it is a key factor in legal decisions. Research conducted by Patry (2008), showed when groups were manipulated by physical attractiveness, deliberation between jury members nullified the attractiveness-leniency effect. When participants talk with one another about the

factors of the case, their own personal biases tend to be less influential in the overall decision making.

Limitations

A possible limitation to this study was the small sample size. A priori G*Power analyses indicated that 1,436 participants should be recruited to achieve sufficient statistical power (.80) to detect a small effect in all analyses. However, due to financial and time constraints, ultimately a sample of only 493 participants were retained for our analysis. Only 393 participants were included in the final analysis after data cleaning. It was revealed by post-hoc power analysis that achieved statistical power for a small effect size was not obtained. In addition, the sample was recruited using convenience sampling, resulting in the inability to generalize our findings to the general population. Post-hoc power analysis for the interaction between crime severity and attractiveness revealed that the statistical power was .51, meaning that sufficient statistical power was not reached. Post-hoc power analysis evaluating an interaction between all conditions revealed that the statistical power was .35, meaning that, again, sufficient statistical power was not reached. Approximately 73% of the participants were women and, although research has shown the attractive-leniency effect to be stronger among women, this overrepresentation provides issues regarding the generalizability of the sample (Abwender & Hough, 2001).

Another limitation in relation to the sample was the high percentage of Caucasian participants (73.3%) in the current study. This could be a possible strength, as the majority of participants were rating a defendant of the same race. However, the remaining 26.7% were rating a defendant from a different racial group, and research on this topic has indicated an in-group bias within juror decision making when looking at the decisions of Black and White participants on Black and White defendants (Abwender & Hough, 2001). Future research should expand on the effects of attractiveness on jury decisions both within and across differing racial groups, examining the effect of race on the attractiveness-leniency effect.

Methodological limitations are also present in the current study. First, the violation of regression to the mean in the unattractive subject condition could have been a result of the methodological differences between the pilot and main study. The pilot study asked participants to rate and rank 10 different photos, whereas the main study only provided one photo for evaluation. The process of looking over multiple photos could have led the participants to compare the different photos, resulting in significantly lower ratings of the unattractive subject in the pilot study. Future research should use multiple subjects for each condition to ensure a better manipulation of the independent variable. Furthermore, the unattractive photo in the main study, though rated significantly lower in attractiveness than the attractive photo, was rated at average attractiveness, rather than truly being considered unattractive, whereas the attractive defendant was of high attractiveness. Better manipulation of the attractive and unattractive photos may have yielded a stronger effect. Future research could focus on better methods of manipulating the attractiveness of the subjects. Use of computer manipulation, cosmetics or prosthetics to more extremely alter the features of the unattractive defendant, in addition to enhancing the features of the attractive defendant, may have resulted in a better manipulation.

Additionally, there was only one crime investigated, theft, which was manipulated to fit the characteristics of a low severity

misdemeanor or a high severity felony. The nature of the crime may have affected the participants' decision-making process. Research has indicated that if the characteristics of the defendant, such as attractiveness, were seen to help the defendant commit the crime, the attractiveness-leniency effect was negated (Sigall & Ostrove, 1975). The use of female only defendants may have yielded non-significant results, because their levels of attractiveness were related to their ability to commit the crime. Future research might examine male and female defendants to see if there is a possible gender effect. Another area of improvement in future research would be to obtain qualitative data as to why the participants chose to convict or exonerate the defendant, either for reasons of the crime itself or because of the defendant's personal traits.

Conclusion

The current study adds to the literature exploring the implications of the attractiveness-leniency bias and offers an explanation of other factors that may be important when examining jurors' judgements of the culpability of a defendant. This study's findings were consistent with the "what is beautiful is good" phenomenon, that individuals perceived as more attractive are also attributed as possessing more positive social and character traits than individuals considered less attractive (Dion et al., 1972; Willis & Todorov, 2006). The attractive subject was rated significantly more credible, reliable, and trustworthy and less aggressive and disagreeable. However, these associations between attractiveness and character were not found to influence the way a defendant was judged within a mock legal setting. There is evidence to suggest that attractiveness becomes a hindrance to leniency when it is perceived to be used in order to commit the crime. Just as the defendant's appearance is associated with specific character traits, appearance may also be associated with a higher likelihood or justification to commit specific types of crime. Factors related to defendant sex or race, which were not examined here, may be related to preexisting ideas people have when defining the types of people who commit certain crime.

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Table 1: *Experimental Vignettes*

Low Severity Condition	High Severity Condition
Jessica Doe, pictured above, has been accused of burglary and has been charged with committing a felony. The details known about the crime are that $100 in merchandise were stolen from the retail establishment after the back-alleyway door was broken following closing. Ms. Doe was reported being in the area at the time that the crime was committed and was identified by a cashier from the retail establishment. Jessica Doe was arrested a block away from the crime scene after police were alerted by the store's internal alarm. The stolen merchandise was not on her person at the time of the arrest. It is believed that she stashed the stolen items somewhere in close vicinity to the crime scene before the arrest was made.	Jessica Doe, pictured above, has been accused of shoplifting and has been charged with committing a misdemeanor. The details known about the crime are that $100 in merchandise was stolen from the retail establishment during normal business hours. Doe was reported being in the area at the time that the crime was committed and was identified by a cashier from the retail establishment. Jessica Doe was arrested a block away from the crime scene after police were alerted by the store's manager. The stolen merchandise was not on her person at the time of the arrest. It is believed that she stashed the stolen items somewhere in close vicinity to the crime scene before the arrest was made.

Table 2

Average Character Ratings for the Attractive Defendant

Character Trait	*n*	*M*	*SD*
Attractiveness	203	4.58	.84
Credibility	203	4.24	1.06
Reliability	203	4.18	1.09
Trustworthiness	203	3.89	1.08
Aggressiveness	203	2.44	1.14
Disagreeableness	203	2.76	1.15

Note. Maximum rating is 5.

Table 3

Average Character Ratings for the Unattractive Defendant

Character Trait	*n*	*M*	*SD*
Attractiveness	189	3.84	1.08
Credibility	190	3.96	1.06
Reliability	190	3.81	1.06
Trustworthiness	190	3.66	.94
Aggressiveness	190	2.85	1.13
Disagreeableness	190	3.35	1.12

Note. Maximum rating is 5.

Figure 1: *Photo for Attractive Condition*

Figure 2: *Photo for unattractive condition*

Attitude Matters: How Friendship Formation is Affected by Mutual Positive and Negative Attitudes Toward Various Possible Interests

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Bosson, Johnson, Niederhoffer and Swann (2006) demonstrated that the initial stages of friendship may be characterized by more mutual positive than mutual negative attitudes toward common interests, and on the other hand, more mutual negative than mutual positive attitudes toward a third party. In the present study, two contrasting hypotheses were proposed to explain these findings. The presentism hypothesis (PH), based on memory bias in friendship trajectory, proposed that strong mutual negative attitudes toward various possible interests would have a stronger effect on the likelihood to form friendships compared to strong mutual positive attitudes. The second hypothesis, dubbed the interpersonal chemistry through positivity hypothesis (ICP), proposed the opposite of the presentism hypothesis: strong mutual positive attitudes toward various possible interests will have a stronger effect than strong mutual negative attitudes. Since previous research has produced some evidence favoring mutual positive attitudes and some evidence favoring mutual negative attitudes, the present study attempts to determine which type of attitude is more effective in facilitating friendships when the attitudes are strong and are directed toward mutual interests. In the current study, mutual positive attitudes toward various possible interests were shown to be more effective for the facilitation of a friendship with a stranger than mutual negative attitudes toward various possible interests, providing support for the ICP. It is hoped that these results will elucidate the relationship between mutual attitudes and friendship formation.

Keywords: friendship, interpersonal bonding, mutual attitudes, positive attitude, negative attitude

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Exploring the Impact of Mutual Positive and Negative Attitudes on Interpersonal Relations

Heider's Balance theory attempts to explain the foundation of bonds or friendships that we make with others (Heider, 1946, 1958). Heider proposed four balanced triadic configurations, two of which involve sharing the same beliefs about a third party or object, regardless of those beliefs being positive or negative. These specific two balance triads will create and maintain a favorable relationship between two people (1946, 1958). These systems are based off the pox triple where p is the focal person, o another actor and x being the object or target party (1946). When p and o both like x, they will get along, and the same can be said when they both dislike x (Heider, 1946, 1958). In general, these are the types of relationships people prefer; one in which a person agrees with someone about some other target (Byrne, 1997; Heider,

1946, 1958). This type of reciprocity or agreement is important for the development of friendship. However, Heider did not address the difference in bonding powers that positive or negative attitudes have toward forming and maintaining friendships.

An effective strategy used to initiate friendship formation is for people to establish common ground. In fact, regardless of the type of mutual attitude shared, positive feelings and an interpersonal bond are fostered through a person's discovery of having something in common with another individual (Byrne, 1961, 1971, 1997; Byrne, Clore & Smeaton, 1986). According to the research conducted by Folkes and Sears (1979), people prefer those who like others over those who dislike others. This finding, however, does not completely refute the power of negative attitudes. For example, a person cannot always know if people who reveal positive attitudes about others or objects are saying what they truly feel or are simply responding according to social desirability (Byrne, 1971). In contrast, expressing negative attitudes attracts more attention (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001) which provides a person with more information about the speaker (Baumeister, Zhang, & Vohs, 2004; Bosson et al., 2006) including their disposition (Kelley, 1973). Accordingly, Bosson et al. (2006) believed that when negative attitudes are mutual between two individuals, a sense of closeness would be promoted, thus facilitating friendship formation.

A dating app named Hater attempts to match people together based on mutual hatred toward various possible interests (including food, movies, music, being outside, and even football teams). Hater's premise may be validated by the correlational work of Bosson et al. (2006), which demonstrated that a sense of familiarity and friendship can be born between two people from sharing strongly held, mutual negative attitudes about another person.

Impact of Mutual Positive Attitudes on Friendship

Bosson et al. (2006) conducted three studies to catalogue the power of shared negativity in friendship formation. They proposed that shared negative attitudes — compared to positive attitudes — are much more effective for the formation of a friendship. Using a correlational design, the first study required participants to think of their current non-familiar best friend or a romantic partner. They were then asked to recall the likes and dislikes they shared when first becoming acquainted with them. Participants were not asked about specific concepts or objects; they were asked a single, open-ended question, to which they could respond as little or as much as they liked. The results displayed a higher proportion of positive attitudes — compared to negative attitudes — toward various possible interests that were reported as being shared between the participant and their listed friend. Participants reported that sharing positive attitudes should promote interpersonal closeness more effectively than negative attitudes. This is inconsistent with the presentism hypothesis, that negative attitudes play a stronger role in interpersonal bonding.

In a second study, Bosson and colleagues corrected for the retrospective design used in the first study by asking participants to list three of their closest friends (in descending order) and their current shared likes and dislikes. To ensure that participants listed their closest friends, they were asked to rate how close they felt to them on a scale of 1 (an acquaintance) to 5 (my closest friend), which revealed a mean of 4.50. Participants went through the same procedures that were employed in the first

study. Similar to the results of the first study, participants reported sharing more positive attitudes about various possible interests with their current closest friends than negative attitudes. Intuitively, the closer the participants were to their listed friend, the more they reported similar positive attitudes about various possible interests.

Bosson et al. (2006) also used an experimental design to test the difference between how positive and negative attitudes toward third-parties affected the formation of friendships. First, participants were instructed to listen to a recording of two undergraduate students talking about a football game and a movie and then to come up with one positive and one negative attitude toward one of the undergraduate students, identified as Brad. Participants were then asked to rate how strongly they felt about the attitude they listed about Brad on a scale from 1 (not at all) to 9 (very strongly). Based on their attitudes about Brad, participants were told that they were to be matched with another participant in the study whom expressed a similar attitude; Bosson and colleagues (2006), however, never intended to match participants together. Bosson et al. wanted to see how people would respond to this potential match and as such they assessed the participants' feelings of closeness to a hypothetical match based solely on shared attitudes about a third-party. Results indicated that strongly held attitudes (positive or negative) had a similar effect on how close participants felt to the paired partner. In other words, sharing a strong attitude about a third party with someone promoted closeness regardless of the type of attitude expressed. However, when the attitudes were weakly held, negative attitudes prevailed over positive attitudes for promoting closeness, as will be addressed in the next section.

Counter to the notion proposed by Bosson et al., it seems that positive attitudes are more effective for the formation of friendships than negative attitudes are. Consistent with the findings that support the effectiveness of positive attitudes toward the formation of a friendship (Bosson et al, 2006), the interpersonal chemistry through positivity (ICP) hypothesis predicts that positive attitudes will be the attitude most necessary to share with strangers to promote friendship formation. The findings by Bosson et al. (2006), however, demonstrate that negative attitudes are not unimportant for friendship development.

The Negative Attitude Perspective and Presentism

The first two studies conducted by Bosson et al. revealed a tendency for people to recall sharing more negative than positive third-party attitudes with their closest friend, but also sharing more positive than negative attitudes toward various possible interests. Bosson et al. also demonstrated that participants believed that sharing positive attitudes would promote interpersonal relationships more so than negative attitudes. However, experimental evidence provided by Bosson and colleagues demonstrated that sharing either strong negative or positive attitudes about a third party promoted friendship formation equally, as well as that sharing weak negative attitudes promoted friendship more than weak positive attitudes. The folk beliefs held by the participants in their study reflected a tendency for people to expect negative attitudes to have no effect on interpersonal closeness at all. This may not be the case, as supported by the results of their study which suggested that negative third-party attitudes are not only more prevalent but may be more effective than positive third-party attitudes for interpersonal connectivity when weakly held. This result from study 3 provides evidence for the

presentism hypothesis.

The first study by Bosson had participants retrospectively recall the attitudes they shared with their closest friends at the start of the friendship, or in other words, investigated the relationship's past rather than present. Thus, it is possible that the retrospective nature of the first study may reflect a bias in memory, where participants may be engaging in presentism, an act in which what people think that what they do now was what they also did in the past (Gilbert, 2006). The retrospective study's results may be explained by presentism, and is further supported by the second study. The second study by Bosson et al. had participants think about the attitudes they currently share with their closest friends and found that the friends reported sharing more positive attitudes at the current time with their current friends. Presenitism (Gilbert, 2006) is used to propose that the participants may mistakenly remember sharing more positive attitudes (as opposed to more negative attitudes) when they first got acquainted with their closest friend, since this is in line with their current experience. In other words, participants may mistakenly remember sharing more positive attitudes toward various possible interests because their friendship is currently based on sharing those attitudes. An argument could be made that the second study, which attempted to correct for the retrospective nature of the first, instead reflects a change in the nature of the relationship. It is possible that the dyad shifts from sharing negative attitudes to positive attitudes toward various possible interests. This feeds into the essence of presentism; due to the state of the current nature of the relationship, participants are retrospectively recalling sharing more positive attitudes than negative attitudes toward friendship formation. It is possible that this memory bias obscures the true force of negative attitudes in the beginning of the relationship.

The findings supporting negative attitudes (Bosson et al., 2006; Byrne, 1997; Byrne, Clore, & Smeaton, 1986; Kelley, 1977) and presentism (Gilbert, 2006) will be used to support the second hypothesis. The presentism hypothesis predicts that negative attitudes will be more effective for the formation of a friendship with a stranger.

Present Study

Two competing hypotheses will be presented. The presentism hypothesis (PH) is supported by research suggesting that negative attitudes should promote interpersonal closeness (Bosson et al., 2006 [Study 3]; Byrne, 1997; Byrne, Clore, & Smeaton, 1986; Kelley, 1977) and by the memory bias of presentism (Gilbert, 2006). The interpersonal chemistry through positivity hypothesis (ICP) is supported by the correlational findings from the first two studies of Bosson et al. (2006), which suggest that positive attitudes toward various possible interests may be more effective for the formation of a friendship.

The purpose of this study is to replicate through an experimental design the correlational findings from Bosson et al. (2006) but with a novel extension: the testing of strong attitudes toward various possible common interests. The presentism hypothesis proposes that strong mutual negative attitudes about common interests will have a stronger effect on the likelihood to form friendships compared to strong mutual positive attitudes. Specifically, the presentism hypothesis predicts that participants exposed to a stranger who expresses similar strong negative attitudes toward common interests will score higher on the Likelihood to Form a Friendship scale than participants exposed to a stranger who expresses similar strong positive attitudes.

On the other hand, the ICP hypothesis

proposes that strong mutual positive attitudes about various possible interests will have a stronger effect on the likelihood to form friendships compared to strong mutual negative attitudes. Specifically, the ICP hypothesis predicts that participants exposed to a stranger who expresses similar strong positive attitudes toward various possible interests will score higher on the Likelihood to Form a Friendship scale than participants exposed to a stranger who expresses similar strong negative attitudes.

Method

Participants

A total sample of 79 participants (Mage = 20.98, SD = 4.35) were recruited through sampling of two psychology classes from Fullerton college in California. Of the 79 participants, 24 (Mage = 22.55, SD = 5.5, age range: 19-41) were from a research methodology in psychology course, and the other 55 (Mage = 20.31, SD = 3.58, age range: 18-35) were recruited from a general psychology class. The majority of the students identify as Hispanic and female. The general psychology class offered one point of extra credit for taking the survey, and the research methods class did not offer any extra credit points. Instead, the survey was distributed as part of an in-class assignment. No participants were excluded from the study.

Research Design

This present study examines the strength of positive and negative attitudes on friendship formation. Participants were randomly assigned to one of two conditions of the independent variable. In both conditions, participants are presented with a short story about a stranger who shares strong attitudes with the individual toward various possible interests. However, in one condition, the strong attitudes are positive and in another condition, the strong attitudes are negative. For example, the stranger is said to "have the same strong positive attitudes as you," and "like the same things you like," in the positive attitude condition (See Appendix B for the vignettes used).

Attitudes include likes and dislikes, opinions, and preferences (Bosson et al., 2006). A negative attitude is defined as expressing feelings of disapproval about a person, place, concept, or object. A positive attitude is defined as expressing feeling of approval about a person, place, concept, or object. The likelihood to form a friendship is the dependent variable. For the purposes of this study, attitudes will be related to places, concepts and objects, and will be referred to as various possible interests.

Materials

The survey used was based on the Bosson et al. (2006) seven-item, seven-point Impressions Scale. Modifications to the Impressions Scale were made for this experiment. Instead of measuring impressions, it measured likelihood to form friendships (LFF) and questions were changed to fit the new purpose of the survey (see appendix A). An example of a question similar to a question used by Bosson et al. is, "Based on the story you just read, to what degree do you think you and the stranger will 'click'?" An example of a question that was changed to fit the purpose of the survey is "Based on the story you just read, do you think that interactions with this stranger will go smoothly?" (See Appendix A for both surveys for comparison purposes). Participants responded on a scale of 1 (not at all) to 7 (very much). A low score (7-21) on the LFF scale suggests a low likelihood to form a friendship, and a high score (35-49) suggests a high likelihood to form a friendship. Any score in-between a high and low score, (22-48) would be a moderate score.

The stories are short and contain various possible interests people would either like or dislike. The various possible interests include things such as music, literature, movies, food, and fashion. The interests were chosen out of the assumption that they are common and believable for people to have positive or negative attitudes toward them, and for someone else to share similar positive or negative attitudes toward them as well. The various possible interests described in the story were identical across both conditions, the only difference was whether the stranger whom the participants read about had similar negative attitudes or positive attitudes (See Appendix B for both versions of the vignette).

Procedure

The professor of the two classes distributed the Qualtrics survey via email to the research methods class first, and the general psychology class second. Both sets of participants answered the same brief survey. All participants were instructed to respond to all questions. The participants were randomly assigned to a condition using Qualtrics' randomization feature. Participants were then asked the same questions after reading the story.

Results

Analyses focused on participants' scores on the LFF scale to their randomly assigned condition. An independent-samples t-test was used to compare the means of the mutual positive attitude story LFF score (n = 40, M = 34.68, SD = 8.92, SEM = 1.41) and the mutual negative attitude story LFF score (n = 39, M = 29.49, SD = 9.53, SEM = 1.53) (see Figure 1). An independent samples t-test found a statistically significant difference between mutual positive attitude story and mutual negative attitude story, t(77) = 2.50, p = .015, with an effect size of d = .562. That is, reading the mutual positive attitude story led to a greater likelihood to form a friendship, whereas the mutual negative attitude story led to a lower likelihood to form a friendship. However, the means for both conditions fall short of the set value for a high likelihood to form a friendship of 35. The results provide evidence that mutual positive attitudes have a stronger effect on the likelihood to forming a friendship over mutual negative attitudes, but not enough to, on average, have a high likelihood to form a friendship.

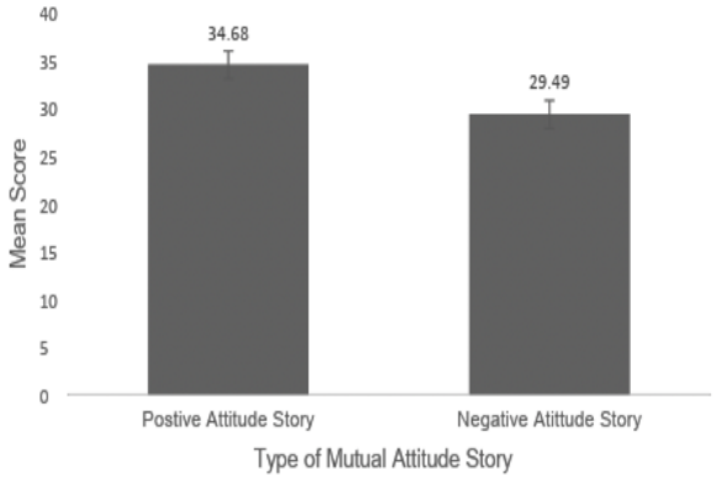

Figure 1. Mean scores for the Likelihood to Form a Friendship Scale based on attitude story.

Moderation Analysis

A 2 (male vs female) X 2 (mutual positive vs mutual negative) independent measures ANOVA revealed that gender moderated the relationship between attitude and likelihood to form a friendship, F(1,75) = 4.68, p = .034. Specifically, males had a statistically significant difference, t(19) = 2.98, p = .008, Cohen's d = 1.13, whereas females did not, t(56) = 1.14, p = .258, Cohen's d = .30. Gender was a moderator in this case because there was a statistically significant difference between the likelihood for males to form a friendship with a stranger compared the likelihood for females to do the same. The effect of mutual attitudes on the

formation of friendships was mediated by the gender of the participants. Men exposed to strangers who expressed mutual positive attitudes were more likely to befriend that stranger (n = 11, M = 35.91, SD = 10.90) whereas men exposed to strangers who expressed mutual negative attitudes were less likely (n = 10, M = 23.40, SD = 7.97). Women exposed to strangers who expressed mutual positive attitudes (M = 34.21, SD = 8.22) had an equal chance of befriending the stranger as women exposed to strangers who expressed mutual negative attitudes (M = 31.59, SD = 9.22).

The results suggested that males had a higher likelihood to form a friendship when they shared positive attitudes with a stranger, and had a moderately lower likelihood to form a friendship when they shared negative attitudes with a stranger (see figure 2).

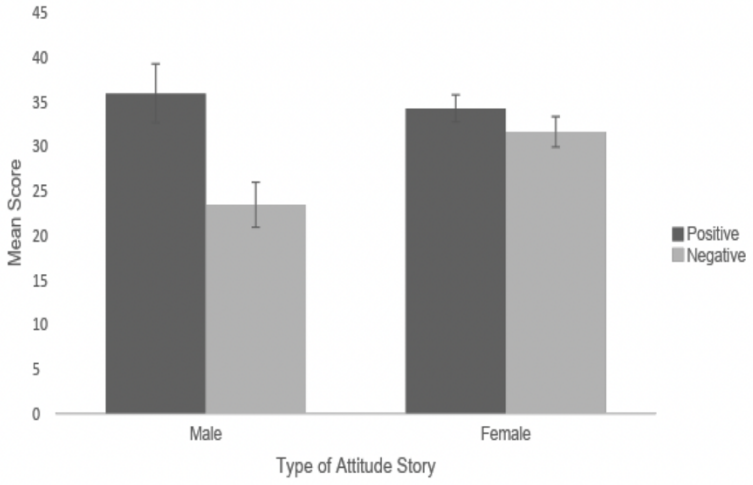

Figure 2. Gender differences in the mean score of the Likelihood to Form Friendships scale scores. Results provide evidence for gender as a possible moderator.

Discussion

Summary of Key Findings

The results did not support the presentism hypothesis, where participants would be more willing to form a friendship with a stranger through sharing similar strong negative attitudes about various possible interests over sharing similar strong positive attitudes. This provides evidence against presentism as a possible memory bias for the recollection of sharing more positive attitudes over negative attitudes toward common interests. It is not the case that the correlational findings from Bosson et al. (2006) reflect participants failing to accurately recall the beginning of their current closest relationship by using the recent state of that relationship. Rather, mutual positive attitudes are more effective for the formation of a friendship than mutual negative attitudes when they are toward various possible interests. With more degree of certainty, it can be concluded that not only does the nature of a friendship not change to share more positive attitudes toward various possible interests, but mutual negative attitudes are not as strong as mutual positive attitudes for the formation of a friendship when held strongly.

Consistent with the findings by Bosson et al. (2006) and the second hypothesis which expected strong positive attitudes to be more impactful than strong negative attitudes on friendship formation, participants reported a greater likelihood to form a friendship with a stranger when they shared similar strong positive attitudes about various possible interests compared to strong negative attitudes. The results of the study suggest that to effectively become friends with a stranger, it is better to share similar strong positive attitudes over similar strong negative attitudes about common interests. Intuitively, this appears to be common sense. It seems appropriate that sharing interests you like with someone and discovering you share similar positive feelings about those common interests would promote friendship. However, both means fell just below the critical value for a high likelihood to form a friendship (35), with mutual positive attitudes (M = 34.68) being just below that value. As such, the results of this study provide evidence that sharing similar strong

positive attitudes or similar strong negative attitudes about common interests have a roughly equivalent moderate effect on the likelihood to form a friendship with a stranger. This is consistent with the third study conducted by Bosson et al. which suggested that strong positive and negative attitudes were both effective for forming a friendship, while strong positive attitudes are more effective than strong negative attitudes.

A moderator analysis reveals that there was a statistically significant difference between males and females and the likelihood to form a friendship. The analysis reveals that for males, having similar strong positive attitudes was important for a friendship to form, while females, regardless of the type of mutual attitudes, had a moderate likelihood to form a friendship (see figure 2). These results suggest a new nuance to the conflicting results presented in previous research; perhaps gender effects at least partially mediate differences in friendship likelihood across various conditions involving strong and weak attitudes, positive and negative attitudes, and mutual interest vs. third-party attitudes.

Limitations and Strengths

A possible explanation for the difference found between men and women could be the use of the word "stranger" in our manipulations. Men may be more willing to be friends with someone who has negative attitudes similar to their own when that someone is not described as a "stranger." Whereas for women, it is possible that the use of the word "stranger" did not matter, so long as attitudes were mutual, friendship could be established. Future replication involving gender as a status variable would be required to confidently state that there indeed is a difference between men and women and their likelihood to form a friendship with a stranger with attitudes similar to their own. To see whether gender is a moderator in the likelihood to form a friendship can be done with a bigger and more equivalent gender ratio sample size. Since the sample size for men in this study is small, it is possible that the found moderation effect might not exist.

No pilot study was used to determine if the LFF scale questions and the stories used elicit the desired responses from participants. Regarding the LFF scale, question 6 ("Are you likely to discuss personal information with this stranger if you meet them?"), had consistently low scores ($M = 2.99$) compared to the mean of the other 6 questions ($M = 5.81$). The low scores could be a threat to the construct validity of the study. The scores on the LFF scale could have possibly been higher, or a different statistically significant difference could have been present if question 6 did not receive low scores. Possibly, question 6 did not accurately determine a participant's likelihood to form a friendship, since it attempts to estimate how likely one is willing to convey their personal information to a stranger, which may be an action reserved for close friends.

Most of the sample was female and identified as Hispanic, and thus the present study's results cannot be generalized to the greater populace. A larger sample size with more equivalent gender ratios would address this issue. Perhaps using multiple cluster samples to obtain data from cities across the country would be helpful in elucidating possible patterns that occur as people form friendships. Additionally, it is possible that culture has an effect on the way shared attitudes are involved in the formation of friendship.

In the future one could explore the formation of romantic relationships to discover which attitudes have a stronger influence on their creation. A replication of

this study could include a variable manipulating the gender of the stranger and inquire not only about participants' desire to form a friendship, as well as their interest in pursuing a romantic relationship with the same or opposite sex stranger. A pilot study should be used to find specific interests that participants would report desiring harmony (having similar attitudes about these interests, either positively or negatively) with their romantic partner. Through this, a comparison between participants who prefer positive harmony versus participants who prefer negative harmony with their romantic partner about various possible interests can be made. This comparison might provide further insight into the bonding power of similar negative versus similar positive attitudes for romantic relationships.

Overall, a replication with a larger and more diverse sample would be the most logical approach. In addition, using specific subjects or concepts that the participants would express their attitudes toward would be more insightful than using vague ideas as used in the attitude stories. It is still possible to find results that support the previous research findings where mutual negative attitudes have a greater influence toward the formation of friendships with a more intricate manipulation. Future research may find an effect similar to the one found in the third study by Bosson et al. (2006), where weakly held negative attitudes toward various possible interests will be more effective for the facilitation of a friendship than weakly held positive attitudes. Future research might also match participants with weakly held attitudes to a stranger with strongly held attitudes, and vice-versa, to see if that changes the previously found effect.

The strength of the present study lies in the use of an experimental design to test the correlational findings from Bosson et al. (2006). The current research provided causal evidence that sharing strong positive attitudes was more effective for forming a friendship than was sharing strong negative attitudes about various possible interests. This is consistent with a part of Bosson et al's (2006) findings that demonstrated that people report sharing more positive attitudes about various possible interests with their best friends at the start and current stage of the friendship.

Conclusion

This study offers important insights into the formation of friendships and the type of attitude that facilitates friendship more effectively. The results provide clear evidence in support of the interpersonal chemistry through positivity hypothesis, where sharing strong positive attitudes toward various possible interests facilitated friendship formation more effectively than sharing strong negative attitudes. The findings refuted the possibility of presentism creating a bias in recall in favor of mutual positive attitudes as well as counter evidence to past research; negative attitudes are not as effective as positive attitudes for the formation of friendships. However, this study provided empirical support for the strength of negative attitudes. Negative attitudes were shown to still facilitate friendship formation equally as strong as positive attitudes among female participants. The results reveal the possibility that females have an equal chance of being friends with a stranger when they feel the same way about various possible interests. On the other hand and in accordance with the ICP, males may be more likely to be friends with someone new when they share similar positive attitudes toward various possible interests rather than sharing dislikes, and as such males benefit more from expressing positive attitudes. Hater may indeed have the right idea for attempting to pair people up through mutual dislikes,

though it seems as if the bonding power of negative attitudes may not be equal to positive attitudes.

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Tables

Table 1

The effects of mutual attitudes on friendship formation: LFF scale results

Measure	*M*	*SD*
Positive Attitude Story	34.68	8.92
Negative Attitude Story	29.49	9.53

Table 2

The effects of mutual attitudes and gender on friendship formation: LFF scale results

	Women	Men
	M (*SD*)	*M* (*SD*)
Positive Attitude Story	34.21 (8.22)	35.91 (10.90)
Negative Attitude Story	31.59 (9.22)	23.40 (7.97)

Figures

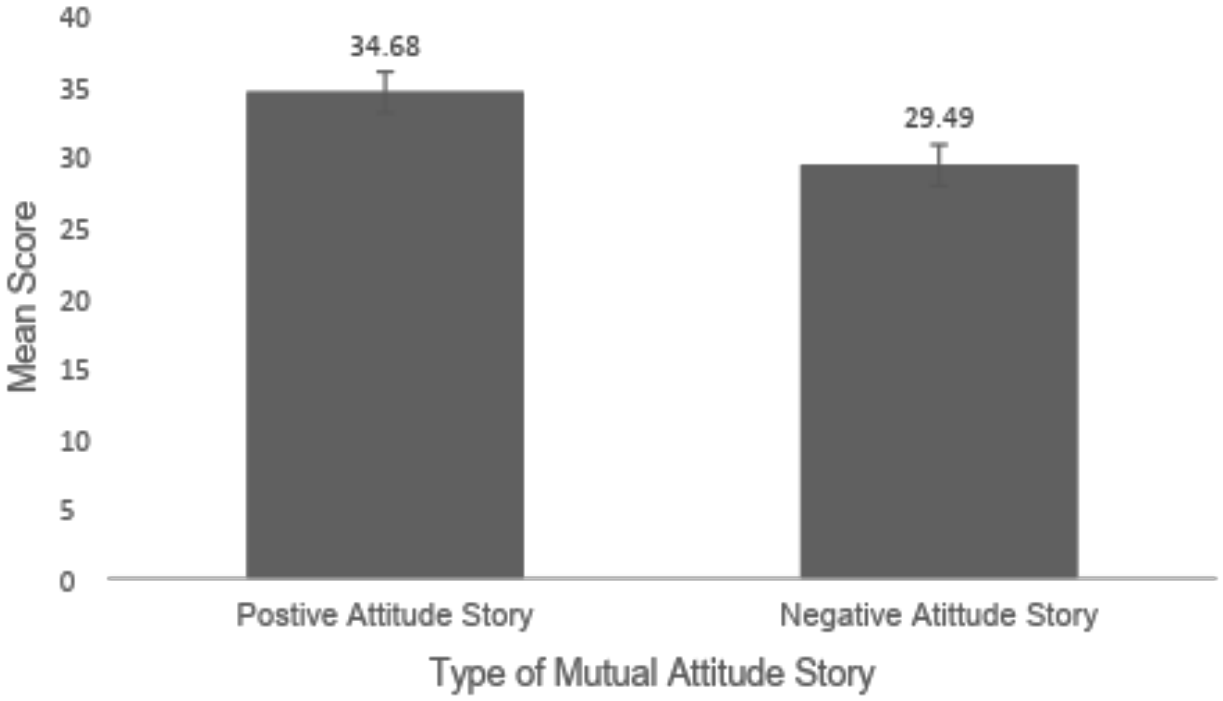

Figure 1. Mean scores for the Likelihood to Form a Friendship Scale based on attitude story.

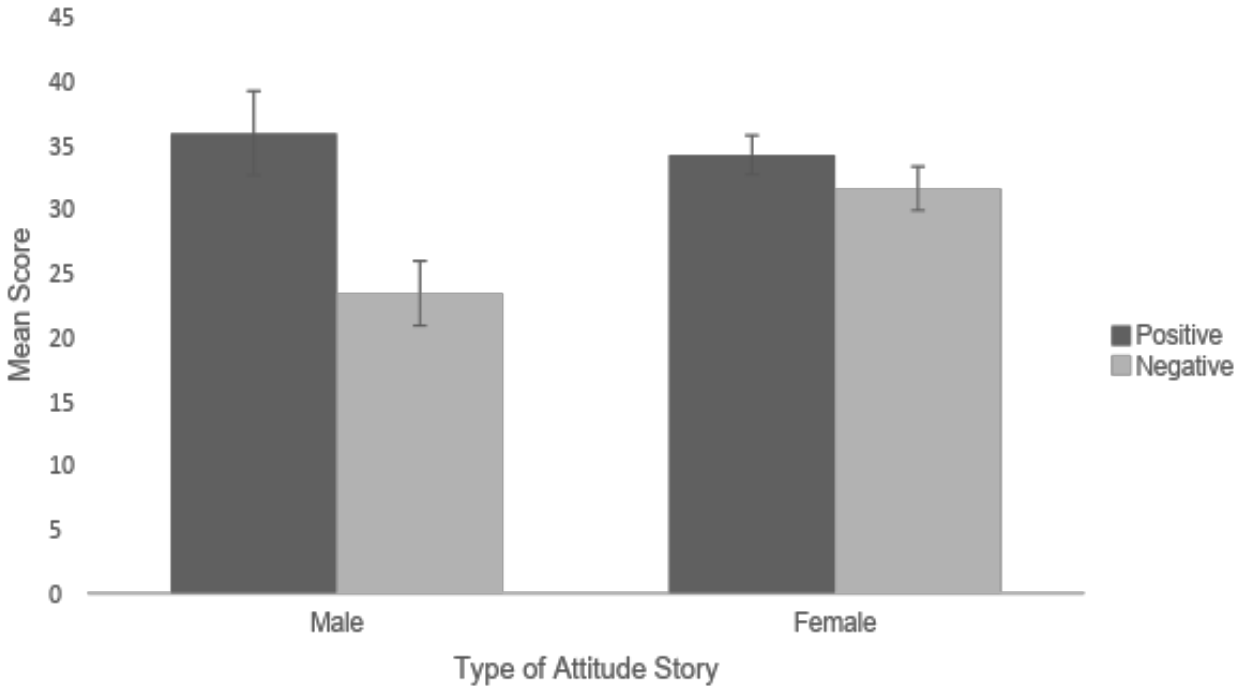

Figure 2. Gender differences in the mean score of the Likelihood to Form Friendships scale scores. Results provide evidence for gender as a possible moderator.

Appendix A

Likelihood to form a Friendship Scale

(Based on Dr. Bosson's Impression Scale)

The questions below are used to assess the likelihood to form a friendship. Please use the scales provided to answer each question.

1) Based on the story you just read, to what degree do you think you and the stranger will "click"?

1	2	3	4	5	6	7
Not at all						Very Much

2) Based on the story you just read, to what extent do you think the stranger is someone with whom you could establish a friendship?

1	2	3	4	5	6	7
Not at all						Very Much

3) Based on the story you just read, to what extent do you feel close to this stranger?

1	2	3	4	5	6	7
Not at all						Very Much

4) Based on the story you just read, do you think that interactions with this stranger will go smoothly?

1	2	3	4	5	6	7
Not at all						Very Much

5) Based on the story you just read, to what extent would you want to meet with this stranger?

1	2	3	4	5	6	7
Not at all						Very Much

6) Based on the story you just read, to what degree are you likely to discuss personal information with this stranger if you meet them?

1	2	3	4	5	6	7
Not at all						Very Much

7) How comfortable do you think an interaction with this stranger will be?

1	2	3	4	5	6	7
Not at all						Very Much

Dr. Bosson's Impressions Scale

The questions below are used to assess how first impressions are made. Please use the scales provided to answer each question.

1) To what degree do you think you and your future partner will "click"?

1	2	3	4	5	6	7
Not at all						Very Much

2) To what extent is your future partner someone with whom you could establish a friendship?

1	2	3	4	5	6	7
Not at all						Very Much

3) To what extent do you feel close to your future partner?

1	2	3	4	5	6	7
Not at all						Very Much

4) Do you think that the interaction with your future partner will go smoothly?

1	2	3	4	5	6	7
Not at all						Very Much

5) To what extent are you looking forward to the interaction task with your future partner?

1	2	3	4	5	6	7
Not at all						Very Much

6) To what degree are you likely to discuss personal information with your future partner during the interaction task?

1	2	3	4	5	6	7
Not at all						Very Much

7) How comfortable do you think the interaction task with your future partner will be?

1	2	3	4	5	6	7
Not at all						Very Much

Below please jot down any details that you recall the experimenter having told you about your future interaction partner.

Appendix B

Positive Attitude Story

There is a stranger who you are soon going to meet. This stranger has the same strong positive attitudes as you. They like the same things that you like. You share the same likes in terms of music, hobbies, types of fashion as the stranger. This stranger also likes the same movies, and TV shows that you do. They like the same books and genres that you do as well. The leisurely activities and pastimes that you like, they too like. This stranger also likes the same food and drinks as you as well. They even have the same pet penchants as you do, too.

Negative Attitude Story

There is a stranger who you are soon going to meet. This stranger has the same strong negative attitudes as you. They dislike the same things as you. You share similar dislikes in terms of music, hobbies, types of fashion as the stranger. This stranger also dislikes the same movies, and TV shows that you do. They dislike the same books and genres that you do as well. The leisurely activities and pastimes that you dislike, they too dislike. This stranger also dislikes the same food and drinks as you as well. They even have the same pet peeves as you do, too.

Neurobiological Data on Problematic Pornography Use as it Relates to the Behavioral Addiction Model – A Brief Review

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Temple University

Behaviors not traditionally considered addictive have recently come under investigation for their ability to elicit pathological and destructive behaviors. The newly developing topic - behavioral addiction - has shown significant promise in its diagnostic utility in a clinical setting. Of the behaviors associated with behavioral addiction, pornography addiction was investigated to determine its validity as a clinical diagnosis. This review seeks to evaluate the current literature on pornography use and its potential for pathology. The articles reviewed discuss neurological bases of addiction, providing support for pornography use's classification as a behavioral addiction under the non-substance use disorders listed in the DSM. The data was then compared to established physio-neurological markers commonly associated with addiction in order to evaluate pornography use on an objective scale. The purpose was to apply research regarding commonly referenced addictions and to relate them back to problematic pornography use. The results indicated that individuals who frequently used pornography shared neurological markers associated with forms of substance abuse. However, the data is controversial and still in its infancy. More data and longitudinal studies will be necessary to confirm causation and give validity to the premise of behavioral addiction, specifically pornography addiction.

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Since the publication of DSM-V, behavioral addiction has come under serious investigation. Though behavioral addiction has no agreed upon definition, it is primarily understood as a disorder involving the ventral striatum, the prefrontal cortex, and other distinct areas of the brain (Potenza, 2017; Brand et al., 2016; Hilton, Watts, 2011). These areas of interest are linked to the regulation of reward processes, as well as planning, judgement, and executive function. When these areas are impaired, the potential for compulsive cravings and unregulated habits increases (Potenza, 2017).

This review seeks to understand the data on the neurobiological signs of behavioral addiction and its relation to pornography use. Signs of behavioral addiction found in pornography use will be compared to similar signs found in more commonly understood addictions and behaviors. The primary focus will be to look at pornography use and identify neurological markers generally associated with addiction. It is expected that, if pornography use constitutes an addictive behavior, then it will share neurobiological markers with behaviors commonly understood as addictive and should be considered for DSM categorization as a non-substance related disorder.

Methods

In order to generate a base of literature, searches were conducted on PubMed and Google Scholar. The searches were for the primary topic, "pornography addiction" and "pornography addiction - neuroscience." The first 20 articles from each search were then manually screened for relevance, as many articles focused on the effects of pornography and its sociological meaning, rather than empirical evidence on its association with addictive behavior. The focus of the review was on identifiable neurological markers; however, articles were kept on their ability to define characteristic behaviors and attitudes of problematic pornography use. This was done in order to delineate problematic pornography use (PPU) against non-problematic pornography use. The data was further refined by removing articles that did not include identifiers for addictive behavior.

Once the data had been compiled and reviewed, further research was necessary to clarify key terms and concepts. The articles and papers cited by the articles under review were then analyzed for appropriate definitions and concepts. This technique was also used to find relations between the neurological markers in pornography use and similar markers found in behaviors commonly understood as addictive. Of the 80 items screened, only 14 were considered relevant. Of these 14 articles, there were 7 research studies, 3 literature reviews, and 4 scientific commentaries.

Article	Author	Year	Research Method	Method of Data Collection	Statistical Analysis	Key Points
Neuroscience of internet pornography addiction: A review and update	Love, T., Laier, C., Brand, M., Hatch, L., & Hajela, R.	2015	Literature Review	EBSCO collections, ProQuest collections, Google Scholar, and Pubmed were searched for the topics: Neurobiology of Addiction, Neurobiology of Addictive Behaviors, Gambling Disorder, Internet Addiction, Internet Gaming Disorder, and Internet Pornography Addiction. Each topic was broken down into keyword searches and age limits were set on sources.	-------	The review, citing 311 sources, concludes that Internet pornography addiction fits the addiction framework. Additionally, Internet addiction and Internet Gaming Disorder provide strong evidence for Internet behaviors being considered behavioral addiction. This review cites the need to distinguish any differences between substance and behavioral addiction.
Paroxetine Treatment of Problematic Pornography Use: A Case Series	Gola, Mateusz, and Marc N. Potenza	2016	Research Study	Case study of 3 heterosexual males who were seeking treatment for PPU and compulsive masturbation.	Standard	The study found that Paroxetine and Cognitive Behavioral Therapy may lead to a short term reduction in PPU and related anxiety. However, "new, potentially distressing sexual behaviors may emerge." The study states that an abuse of neural reward circuitry is indicated by the cases presented.
Pornography addiction: A neuroscience perspective	Hilton DL, Watts C.	2011	Scientific Commentary	The author of this article is putting forth a theory on the nature of pornography addiction supported by various sources.	-------	The author, a lead neurosurgeon, describes the neuroscientific theory of pornography addiction. The others concluding remarks call for a public health investigation of the issue in an attempt to understand what causes pornography addiction and to develop methods of managing non-substance addictions.
Clinical neuropsychiatric considerations regarding nonsubstance or behavioral addictions	Potenza, Marc N.	2017	Scientific Commentary	The author of this article goes over the concept of behavioral addiction and several non-substance-use behaviors - gambling, gaming, and sex.	-------	The author, Marc Potenza MD, PhD, a Yale professor, covers many non-substance-use behaviors and details the need for further research in these areas. Potenza, citing the slow progress in the field as a potential for health disparities for people with behavioral addictions, calls for an increase in funding and priority for behavioral addictions.
Pornography addiction – a supranormal stimulus considered in the context of neuroplasticity	Donald L. Hilton Jr.	2013	Scientific Commentary	The author of this article postulates the idea of a "supranormal stimulus," a stimulus which fulfills an already existing desire, but to a much greater extent, and provides reasoning for pornography as this type of stimulus.	-------	The author goes over the idea of supranormal stimulus, citing artificial sweeteners and synthetic substitutes as examples where organisms have been shown to prefer these substitutes to their natural counterparts, many times to the detriment of the organism. The author then proposes the idea of pornography as such a stimulus.
The Emperor Has No Clothes: A Review of the 'Pornography Addiction' Model	David Ley, Nicole Praus, Peter Finn	2014	Literature Review	The author of this article argues that the current concept of pornography addiction is not grounded in scientific literature.	-------	The authors refute the notion of pornography addiction, citing that many professionals in the field do not recognize it and that there is not enough literature to support the claim. Additionally, the authors argue that the terminology is biased and the term "visual sexual stimulus" (VSS) better captures the concept. Moreover, the benefits of VSS use are supported and the pathology of VSS use is examined.
Cybersex addiction: Experienced sexual arousal when watching pornography and not real-life sexual contacts makes the difference	Laier, Christian, et al.	2013	Research Study	Two experiments were conducted. The first of which measured quality of in person sexual encounters among a random sample of 171 heterosexual men and compared it to both their craving and arousal to pornographic cues and score on a cybersex questionairre. The second measured craving and arousal between a "healthy" pornography use group and a "problematic" pornography use group when presented with pornographic cues.	Standard	The authors found that there is no correlation between pornography use and the quality of real-life sexual contacts. However, problematic pornography users did report greater arousal and craving when presented with pornographic cues.

Article	Author	Year	Research Method	Method of Data Collection	Statistical Analysis	Key Points
Brain Structure and Functional Connectivity Associated With Pornography Consumption	Kühn, Simone, and Jürgen Gallinat	2014	Research Study	MRI scans were taken of 64 male participants before and during presentation of visual sexual stimulus. The scans were analyzed and compared to pornography consumption of each individual.	Voxel-Based Morphometry	The authors found pornography use correlates to changes in the activity of areas of the brain associated with reward processing and behavioral control.
Decreased LPP for sexual images in problematic pornography users may be consistent with addiction models. Everything depends on the model.	Mateusz Gola	2016	Scientific Commentary	The author of this article critiques the conclusions found by Prause et al. (2015).	-------	The author argues that the data found by Praus et al. (2015) is consistent with the insentive salience theory model of addiction. The author notes that depending on the interpretation of the system used by Prause the data can show an increase in craving and a decrease in liking in the problematic pornography use group.
Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: An Interaction of Person-Affect-Cognition-Execution (I-PACE) model	Brand, Matthias, et al.	2016	Literature Review	The authors review the literature surrounding Internet use disorders and postulate of model that distinguishes between predispositions, moderating factors, and mediating factors.	-------	The authors find support for the concept of behavioral addictions and outline many of the concepts of behavioral addiction.
Problematic internet pornography use: The role of craving, desire thinking, and metacognition	Allen, Andrew, et al.	2017	Research Study	1172 participants were screened online for inclusion criteria. From the 192 participants who met the criteria, a problematic pornography use scale, pornography craving questionnaire, desire thinking questionnaire, metacognitions and desire thinking questionnaire, patient health questionnaire, and generalized anxiety disorder questionaire were taken.	Histograms and z scores were examined for univariate outliers and normality. Multivariate outliers were assessed using Mahalanobis distance, one outlier was removed. Mardia's estimate of kurtosis was used to assess multivariate normality and Pearson's correlation coefficients were calculated	The study investigated the model for the occurrence of cravings in individuals with behavioral addictions. The group studied were individuals who self-reported their problematic pornography use and met the problematic pornography use questionnaire cut offs. This article was particularly useful for concise characteristics of behavioral addiction.
Technology Addiction among Treatment Seekers for Psychological Problems: Implication for Screening in Mental Health Setting	Aswathy Das, Manoj Kumar Sharma, P. Thamilselvan, and P. Marimuthu	2013	Research Study	75 subjects from in-patient and out-patient tertiary mental health setting were assessed for addiction to information technology (internet, video games, and pornography) by the use of an internet addiction impairment index, video game use pattern, pornography addiction screening tool.	Statistical Package for Social Science 16.0	The study itself was excluded from this review, as it did not clearly define addiction, nor present a case for the use of the word in association with behaviors. Additionally, discrepencies in the citation and credibility of their screening methods were considered too unreliable for inclusion.
The Development of the Problematic Pornography Consumption Scale (PPCS)	Bőthe, B., et al.	2017	Research Study	1102 participants were recruited from a topic irrelevant facebook page. Of these, 772 met the inclusion criteria. Participants filled out a subjective well-being scale, the UCLA loneliness scale, relationship satisfaction measure, sexuality and pornography related general questions screen, and a problematic pornography consumption scale.	Confirmatory factor analysis, weighted least squares estimator, Comparative Fit Index, Tucker–Lewis index, and RootMean-Square Error of Approximation with Cronbach's alpha.	The study sought to create a problematic pornography consumption use scale that effectively measured all factors of problematic pornography use while maintaining specificity for each question. The scale delineates the factors or use such as frequency and duration. It also reports the effects of these factors on pathology such as loneliness and social impairment.
Can pornography be addictive? An fMRI study of men seeking treatment for problematic pornography use.	Gola, Mateusz, et al.	2016	Research Study	An fMRI analysis of 28 heterosexual males with self reported problematic pornogaphy use vs a control of 24 heterosexual males without problematic pornography use.	Statistical Parametric Mapping, FieldMap toolbox, and additional custom fMRI screening.	The study investigated craving and satisfaction differences between the two groups and concluded that problematic pornography use individuals exhibit an increased desire for visual sexual stimuli without significant increased satisfaction.

Review

One of the most important topics in discussing the potential addictive aspects of pornography is the correct identification of addictive behavior itself. In order to identify addictive behavior, one can look to the DSM for the defining characteristics of substance use disorders. Recent research has further refined the definition of addiction from the DSM in a way that separates the individual who experiences the addiction from the substance to which they are addicted. This gives the conversation a broader scope and allows for greater examination of the psychological pathology of addictive behaviors.

Characteristics of Addiction

DSM-V classifies commonly understood addictions (e.g., opioid and nicotine use disorders) and lesser known addictions, (e.g., problematic gambling) under substance-related and addictive disorders. Understanding the classification of these disorders may lend itself to understanding the hallmarks of addiction.

Substance-related and addictive disorders are recognized by four groupings of criteria: impaired control, social impairment, risky use, and pharmacological criteria. Each of these groups is further broken down into specific criteria used for making diagnoses. A disorder's severity can range from mild (2-3 criterion met) to severe (6 or more criterion met).

Impaired control is composed of four criteria. The first criterion is excessive use, which is characterized by greater frequency or longer duration of use of the substance than was originally intended. Criterion two consists of a desire to cut down or regulate one's substance use. This is commonly associated with unsuccessful attempts to decrease or discontinue use.

Criterion 3 requires spending a great deal of time engaging with the substance - obtaining, using, and recovering from it. Criterion 4 is "craving." Craving is an intense desire or urge to use the substance. The compulsion may be so strong that the individual is unable to think of anything else.

These first two criteria focus on excessive substance use. It should be noted that "excessive" is subjectively measured by the individual's desire to regulate use. The second two criteria focus on the extent of engagement with the substance. This is evaluated by the amount of time and attention given to the substance.

Social impairment is composed of three criteria which focus on the individual's occupational, social, and personal life. The first criteria states that the individual fails to fulfill major obligations or responsibilities in home or at work due to engagement with the substance. The second criteria notes that substance use persists, despite these impairments at work or at home. Similarly, the third criteria is characterized by abstaining from or reducing important social, occupational, or recreational activities due to substance use.

Risky use is defined by (1) substance use in situations where it is physically hazardous and (2) consistent use despite being aware that persistent physical or psychological problems can be caused or exacerbated by the substance.

Lastly, pharmacological criteria include (1) tolerance and (2) withdrawal. Tolerance is classified by increased doses being required to elicit the same effect, or a reduced effect from consumption of the usual dose. Tolerance varies widely by individual and substance and may be measured by laboratory test or by self-reported change in consumption over time. Withdrawal is characterized by the physiological symptoms associated with discontinued use of the substance. Similarly to tolerance, the symptoms of withdrawal can vary greatly by individual and substance (American Psychiatric Association, 2013).

The DSM-V specifically notes that neither tolerance nor withdrawal are necessary in the diagnoses of substance-related disorders. Accordingly, steps have been taken towards accepting disorders that do not have a physical stimulus by adding non-substance related disorders. The DSM-V includes gambling disorder, citing research that it shares many of the pathological features of substance related disorders. The DSM-V also notes that gambling addiction abuses the same reward-based neural circuitry as substance related disorders.

A study by Allen et al. (2017) follows suit by defining addictive behavior using four components: "excessive behavioral engagement," "craving for behavioral engagement," "diminished self-control over the behavior," and "continued behavior despite personal, social, or occupational impairment." These identifiers appear to be adapted from the DSM-V groupings of impaired control and social impairment. Having their definitions rooted in the DSM lends to the validity of these characterizations. Additionally, these characteristics are able to communicate the pathology of addiction without relying on defining the disorder based on substance use. They are equally applicable to both traditional substance use disorders and non-

traditional addictive behaviors. In this way, the identifiers widen the scope of the discussion of addiction without losing sight of the pathology of addiction.

Excessive Behavioral Engagement

A study from Gola and Potenza (2016), considered problematic pornography users to be addicted if users self reported as such. This is similar to the DSM-V criteria of impaired control, as self reporting may be a sign of an individual failing at attempts to reduce consumption. Furthermore, self reporting may indicate that pornography addiction is a more subjective disorder - that there is no degree of pornography use that constitutes an addiction for all individuals. It may be that it is the individual's dissatisfaction with their own lifestyle and choices regarding pornography that constitutes the disorder. Again, this is in accordance with the DSM characterization of excessive as defined by the individual to some degree. Accordingly, the implication for treatment may not necessarily be to discontinue pornography use, but to help the individual adjust their views and understanding of their lifestyle.

However, the same study also took note of each participant's pornography use per week, masturbations per week, and onset of pornography use with the implication that these all may be considered relevant criteria for a diagnosis of problematic pornography use. This may be the inverse of the previous argument: there is some objective threshold of pornography use that indicates addiction. Thus, the implication for treatment may be to lower pornography use below the objective threshold, so that the individual no longer experiences the pathology associated with the behavior.

Similarly, Gola et al. (2016) allowed males to self-report their problematic pornography use but all members of the PPU group met the criteria for hypersexual disorder as suggested by Kafka (2010). This continues the line of thought that pornography use may have both a subjective, self reporting component (i.e., the duress PPU places on the individual that indicates pathology) and an objective use threshold (i.e., daily/weekly consumption, possibly coupled to other behaviors).

Kafka's hypersexual disorder criteria mentioned in Gola et al (2016) include a loss of control and a large time consumption associated with the behavior. These criteria are consistent with the idea of a high degree of consumption being a characteristic of addictive behavior (Kühn, Gallinat, 2014; Bőthe et al., 2017). Kafka's loss of control is also in line with Brand et al. (2016) that noted a high degree of impulsivity in the case of internet-use disorder.

Social Impairment

Kafka's hypersexual disorder criteria not only includes a loss of control, but also social impairment and/or personal distress. It also involves a comorbidity with anxiety/depression in which engagement in sexual behavior is in response to those mood states. It is explicitly stated that not all of these criteria are necessary for hypersexuality classification, but the criteria themselves seem to imply that personal subjective measures of pathology (i.e., psychological distress) may be components of pornography addiction. The criteria also suggest that more observable subjective measures, such as social or occupational impairment, may be significant clinical markers of pornography addiction. This is in line with the characteristic of addictive behavior, "continued behavior despite social or occupational impairment," seen in Allen et al. (2017) as well as the DSM-V criteria grouping of social impairment.

Kor et al. (2014) sought to develop a

psychometric based PPU scale by modifying a scale from an internet addiction test, a hypersexual disorder questionnaire, and a self-report internet pornography use scale. This scale asked questions about distress and functional problems, excessive use, control difficulties, and escape/avoiding negative emotions with respect to pornography use. The experimenters then conducted an online survey with 298 participants. Although social impairment was not directly surveyed, they found a moderate correlation between PPU scale score and emotional avoidance. This may be indicative that pornography use causes personal impairment through an avoidance mechanism.

Furthermore, in a study by Voon et al. (2014), study subjects diagnosed with compulsive sexual behavior (CSB) reported several forms of social impairment, including: employment instability due to pornography use at work, inability to maintain intimate relationships, diminished libido with in-person sexual encounters, and suicidal ideation, and excessive spending. These self reports indicate that in severe cases, pornography use has the potential to cause serious impairment. However, it is important to note that these patients were recruited from internet based advertisements and therapist referrals. Although it was the intention of the researcher to find particularly severe cases of CSB patients for their experimental group, many of these patients may have compulsive sexual behavior that spans outside of pornography use.

Relevance to DSM

The DSM-IV did not recognize addiction as a useful diagnostic tool, rather it characterized drug addiction as a "substance use disorder". Substance referred only to illicit drug abuse, medications, and toxins. Additionally, key features of a substance use disorder involved dependence, tolerance, withdrawal, and compulsive use. Dependence covers the concepts of diminished self control, noting patients with substance use disorders may "take the substance in larger amounts or over longer periods of time than intended," and have "many unsuccessful efforts to decrease or discontinue use." Dependence also covers excessive behavioral engagement and continued behavior despite personal, social, or occupational impairment, noting that substance use disorder patients may have "virtually all of the person's daily activities revolve around the substance," and "important social, occupational, or recreational activities may be given up or reduced because of the substance use," (American Psychiatric Association, 1994).

Under the DSM-V update, there has been a trend away from the physiological symptoms of substance use and a trend toward the psychological basis of "substance related disorders," and the related activation of the brain's reward system. The DSM-V notes that although these disorders are distinctly related to the consumption of a substance, changes in brain circuitry may persist after detoxification. This important addition shows that substance related disorders have some impact on the brain that is lasting and potentially neuro-physical. Craving, or "a strong desire or urge to use a substance," became an official addition to the features of substance related disorders. This is in line with Allen et al. (2017) characterization of addiction.

Furthermore, DSM V has begun to recognize "non-substance related disorders" under the section "substance-related and addictive disorders." Currently, DSM-V only lists gambling as a non-substance related disorder, recognizing that substance related disorders share a characteristic activation of the brain reward system with gambling.

However, the DSM specifically notes that it does not accept behavioral addictions on that basis that, at the time of writing, there was insufficient peer-reviewed evidence for the diagnostic criteria and course description of behavioral addictions.

The DSM acknowledges criteria of addiction that are not presently discussed in PPU, under the subsection of substance related disorders: substance induced disorders. These criteria include withdrawal and tolerance. There is also no threshold of use that must be met for substance use disorder, it is only necessary that overall use increases. It should be noted that the DSM does not require all criterion to be met for an individual to be diagnosed with a substance use disorder, but it does not currently recognize pornography as a class of substance (American Psychiatric Association, 1994).

Pornography has been shown to meet the DSM characteristics of craving, excessive engagement, loss of self control, and personal impairments for substance related disorders. However, as there does not seem to be any evidence at this time for tolerance and withdrawal for pornography use, nor does it distinctly match the criteria of a substance as laid out by the DSM, PPU does not meet the criteria for a substance related disorder. However, as it does share characteristic activation of the brain reward system and pathological psychological and social characteristics, it should be considered for addition to the DSM under non-substance related disorders.

Investigation of Craving

Craving was examined in a study by Gola et al. (2016) in which an experimental PPU group and a control were asked to perform a discrimination task (in which they distinguished between a square and a triangle in less than 1 second) after being told what type of reward, either erotic or monetary, they would get from correctly completing the task. Both the control and the PPU group showed the same accuracy in distinguishing between the shapes when presented with either a monetary or erotic reward. Similarly, increased reward size indicated smaller reaction times for both groups. However, the PPU group had the shortest reaction time when presented with the opportunity for an erotic reward and showed decreased accuracy when presented with control tasks (no reward).

Moreover, during the cue phase the PPU group demonstrated under an fMRI to have increased activation in the ventral striatum, an area of the brain associated with cue reactivity and craving. Activation was the same during the reward phase as the control. This finding suggests individuals with PPU experience a greater desire for pornography, without an increased enjoyment (Gola et al., 2016).

A similar study by Voon et al. (2014) showed nine second videos that were either explicitly sexual, erotic, non-sexually exciting, money-related or neutral to members of a compulsive sexual behavior (CSB) group and a control group. Both groups contained 25 men each; however, the CSB group completed an extensive questionnaire that included onset, frequency, duration, attempts to control use, abstinence, patterns of use, treatment, and negative consequences. Following the questionnaire, the CSB group members met with a psychiatrist to confirm that they fulfilled the diagnostic criteria for CSB.

Self reported measures showed that the "craving" and "liking" of a stimulus varied both by group and by stimulus type. The CSB group showed increased craving for sexually explicit stimuli and increased liking for erotic stimuli compared to controls.

Further, fMRI analysis showed that,

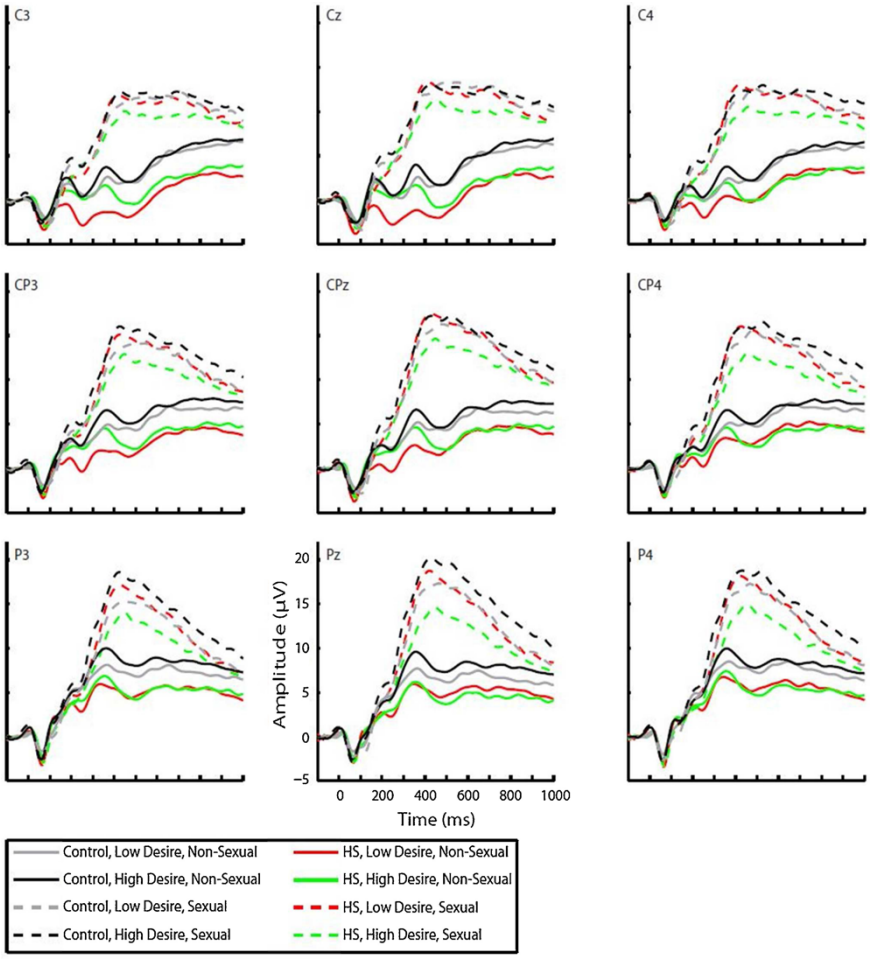
when presented with explicit stimuli, the CSB group had greater activation in the right ventral striatum (cue reactivity and craving) and the substantia nigra (dopaminergic function).

Similarly, an fMRI study of smokers vs nonsmokers was conducted in which the two groups were shown images of people smoking. The smoking group displayed increased activation in the ventral striatum compared to the control (nonsmoker) group (David et al., 2005). This finding demonstrates that individuals with a traditional substance use disorder (i.e. smoking) and individuals with PPU share an increased activation of the ventral striatum when presented with their respective stimulus. This shared biological marker may indicate that PPU subjects share the same or similar levels of craving for their stimulus as smokers do.

Craving and LPP

Interestingly, an electroencephalogram (EEG) study performed on the late positive potential (LPP), a potential that is commonly related to motivation and sustained attention, showed below normal activation in the LPP in PPU subjects, compared to a control, when both were shown explicit sexual imagery (Prause et al., 2015). The study noted that this was inconsistent with the current addictive model, as the visual sexual stimulus (VSS) should have elicited higher responses than the control, indicating a higher degree of craving, as demonstrated in studies of the LPP and drug abuse.

A study by Dunning et al. (2011) focused on the LPP as it relates to cocaine users. Cocaine users were found to have a much higher LPP rating than the control (non-cocaine users) when shown cocaine related images.



EEG data on the LPP as conducted by Prause et al. (2015). The amplitude of the LPP is correlated to sustained attention and motivation. It can be seen here that sexual images evoked the largest potentials in both groups; however, the control group exhibited larger LLP amplitudes in all categories and a greater difference in activation between neutral and sexual stimuli.

A 2016 paper from Gola responded to Prause et al. (2015), asserting that in studies on drug addiction, the imagery used can be considered the conditioned stimulus, as it does not elicit a response in individuals who are not addicted. It elicits a response in drug users who associate the imagery with the engaged behavior. In the case of VSS, viewing pornography is the engaged behavior, and therefore the unconditioned stimulus. A weaker activation to the uncontrolled stimulus is noted as being consistent with the incentive salience theory, which dictates a divergence in the "craving" and "liking" of an addictive behavior (Gola, 2016). Salience theory states that ordinarily,

people crave something, obtain it, and proceed to enjoy it. Drug users on the other hand, will crave something they do not enjoy. The incentive salience theory of addiction matches Allen et al.'s (2017) study on the basis that salience theory calls for continued desire to engage (craving) despite the behavior causing serious personal impairment (devoid of liking).

Under this interpretation, the explicit stimulus used by Prause et al (2015) mimics the effects of pornography exactly. In the study by Dunning et al. (2011), this would be akin to directly using cocaine, since it is not a cue for the stimulus; it is the stimulus. Dunning et al., (2001)'s study uses a cue for cocaine to trigger the subject's craving. This could be likened to showing PPU subjects images of their preferred pornography medium t without actually showing them the explicit material. The medium would then cue the craving in the PPU subjects.

Diminished Self Control

Lastly, impaired control over the behavior is suggested in behavioral addiction theories (Allen et al., 2017; Potenza, 2008) and was investigated by Kühn and Gallinat (2014) in an MRI study of patients who self-reported their pornography use. In both groups, pornography use per week was estimated by the participants and a negative correlation was found between hours spent viewing pornography per week and right caudate volume, as well as functional connectivity of the right caudate to the left dorsolateral prefrontal cortex (Kühn, & Gallinat, 2014). The prefrontal cortex is the region of the brain associated with executive function, controlling behavior, personality, and complex behavior (Yang & Raine, 2009). The right caudate has been implicated in inhibitory control of action (Malenka et al., 2009).

These findings are of particular interest because they match an MRI study conducted on alcohol abuse relapse patients. These patients were found to have a decrease in the caudate volume (Wrase, 2008). However, Jacobsen et al. (2001) found an increase in caudate volume when performing MRIs on patients with cocaine addiction. It should be noted that Kühn, Gallinat, (2014) cited both of these studies and theorized it may not be the size, but the difference in size between the caudate that matters.

A study by Hong et al. (2013) on internet addiction showed that individuals who were considered "internet addicted" by the Young Internet Addiction Scale (Widyanto & McMurran, 2004), had significantly decreased functional connectivity in the cortico-subcortical circuits. Accordingly, in the prefrontal cortex. Hong et al. (2013) found this to be consistent with current addiction models of the prefrontal cortex.

Opposing Views

A critique of the current literature was conducted by Ley et al. (2014) citing the ambiguous nature of the term addiction, and criticizing the current mechanism of addictive behaviors (i.e., the reward system pathway). The critique further mentions the need for a distinctive checklist for PPU or pornography addiction and goes on to discuss gaps in the literature. Since the critique's publication, researchers have made several attempts to remedy the lack of a definitive system for distinguishing PPU from non-problematic pornography (Bőthe et al., 2017). These scales attempt to measure and classify pornography use based on both self-reported measures of consumption as well as the subjective experience of individuals as they relate to pornography use.

Furthermore, Ley et al. (2014) discuss the incentive salience theory of addiction and mention that it has not been proven in the case of pornography use. This was prior to

the fMRI studied as mentioned above, conducted by Gola et al. (2016). Moreover, Ley et al. (2014) mention specific portions of the brain ("dopamine, glutamate, and GABA in the fronto-limbic system involving the interconnectedness of the ventral tegmental area, nucleus accumbens, amygdala, and prefrontal cortex"). Although there have been no longitudinal studies of these areas, Gola et al. (2016) and Kühn and Gallinat (2014) have since released publications investigating these areas of the brain as they relate to pornography. Ley et al. (2014) also cited Prause et al. (2015) (pre-publication data) on the LPP activation in individuals reporting PPU. This finding is now considered controversial because it may indicate either a decrease in "craving" (Prause et al., 2015) or a decrease in "liking" (Gola, 2016). A major critique questions whether the explicit images used by Prause et al. (2015) were sufficient to act as the PPU stimulus themselves or the explicit images served only as a cue for stimulus craving. If the stimulus functioned as a cue, a decrease in the LPP would indicate a decrease in craving. Conversely, if the explicit image served as a PPU stimulus to the subject, the decrease in the LPP would indicate a decrease in liking of the stimulus.

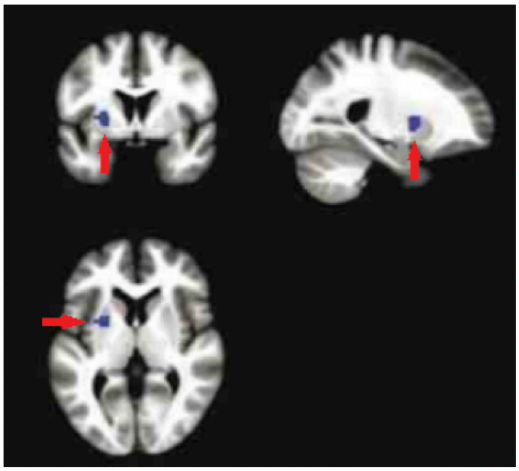
Please, think back to the last six months and indicate on the following 7-point scale how often or to what extent the statements apply to you. There is no right or wrong answer. Please indicate the answer that most applies to you.

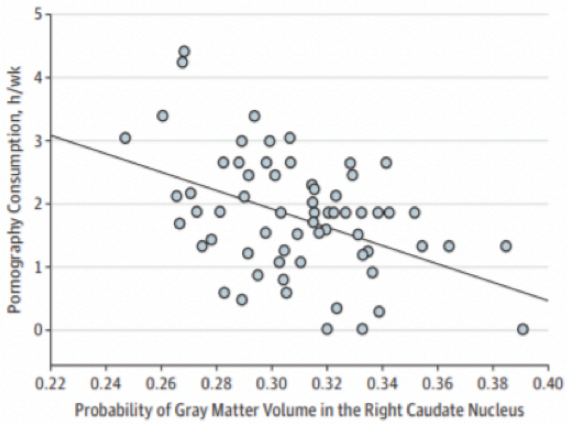
1- Never *2- Rarely* *3- Occasionally* *4- Sometimes* *5- Often* *6- Very often* *7- All the time*

	1	2	3	4	5	6	7
1. I felt that porn is an important part of my life	O	O	O	O	O	O	O
2. I used porn to restore the tranquility of my feelings	O	O	O	O	O	O	O
3. I felt porn caused problems in my sexual life	O	O	O	O	O	O	O
4. I felt that I had to watch more and more porn for satisfaction	O	O	O	O	O	O	O
5. I unsuccessfully tried to reduce the amount of porn I watch	O	O	O	O	O	O	O
6. I became stressed when something prevented me from watching porn	O	O	O	O	O	O	O
7. I thought about how good it would be to watch porn	O	O	O	O	O	O	O
8. Watching porn got rid of my negative feelings	O	O	O	O	O	O	O
9. Watching porn prevented me from bringing out the best in me	O	O	O	O	O	O	O
10. I felt that I needed more and more porn in order to satisfy my needs	O	O	O	O	O	O	O
11. When I vowed not to watch porn anymore, I could only do it for a short period of time	O	O	O	O	O	O	O
12. I became agitated when I was unable to watch porn	O	O	O	O	O	O	O
13. I continually planned when to watch porn	O	O	O	O	O	O	O
14. I released my tension by watching porn	O	O	O	O	O	O	O
15. I neglected other leisure activities as a result of watching porn	O	O	O	O	O	O	O
16. I gradually watched more "extreme" porn, because the porn I watched before was less satisfying	O	O	O	O	O	O	O
17. I resisted watching porn for only a little while before I relapsed	O	O	O	O	O	O	O
18. I missed porn greatly when I didn't watch it for a while	O	O	O	O	O	O	O

Scoring: Add the scores of the items of each factor. For the total score add all the scores of the items. 76 points or more indicate possible problematic pornography use

The latest tool for assessing PPU as indicated by a multifactor analysis (Bőthe B et al., 2017). The questionnaire inquires about many of the characteristics of addiction discussed in this review such as: salience (questions 1, 7, and 13), relapse (5, 11, and 17), tolerance (4, 10, and 16), withdraw (6, 12, and 18), mood modification (2, 8, and 14), and conflict (3, 9, and 15).





Left, MRI image indicating the area of interest, the right caudate (Kühn S, Gallinat J., 2014).

Right, Table demonstrating the slight negative correlation between hours of pornography use per week and the volume of the right caudate nucleus (Kühn S, Gallinat J., 2014).

Where Ley et al. (2014) still stands is that the word "addiction" is not formally recognized by psychological scientists as it is ambiguous and carries a negative connotation. Moreover, pornography addiction has not scientifically demonstrated that in "addicted" individuals that use increases over time. Without this information, it is not clear whether individuals are becoming "addicted" or if these same individuals experience a higher baseline of consumption due to a higher sex drive. Ley et al. (2014) then concludes that pornography addiction cannot be demonstrated without longitudinal studies that investigate the causalities of the correlations demonstrated in Gola et al. (2016) and Kühn and Gallinat (2014).

Conclusion

The review seems to illustrate the existence of pornography addiction; however, it would still be premature to confirm these findings without further study. Kühn S. and Gallinat (2014) cite the need for longitudinal studies in order to determine causation between PPU and neurological markers. Similarly, the number of studies directly focused on PPU and neurological markers is limited. Therefore, it should be noted that these concepts are still in their infancy and cannot be used e to make definitive conclusions. However, at present, it can be concluded that frequent pornography use does correlate to different neurological activity more so than control groups with clinically normal/healthy pornography use levels. That activity's meaning is still up for debate. However, PPU behavior does seem to match the incentive salience theory of addiction, and also has significant neurological similarities to drug addiction.

It should be noted that PPU may differ significantly from substance use. Substance abuse involves chemicals that mimic or add to biological functions to create a response, whereas PPU is considered a supernormal stimulus (Hilton, 2013). A supernormal stimulus, rather than mimicking a chemical to elicit an effect, over excites a naturally occurring pathway in which there is already a response tendency (Martin & Hine, 2008)

Furthermore, PPU does not seem to match enough of the DSM's characteristics of substance use disorder to be included. More research regarding its overall effects, withdrawal, and tolerance will be necessary to completely exclude or include it from that

category. However, the DSM has been moving towards adopting behavioral addictions, as seen in the case of gambling addiction (American Psychiatry Association, 2013). Therefore, the DSM may encompass PPU under the non-substance related category provided that sufficient research has been published on the matter.

This review could have been improved by using more objective search criteria and extending the number of articles researched. "Visual sexual stimulus" may have offered far fewer applicable studies, but would have resulted in a range of more objective articles. Similarly, increasing the number of articles reviewed would have offered a more complete summation of the topic and increased validity.

Studies regarding PPU are giving validity to behavioral addictions as diagnosable disorders. Further research may result in a shift entirely away from substance related disorders and into a classification for system that relies wholly on a stimulus and its effects on the individual. If behavioral addiction becomes the norm, we may see any stimulus qualify as addictive, provided it meets the criteria discussed above and demonstrates significant pathology.

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