Emotion Regulation as a Potential Mediator between Sleep Quality and Intimate Partner Violence Among College Students

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ABSTRACT

College populations evidenced an elevated risk of impaired sleep, with 60% of college students showing disturbed sleep patterns. While more sleep was correlated with better emotional and psychological functioning, sleep deprivation was associated with higher levels of perceived psychological distress. Not surprisingly, sleep impairment affects the capacity for emotion regulation. When examined in experimental, lab-based paradigms and cross-sectional survey studies, sleep impairment and emotion dysregulation was associated with violence perpetration, including intimate partner violence (IPV). It follows that sleep impairment may increase risk for IPV perpetration through its effects on emotion dysregulation. The current study ~~aims to~~ tested the hypothesis that impaired sleep promotes emotion dysregulation and IPV. Gender and site differences were also examined. The data obtained from students (n = 1018) at two universities, were analyzed using structural equation modeling. The results revealed significant paths from sleep quality to emotion dysregulation to psychological aggression perpetration and separately to physical assault perpetration. No site differences were evidenced and, as hypothesized, there were no gender differences. Findings expand current conceptualizations of IPV by the addition of sleep quality and emotion dysregulation in a single model. Support for the association between sleep impairment and emotion dysregulation within a mediation model for IPV suggested that both constructs may be potential points for intervention after the onset of IPV as well as for prevention efforts that would teach such skills prior to onset. Limitations regarding the sample and study design are discussed along with areas for future research.

TABLE OF CONTENTS

CHAPTER ONE: INTRODUCTION AND GENERAL INFORMATION 1
Intimate Partner Violence 1
CHAPTER TWO: LITERATURE REVIEW 3
Emotion Dysregulation and IPV 3
Sleep Quality and IPV 5
Sleep Quality and Emotion Regulation 7
Sleep, Emotion Regulation, and IPV 8
Purpose and Hypotheses 9
CHAPTER THREE: METHOD 11
Participants 11
Procedure 12
Measures 12
Physical and Psychological IPV Perpetration. 12
Emotion Dysregulation. 13
Sleep Quality. 14
Alcohol Use/Problems. 14
Data Analytic Strategy 15
CHAPTER FOUR: RESULTS 18
Descriptive Statistics 18
Analysis of Model Fit 18
Path Analysis for the Overarching Model 19
Site Moderation 20
Gender Moderation 20
CHAPTER FIVE: DISCUSSION 21
Limitations and Future Research 23
Clinical Implications 24
Conclusions 25
REFERENCES 27
APPENDICES 38
VITA 41

CHAPTER ONE: INTRODUCTION AND GENERAL INFORMATION

Intimate Partner Violence

Intimate partner violence (IPV) is a significant societal problem. IPV includes physical or psychological acts of violence toward a romantic partner (Black et al., 2011). Physical IPV encompasses all acts of deliberate physical aggression against a partner (Saltzman, Fanslow, McMahon, & Shelley, 2002). Examples of physical IPV include acts such as punching or choking (Straus, Hamby, & Warren, 2003) with the possibility of serious injury or death (Saltzman et al., 2002). Psychological IPV includes behaviors intended to blame, humiliate, intimidate, or dominate a romantic partner (Follingstad, Coyne, & Gambone, 2005). Such acts can include verbal degradation, threats of harm to the victim or their family, and social isolation (Lawrence, Yoon, Langer, & Ro, 2009). Additionally, such acts were correlated with physical IPV, with many suggesting there may be a causal link between these two types of violence (Baker & Stith, 2008; Hamby & Sugarman, 1999).

Extant research demonstrated that victims of IPV experience numerous negative IPV consequences, including problems related to physical health, mental health (e.g., depression, anxiety), and overall daily functioning (Coker et al., 2002). Such mental and physical health problems can contribute to high medical costs and loss of productivity resulting in an extreme economic burden. Indeed, when examining the impact of IPV on women, the cost was estimated to exceed 5.8 billion dollars annually (National Center for Injury Prevention and Control, 2003). Costs could even exceed this estimate as national surveys did not examine the combined monetary impact of IPV on both men and women. These consequences are particularly concerning with regards to the estimated prevalence rates of IPV perpetration among college populations. Physical IPV perpetration was reported to occur in 20-37% of dating partnerships,

and psychological IPV was reported in 70-90% of dating relationships (Shorey et al., 2008). Given the economic, physical, and psychological costs of IPV, it is imperative to examine understudied risk factors for IPV perpetration to improve IPV prevention and intervention programs.

CHAPTER TWO: LITERATURE REVIEW

Emotion Dysregulation and IPV

One such risk factor that has garnered increased attention in recent studies is the inability to self-regulate emotional experiences, or emotion dysregulation (Gross & Thompson, 2007). Adaptive emotion regulation involves healthy expression and suppression of negative affect and emotion (Roberton, Daffern, & Bucks, 2012). However, those who experience emotion dysregulation may over- or under- utilize strategies leaving them unable to contain their emotional experiences or overly suppress them (Roberton et al., 2012). Difficulties self-regulating emotional experiences is a key facilitator of aggression (Finkel, 2007). Emotion dysregulation may externalize through aggression perpetration and, more specifically, IPV (Shorey et al., 2011). Researchers suggested that IPV perpetration may serve as a maladaptive tool to regulate emotional experiences (O'Neil & Harway, 1997). This inability to cope with affect was a risk factor for IPV perpetration among a group of men in batterer intervention programs who reported frequently experiencing affect that was difficult for them to manage (Tager, Good, & Brammer, 2010). In another study of men and women arrested for IPV and court mandated to batterer intervention programs, participants reported that a significant motivator for their perpetration of physical IPV was to deal with negative emotions (Elmquist et al., 2014). In a sample of college students, emotion dysregulation moderated the association between different forms of daily negative affect and physical IPV but not psychological aggression (Shorey, McNulty, Moore, & Stuart, 2015). However, Shorey et al. (2015) called for more research of known correlates of IPV perpetration as emotion regulation may play a significant role in both physical and psychological IPV.

Perpetrating general violence to ameliorate negative emotional experiences has been tested in experimental studies. College students' reactions to provocation were examined when the researchers induced them to believe that "venting" anger would serve as a catharsis and improve their emotional state states (Bushman, Baumeister, & Phillips, 2001). Participants received negative evaluations on a task and were then placed within a laboratory aggression paradigm in which they could perpetrate aggression by delivering noise blasts to a stranger. Individuals were more likely to aggress if they believed such acts would improve their current affective state (Bushman et al., 2001). This suggests that those who cannot regulate emotion may turn to aggression as a method of reducing negative affect.

Additional research supported the temporal relation between emotion dysregulation and IPV perpetration. One such study examined college students with and without histories of IPV perpetration to examine the interaction between emotion dysregulation strategies and insulting or demeaning verbalizations to characters in evocative dating scenarios. Among perpetrators of IPV, emotion regulation skills training via the utilization of cognitive reappraisal decreased aggressive verbalizations whereas using maladaptive strategies (e.g., expressive suppression) increased aggressive verbalizations (Maldonado, DiLillo, & Hoffman, 2015).

This is supported in cross-sectional studies of IPV perpetration in college students which demonstrated that emotion dysregulation is a risk factor for physical and psychological IPV perpetration (Bliton et al., 2016; Shorey et al., 2011). This body of work demonstrated that emotion dysregulation is a salient risk factor IPV and aggression and should remain a continued focus of research efforts. However, extant literature highlights the importance of examining emotion dysregulation within the framework of other known risk factors and contexts (e.g. Shorey et al., 2015). This is further highlighted via widely supported theories of IPV which

emphasize the salient and compounding nature of situational and dispositional factors in violence perpetration (Finkel, 2007).

Sleep Quality and IPV

Shorey et al. (2015) indicated that it is important to study emotion regulation within the context of its potential interactions with known IPV risk factors. Sleep is one such factor. Sleep is a vital aspect of maintaining physiological and psychological health (e.g., Walker, 2010; Xie et al., 2013). The definition of good sleep quality varies widely in the literature (Ohayon et al., 2017). In their review, a panel of sleep experts determined that shorter sleep latencies, or the time it takes for an individual to go from awake to fully asleep, fewer awakenings throughout sleep, and higher quantity of sleep after onset were indicative of good sleep quality (Ohayon et al., 2017). Conversely, impairments in any of these areas can decrease sleep quality and result in negative physical and mental health consequences (Killgore, 2013; Reynolds & Banks, 2010). Good sleep quality contributes to processes such as learning new information, toxin disposal, physical regeneration, and regulating emotional experiences (Walker, 2010; Xie et al., 2013). Poor quality sleep was associated with many negative consequences including lowered energy, cognitive impairment, and psychological distress (Killgore, 2013; Reynolds & Banks, 2010).

College populations evidenced an elevated risk of having poor quality sleep, with 60% showing disturbed sleep patterns (Lund et al., 2010). In the midst of a critical developmental period, many may be susceptible to developmental changes in their sleep/wake cycles resulting in going to bed later (Carskadon, Acebo, & Jenni, 2004). This coupled with the tendency for college students to have academic and other requirements early in the morning results in erratic sleep schedules both day to day and from weekdays into the weekend where many students try to "catch up" on sleep (Gaultney, 2010; Lund et al., 2010). However, varying sleep schedules and

overall poor sleep quality impacts multiple areas of functioning for college students including physical, psychological, and academic impairment (Gaultney, 2010; Trockel, Barnes, & Egget, 2000). Overall, college students face unique stressors combined with functional impairment from sleep quality which may result in a cycle of worsening sleep quality and other negative impacts (Buboltz, Brown, & Soper, 2001).

In addition to academic, physical, and psychological problems associated with decreased sleep quality, sleep disruptions (e.g., any deviations or alterations in sleep timing or quantity), a component of overall sleep quality, may play a salient role in the perpetration of aggression (Krizan & Herlache, 2016). Studies showed that sleep deprivation was related to increased frequency of physical and psychological IPV perpetration (e.g. Keller et al., 2014; Kelly & Bagley, 2017) and that perpetrators of IPV had higher levels of sleep disturbances relative to the general population (Hoshino et al., 2009). Keller et al. (2014) studied 108 female undergraduates while Kelly and Bagley (2017) examined 108 couples through actigraphy and self-reports of sleep quality and IPV perpetration. Both found significant associations between impairment in sleep quality and increased IPV perpetration, with Kelly and Bagley (2017) additionally finding that IPV victimization negatively impacted the victims' sleep cycle.

Some researchers attributed this increase in IPV frequency to sleep's role as a potential instigator for violence perpetration, lowering inhibition, and increasing impulsivity in reaction to negative stimuli (Anderson & Platten, 2011). Past studies indicated that interpersonal conflict is more likely to occur after a night of poor sleep quality and that couples may have a lowered capacity for conflict resolution when in sleep deprived states (Gordon & Chen, 2014). In particular, following nights of poor sleep, couples could not utilize empathetic reasoning and presented with higher levels of negative affect compared to positive affect (Gordon & Chen, 2014). These studies indicated that the relation between sleep quality and emotion dysregulation is

important to consider. In addition, when considering the differences in sleep patterns between perpetrators and non-perpetrators of IPV, authors emphasized that sleep disturbances were frequently associated with high levels of anxiety or alcohol use, which are both constructs that can be influenced by emotion dysregulation and were common in IPV perpetration (Aldao & Dixon-Gordon, 2014; Campbell-Sills & Barlow, 2007; Foran & O'Leary, 2008). Such studies indicated that emotion dysregulation and sleep may be important to consider within integrated models of IPV perpetration.

Sleep Quality and Emotion Regulation

The interconnected nature of sleep to emotion and emotion regulation is largely attributed to the impact of neural networks. More specifically, lower prefrontal amygdala activity and prefrontal cortex connectivity are dependent on sleep quality (Gruber & Cassoff, 2014; Killgore, 2013). Research suggested that the amygdala and prefrontal cortex modulate emotions and that the degree of their network connectivity has the capacity to affect executive functioning and, by extension, emotional reactivity and impulsivity (Gruber & Cassoff, 2014). The functional connectivity within these systems is an essential factor in emotion regulation (Banks, Eddy, Angstadt, Nathan, & Phan, 2007). Higher sleep quality increased these connections and, correspondingly, an individual's capacity to regulate their emotions (Gruber & Cassoff, 2014).

Correlational data indicated that greater sleep duration was correlated with higher emotional and psychological functioning, and sleep deprivation was correlated higher levels of perceived psychological distress (Killgore, 2013). College students who sleep less worried more (Kelly, 2002). Even when controlling for factors such as anxiety and depression, sleep duration still negatively associated with neuroticism and self-criticism (Vincent, Cox, & Clara, 2009). Baglioni, Spiegelhalder, Lombardo, and Riemann (2010) noted a trend of empirical findings in

which poor sleep predicted the onset of mood and anxiety disorders, and disordered sleep is associated with all affective disorders generally (Kryger, Roth, & Dement, 2000). Positive affect as a whole was negatively associated with sleep quality overall, not just measures of sleep duration (Steptoe, O'Donnell, Marmot, & Wardle, 2008). As such, adolescents who were restricted to 6.5 hours of sleep per night reported, in corroboration with parental reports, that they experienced difficulty regulating their emotions leading to outbursts and other responses that were out of proportion with the triggering stimuli (Baum et al., 2014). Such studies suggested a link between not just sleep and affective states but the ability to regulate such states. Mauss et al. (2013) examined this within a laboratory paradigm in which college participants viewed one neutral film and three short films meant to induce moderate sadness. During the second or third sad film, participants were instructed to use cognitive reappraisal, a skill dependent on higher order functioning and a facet of emotion regulation (Gross, 2002; Ochscner & Gross, 2005), to regulate their negative affective experiences. Mauss et al. (2013) found that poor sleep quality negatively impacted individuals' ability to use cognitive reappraisal. Thus, past studies uniformly support the connection between sleep quality and emotion regulation.

Sleep, Emotion Regulation, and IPV

Some researchers speculated that prolonged intervals of disrupted sleep may play a causal role in the perpetration of aggression and that sleep interventions may be important for decreasing general violence perpetration (Kamphuis, Meerlo, Koolhaas, & Lancel, 2012). In one intervention, a population of substance abusing adolescents undergoing behavioral sleep interventions exhibited decreased general aggressive ideations and actions as their sleep quality improved (Haynes et al., 2006). Researchers suggested that the key mediating factor between poor sleep quality and the perpetration of general aggression is the loss of control over emotions

including the ability to regulate impulses (Kamphuis et al., 2012). More broadly, many speculated that this causal link may be mediated by factors such as emotion dysregulation (Keller et al., 2014).

The theoretical implications of sleep disruption coupled with prominent violence theories supported this view. Krizan and Herlache (2016) posited that sleep has three distinct pathways to aggression that may overlap to increase the likelihood of perpetration: The affective pathway, cognitive pathway, and response-control pathway. Taken together, these pathways may intensify negative stimuli and emotional experiences, make threats in the environment appear more hostile and salient, and lower inhibition which can normally compensate for aggressive urges (Krizan & Herlache, 2016). As such, sleep may impact an individual by negatively influencing mood and regulation of both emotion and proclivities toward aggression. Consistent with this, the literature reviewed suggested that sleep quality may affect both emotion dysregulation and IPV, and that emotion dysregulation relates to IPV. However, despite theoretical support and the empirical associations found between sleep quality, emotion regulation, and IPV, investigators have not examined the potential indirect effects of sleep disruption on IPV perpetration through emotion dysregulation.

Purpose and Hypotheses

The current study extended prior empirical and theoretical research by examining the indirect effects of sleep quality on IPV perpetration through emotion dysregulation in a sample of college men and women. As this is an at-risk sample (e.g. Lund et al., 2013; O'Leary, 1999), tests of these effects could inform conceptualizations of the contexts and mechanisms by which IPV may occur among young adults above and beyond the influence of alcohol. Based on theory and previous research, it was hypothesized that impaired sleep quality would associate with

increased emotion dysregulation, which would, in turn, relate to increased psychological and physical IPV perpetration while controlling for the known associations between these two types of violence. Past empirical findings supported associations between alcohol use and IPV (Moore, Elkins, McNulty, Kivisto, & Handsel, 2011), emotion dysregulation (Petit et al., 2015; Weiss, Bold, Sullivan, Armeli, & Tennen, 2017), and sleep quality (Thakkar, Sharma, & Sahota, 2015). Thus, alcohol use/problems was controlled for in all phases of the study. Additionally, although gender differences were not expected based on prior theory and research, it is possible that unmeasured extraneous variables dependent on gender may impact these paths. As such, gender differences were examined within the current study. It was hypothesized that paths would not differ based on gender.

CHAPTER THREE: METHOD

Participants

Researchers recruited 1018 men (N= 169) and women (N=849) from Ohio University and Grand Valley State University psychology participant pools. Participants were all 18 years old or older and in a romantic relationship for at least one month prior to recruitment. Racial composition for the sample was primarily Caucasian/White (84.1%), followed by African American/Black (3.5%), Asian (3%), Multiracial (3%), Middle Eastern (0.6%), Other (.6%), American Indian or Alaskan Native (0.5%), and Native Hawaiian or other Pacific Islander (0.2%). A small portion of the sample chose not to report race (4.5%). The mean age for the sample was 18.93 (*SD* = 1.48) years. As two sites were utilized for data collection, differences in demographics across sites were examined. Students recruited from Ohio University (*M* = 18.31, *SD* = 18.41) did not differ in average relationship length compared to students at Grand Valley State University (*M* = 16.19, *SD* = 15.81); *t* (993) = 1.92, p = .06. Students recruited from Ohio University (*M* = 19.13, *SD* = 1.68) were significantly older than students recruited from Grand Valley State University (*M* = 18.27, *SD* = 2.27); *t*(1010) = 6.96, *p* < .001. Gender also differed between Ohio University (Men = 13.9%; Women = 85.1%) and Grand Valley State University (Men = 15.2%; Women = 60.9%); $\chi^2(1) = 6.47$, *p* = .02. Racial composition of the sample also differed significantly; $\chi^2(1) = 16.93$, *p* = .02. The racial composition for Ohio University was: White/Caucasians (84.8%), Asian (4.1%), Multiracial (3.9%), Black or African American (3.6%), Middle Eastern (.7%), Native Hawaiian or other Pacific Islander (.3%), and American Indian or Alaskan Native (.2%). The racial composition of Grand Valley State University was: White/Caucasians (83.4%), Black or African American (3.4%), Multiracial (1.9%), Asian (1.7%), American Indian or Alaskan Native (.8%), and Middle Eastern (.4%).

Procedure

Participants signed up for this study through the SONA Psychology online system (http://www.sona-systems.com) for course credit within the psychology department. Upon signing up for the study, SONA sent an automated email to the student including the link to the online survey administered through Qualtrics. Participants read over an electronic informed consent form before participating and indicated their consent by clicking an acknowledgement button. Participants could also print this consent form for their records. Participants then had the option to complete surveys including the measures outlined below. Completion of study measures took approximately an hour. Upon completion, participants were brought to a debriefing page which included a list of available psychological resources. The SONA system granted all participants one course credit when they began their participation and was not contingent on completion of the survey. Participants could skip any questions they did not want to answer without penalty.

Measures

Physical and Psychological IPV Perpetration.

The 20 perpetration items of the Psychological Aggression and Physical Assault subscales of the Revised Conflict Tactics Scales (CTS2; Straus, Hamby, Boney-McCoy, & Sugarman, 1996; Straus, Hamby, & Warren, 2003) assessed self-reported psychological and physical IPV perpetration in the past 12 months. Participants rated each of these items on a 0 to 7 scale. Ratings 0-6 corresponded to the perpetration frequency for each act (0 = not at all; 6 = more than 20 times). All scores of 7 were recoded to 0 as they indicated behavior occurring outside of the 12-month range of interest (i.e., happened before but not in the past 12 months). The midpoints for each item response (e.g., a 4 for the response 3–5 times) of the Psychological

Aggression and Physical Assault subscales were summed to calculate the total scores (Straus et al., 2003). More frequent IPV perpetration was represented by higher total scores. The CTS2 is a commonly used measure of IPV perpetration found to be reliable and valid (Straus et al., 1996; Straus et al., 2003). In a similar sample of college students (Shorey et al., 2011) there was acceptable internal reliability for both the Psychological Aggression (α = .74) and Physical Assault scales (α = .86). This is consistent with the alphas for the subscales in the current study, Psychological Aggression (α = .84) and Physical Assault (α = .95) for the total sample.

Emotion Dysregulation.

Self-reported emotion dysregulation was assessed using the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). Each of the 36 items (e.g., "When I'm upset, I lose control over my behavior") was rated on a 0 (*almost never*) to 5 (*almost always*) scale. The DERS measures broad deficiency in emotion regulation via a total score as well as six subscales measuring individual deficits in emotion regulation skills: Nonacceptance of Emotional Responses; Difficulty Engaging in Goal-Directed Behavior; Impulse Control Difficulties; Lack of Emotional Awareness; Limited Access to Emotion Regulation Strategies; and Lack of Emotional Clarity (Gratz & Roemer, 2004). As the current study was is interested in emotion dysregulation more broadly, total of all scale items were utilized for analyses. Total scores were calculated by summing the items. Higher scores represent greater levels of emotion dysregulation (Gratz & Roemer, 2004). The DERS is a frequently used measure of emotion dysregulation with good construct and predictive validity, and good test-retest reliability (Gratz & Roemer, 2004). The DERS demonstrated good internal consistency in past studies of college students (α = .92; Shorey et al., 2011) as well as within the current study (α = .90) for the total sample.

Sleep Quality.

The Sleep Condition Indicator (SCI; Espie et al., 2014) is an 8-item self-report measure designed to assess sleep problems based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013*)* criteria for insomnia. Items include inquiries regarding sleep patterns and quality, perceived impact of poor sleep, concern regarding poor sleep quality, and history of sleep problems (e.g., "Thinking about a typical night in the last month, how long does it take you to fall asleep"). Five options were given for each of the 8 questions and allocated 0-4 item values with higher scores representing worse sleep quality. These items are measured in varying units including minutes (to fall asleep or time awake during the night), days of the week (in which sleep is a problem), and various qualitative responses of sleep quality such as rating overall sleep quality in the past month from very good to very poor. Total scores were calculated by summing all 8 items with higher scores indicating poorer sleep quality. Researchers demonstrated good reliability for the SCI and convergent validity with other well-known and reliable measures of sleep problems, such as the Pittsburgh Sleep Quality Index and the Insomnia Severity Index (Espie et al., 2014). Within the current study, the SCI demonstrated good internal consistency ($\alpha = .91$) for the total sample.

Alcohol Use/Problems.

Alcohol use/problems over the past year were assessed using the Alcohol Use Disorders Identification Test (AUDIT; (Saunders, Aasland, Babor, De la Fuente, & Grant, 1993). This is a 10-tem self-report measure assessed drinking in a variety of domains including: frequency, quantity, intensity, dependence, tolerance, and consequences (e.g. "How often during the past 12 months have you failed to do what was normally expected from you because of drinking?"). All items were summed to equal a total score ranging from 0-40 in which higher scores indicate more

alcohol use/problems. Previous studies assessing alcohol use/problems indicated good reliability and validity of this scale (Saunders et al., 1993). Within the current study, the AUDIT demonstrated good internal consistency ($\alpha = .81$) for the total sample.

Data Analytic Strategy

Prior to analyses, skewness and kurtosis of physical and psychological IPV were examined and corrected with log transformations. Hypotheses were tested using structural equation modeling in Mplus Version 8.1 (Muthén & Muthén, 1998). Data were determined to be missing completely at random χ^2 (46, N = 1013) = 46.81, p = 0.44. Full information maximum likelihood (FIML) estimation was used as it is robust to non-normality and missing data (Enders, 2010). A series of structural regression equations were simultaneously analyzed using path analyses. Physical and psychological IPV perpetration were examined as separate outcome variables in a single model to control for the strong bivariate association between physical and psychological IPV (Murphy, & O'leary, 1989; Salis & Salwen, 2014). Physical and psychological IPV were simultaneously regressed on emotion dysregulation and sleep quality total scores. In order to control for the influence of alcohol use/problems on study variables, the AUDIT (Saunders et al. 1993) was included as a covariate in all paths and relationship length was statistically controlled for on all independent variables and outcomes but not mediator variables. Next, the indirect associations between impaired sleep quality and physical and psychological IPV perpetration through emotion dysregulation were tested using the bias-corrected bootstrap method while controlling for associations among physical and psychological IPV perpetration as well as AUDIT and relationship length. Ten thousand bootstrap samples and 95% bias-corrected confidence intervals were utilized. Statistical significance of indirect effects was determined by the absence

of zero in the confidence intervals. A non-significant Chi-Square indicated good model fit, $\chi 2$ (1) = .59, p = 0.44.

As data were derived from two sites, a series of t-tests were conducted to examine site differences between all path model variables. Among demographic variables, age and race differences across sites emerged which required further examination of associations between study variables, age, and race. Age was not correlated with sleep quality, emotion dysregulation, psychological IPV, or physical IPV and was therefore excluded from further analysis. A chi square test was used to examine the relation between racial groups (dichotomized as Caucasian or not Caucasian) and sleep quality, emotion dysregulation, psychological IPV, and physical IPV. The relationship between race and emotion dysregulation, $\chi 2$ (735, N = 862) = 827.20, p = .01, race and psychological IPV, $\chi 2$ (490, N = 979) = 652.14, p < .001, and race and physical IPV, $\chi 2$ (280, N = 974) = 526.38, p < .001, was significant. Given the evidence of a relationship between race and emotion dysregulation, psychological IPV, and physical IPV, multigroup model (MGM) approach was utilized (Muthén & Muthén, 2006) in which two models were estimated and compared. The first model was constrained by race while the second allowed for inequalities between parameters (i.e., an unconstrained model). Model fit was then compared using a chi square difference test which revealed that the constrained model fit the data significantly better than the unconstrained model, $\Delta\chi 2(5) = 8.33$, p = .14. It could therefore be concluded that race did not moderate the paths within the model.

Site differences among path model variables (Alcohol use/problems, sleep quality, emotion dysregulation, psychological aggression perpetration, and physical violence perpetration) were then examined. There were significant site differences on AUDIT total scores with Ohio University students endorsing a greater degree of alcohol use/problems, t(906.882) = 6.97, p < .001. This analysis violated Levene's test for equality or variances, (F = 16.83, p < .001),

and therefore a t statistic not assuming homogeneity of variance was reported. Sleep quality also differed by site with Grand Valley State University students endorsing poorer quality sleep, $t(879.09) = -18.46$, $p = .01$. Levene's test likewise indicated a lack of homogeneity of variance ($F = 6.26$, $p = .01$) therefore the t statistic without this assumption was reported. Means and standard deviations are presented in Table 1. Given the site differences in path model variables, site was examined as a possible moderator in the current study using the MGM approach. A model with paths constrained to be equal across site was compared to a freely varying model and a chi square difference test was conducted. This process was then likewise repeated to examine differences across gender, first examining one model constrained by gender then a second model that allowed parameters to vary.

CHAPTER FOUR: RESULTS

Descriptive Statistics

Means, standard deviations, and bivariate correlations for all study variables are presented in Table 1. Psychological aggression perpetration was positively correlated with all study variables. AUDIT total scores positively correlated with emotion dysregulation, psychological aggression perpetration, and physical violence perpetration and negatively correlated with relationship length and sleep. Emotion dysregulation was additionally positively correlated with physical violence perpetration and sleep quality.

Analysis of Model Fit

As the current study used cross-sectional data, the hypothesized model was examined with the predictor and mediator flipped to examine relative model fit. That is, the original model which examined the associations from sleep quality to emotion dysregulation to IPV was reversed such that the associations from emotion dysregulation to sleep quality to IPV was also examined. There is some debate as to which model fit indices are favorable for interpretation. Kline (2005) recommended the following: The chi square, CFI, RMSEA, and SRMR. Model fit is considered acceptable if chi square is not significant and low compared to degrees of freedom (Barret, 2007), CFI is equal to or greater than .95 (Hu & Bentler, 1999), RMSEA is less than or equal to .07 (Steiger, 2007), and SRMR is less than or equal to .08 (Hu & Bentler, 1999). Within the current study, the original hypothesized model evidenced a nonsignificant chi square, χ^2 (1) = .59, p = 0.44, the CFI was equal to 1, RMSEA was equal to .00, and SRMR was equal to .00. The model was therefore determined to have good model fit. Within the reversed model, χ^2 (1) = .51, p = 0.47, the CFI was equal to 1, RMSEA was equal to .00, and SRMR was equal to .00. Therefore, the flipped model had comparable model fit to the original. However, identical degrees of freedom

between the models preclude the ability to compare models via a chi square difference test. It should be noted that the AIC for the flipped model (33703.54) was slightly lower than the hypothesized model (33703.62) which can indicate better model fit. However, as AICs are not normed, it is difficult to develop thresholds of significance such that a lower AIC may not indicate superior model fit (Hooper, Coughlan, & Mullen, 2008). Therefore, as the difference is relatively small, models were interpreted as statistically indistinguishable. Despite this, differences in direct paths between the models indicated that the proposed model may indicate stronger indirect effects. In the proposed model, the standardized betas for the path between the mediator, emotion dysregulation, and psychological and physical IPV was .20, $p < .001$, and .15, $p < .001$, respectively. Within the flipped model, the path between the mediator, sleep quality, and IPV outcomes decreased to -.08, $p = .02$, for psychological aggression and -.00, $p = .97$, for physical violence. As such, the direct paths from the mediator to the outcomes were lower. Variable ordering and implications for future research is further discussed within the limitations section.

Path Analysis for the Overarching Model

Structural equation modeling was used to examine the paths from sleep quality to psychological and physical IPV perpetration through emotion dysregulation while controlling for alcohol use/problems and relationship length. Sleep quality associated with psychological aggression perpetration through emotion dysregulation while controlling for alcohol use, relationship length, and the association between outcome variables ($B = .07$, 95% CI [.05, .09]). Sleep quality associated with physical violence perpetration through emotion dysregulation ($B = .05$, 95% CI [.03, .08]). Significant paths with corresponding standardized betas and standard errors presented Figure 1.

Site Moderation

The MGM approach was used to determine whether path analysis varied by the site of data collection. A model in which paths were allowed to vary by site was compared to a model in which paths were constrained to be equal across site. Constraining paths did not result in significantly worse model fit, $\Delta\chi^2(5) = .64$, $p = .99$. As such, paths did not vary by site of data collection.

Gender Moderation

Moderation by gender was then tested using the same MGM approach in which a model with paths constrained to be equal by gender was compared to a freely varying model. The comparison of these two models yielded a non-significant chi square, $\Delta\chi^2 (5) = .99$, $p = .96$, therefore, gender did not moderate the paths within the current model.

CHAPTER FIVE: DISCUSSION

Sleep impairment was associated with decreased ability to regulate emotion as well as increased IPV perpetration (Gruber & Cassoff, 2014; Keller et al., 2014). Similarly, emotion dysregulation associated with increased risk for IPV perpetration (Shorey et al., 2011). However, no previous studies examined the relationship between sleep quality, emotion dysregulation, and IPV perpetration. The current study addressed this gap in the research literature by examining these three constructs in a single mediation model while controlling for the associations between outcomes and alcohol use, a frequently cited predictor of all study variables (Moore et al., 2011; Petit et al., 2015; Thakkar et al., 2015; Weiss et al., 2017). It was hypothesized that worse sleep quality would increase risk for both physical and psychological IPV perpetration through its effects on emotion dysregulation above and beyond the effect of alcohol use/problems. Additionally, this study examined whether differences in these interrelationships were present based on gender and site of data collection. This model was not found to vary by site of data collection and, consistent with our hypothesis, the model was not moderated by gender. As such, the overarching model was interpreted. When controlling for alcohol use/problems and relationship length, emotion dysregulation mediated the relationship between sleep quality and psychological and physical IPV perpetration.

Such findings are consistent with past research linking sleep quality and emotion dysregulation to IPV perpetration as well as to each other (Gruber & Cassoff, 2014; Keller et al., 2014; Shorey et al., 2011). However, the current study proposed a model that was the first to examine the associations between sleep quality, emotion dysregulation, and IPV perpetration in a single, mediational model. Such a model allows for the simultaneous analyses of associations while controlling for separate, correlated outcomes and covariates. As such, it enhances current

conceptualizations of IPV. Though the empirical combination of these variables into a single model is relatively new, the model itself is well fitted to current theoretical explanations of violence perpetration more generally and with specific applications to sleep quality. The I^3 theory advocated for the compounding effects of instigator, impelling, and inhibiting factors as related to proclivities toward aggression (Finkel, 2007). Instigation encompasses all environmental stimuli that may increase one's proclivity to aggression, impelling factors include situational or dispositional factors that increase the strength of the instigator, and inhibition can decrease or increase impelling factors or instigators to result in elevated or lowered proclivity to violence (Finkel, 2007). For the model of the current study, it is therefore plausible that emotion dysregulation by way of decreased sleep quality increases likelihood for aggression via an increased tendency to notice instigators, interpret them as negative, and lower inhibition needed to prevent reaction. This is likewise consistent with sleep-specific theories regarding violence in which sleep is posited to intensify negative stimuli and experiences, make threats more evident, and disinhibit aggressive urges (Krizan & Herlache, 2016). Taken together, these models provide similar frameworks for the relationship of sleep to violence and provide a solid theoretical basis for the current model.

Such models are more commonly applied to alcohol use/problems as a risk factor for IPV perpetration (e.g., Shorey, Stuart, McNulty, & Moore, 2014). Additionally, alcohol use lowered regulatory capacity for emotion and disrupted sleep architecture and quality (Petit et al., 2015; Thakkar et al., 2015; Weiss et al., 2017). Consistent with this salient effect, direct paths from alcohol use/problems and psychological aggression and physical violence perpetration remained significant when all paths were considered within the model. Despite this, when accounting for these strong associations, the present findings supported the relationship between sleep quality,

emotion dysregulation, and IPV perpetration. Additionally, these relationships were not moderated by gender, which is consistent with study hypotheses.

Limitations and Future Research

While the current study makes novel insights to current conceptualizations of the paths to IPV perpetration, findings should be considered in light of several limitations. First, future researchers should recruit more diverse samples. The sample used in the current study was primarily Caucasian, heterosexual, and between 18 and 25 years old. Generalizability is therefore limited. Additionally, the findings of the current study were derived from cross-sectional data. This is a proposed temporal model that should be tested longitudinally and ideally with methods suited to determine proximal effects (e.g., ecological momentary assessment, experimental paradigms). In addition, the measures used within the study were limited. In particular, the SCI measure of sleep quality includes an item conceptually similar to emotion dysregulation (i.e., "Thinking about the past month, to what extent has poor sleep affected your mood, energy, or relationships?"). Although mediation paths remained consistent after this item was removed, future researchers may consider using a different measure of sleep quality. Further, emotion dysregulation, sleep quality, and IPV perpetration were measured over differing time periods. As such, proximal inferences are further limited. Future studies should employ measures with the same time periods and ideally in ways that would allow for temporal inferences to be made, such as in a daily diary study. This would also allow further elucidation of the relationship between sleep quality and emotion dysregulation as well as a more rigorous test of the proposed model. For instance, it is reasonable to expect that emotion dysregulation may impact sleep quality as well and, in fact, many propose that emotion regulation and sleep quality continually influence each other in a repeating cycle (Kalmbach, Pillai, Roth, & Drake, 2014). Although the model in

reversed order was tested, model fit was determined to be statistically indistinguishable from the proposed path model and a daily diary study would better allow analysis of these trends.

Although paths did not vary by gender, future research should consider replicating this finding. Prior research examined neural correlates of emotion regulation and reactivity and posited that women had greater difficulty regulating emotions than did men (Domes et al., 2010, McRae et al., 2008). However, men may be more prone to elevate to violence as they may be able to increase the emotional salience of stimuli more readily than women (Domes et al., 2010). Additionally, women may be more likely to regulate emotion via positive reappraisal as opposed to negative (McRae et al., 2008). Such findings suggest that the mechanisms by which men and women activate and utilize emotion regulation strategies may differ. This is consistent within IPV literature. While there is increasing debate as to whether men and women should be considered distinct groups in models of IPV perpetration (e.g. Melton & Belknap, 2003), gender differences have emerged in the relationship between emotion dysregulation and IPV in cross-sectional research (Shorey et al., 2011). Therefore, while gender did not moderate the current model, it is plausible that such differences may emerge with more nuanced measurement and examination in future studies. Finally, while findings of the current study did not suggest differing results across site of data collection, future studies should further examine the possible impact of cultural and geographical factors.

Clinical Implications

In spite of the limitations, the current study has several clinical implications. First, is the use of cognitive behavioral interventions for sleep and emotion regulation as a potential method for IPV intervention and prevention. Sleep impairment is frequently considered a result of IPV victimization (Lalley-Chareczko et al., 2017), yet is rarely considered as a risk factor for IPV

perpetration. As such, sleep impairment was never formally incorporated into IPV interventions. However, such interventions could potentially decrease the likelihood of future IPV perpetration via increases in sleep quality and potential improvement in emotion regulation. In college populations research demonstrated that an increase in awareness of sleep hygiene strategies related to better sleep practices and overall sleep quality (Brown, Buboltz, & Soper, 2002). Research could be conducted to examine whether such strategies would be useful for IPV prevention. Cost could be further reduced through the implementation of internet-facilitated sleep interventions that have a growing base of efficacy literature (e.g., Rritterband et al., 2009). Additional research is needed to test the efficacy of sleep interventions on outcomes such as emotional regulation and intimate partner violence.

Further, such interventions should ideally be implemented with components of emotion regulation training. Incorporating aspects of emotion regulation skills training in laboratory studies of simulated aggression paradigms has indicated relative decreases in IPV perpetration (Maldonado et al., 2015). However, such interventions are not currently being incorporated into IPV intervention programs. As sleep quality and emotion regulation are postulated to affect each other in a cyclical pattern (Kalmbach et al., 2014), addressing both factors could further address the compounding effect of these risk factors in violence perpetration.

Conclusions

Poor sleep quality is a pervasive problem linked to detrimental effects on individual capacity to regulate emotion as well as IPV perpetration (Gruber & Cassoff, 2014; Keller et al., 2014). In addition, emotion dysregulation is independently related to IPV in college samples (Shorey et al., 2011). The current study addressed a gap in current research by examining how sleep quality associated with emotion dysregulation in psychological and physical IPV

perpetration. Results were consistent with current theory and study hypotheses such that emotion dysregulation mediated the relationship between sleep quality and psychological and physical IPV, while controlling for alcohol use/problems and relationship length. Findings highlight the importance of the inclusion of sleep quality in IPV conceptualizations and the potential impact sleep and emotion regulation interventions could have on future perpetration.

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APPENDICES

Table 1. Bivariate Correlations and Descriptive Statistics for Study Variables

	1	2	3	4	5	6
1. AUDIT Total Score	-					
2. Relationship Length (Months)	-.08*	-				
3. Sleep Quality	-.07*	-.01	-			
4. Emotion Dysregulation	.15**	.01	.33**	-		
5. Psychological Aggression Perpetration	.19**	.21**	.13**	.23**	-	
6. Physical Violence Perpetration	.15**	.04	.04	.17**	.51**	-
Mean (SD) Total Sample	5.05 (4.50)	17.38 (17.35)	13.59 (8.10)	79.97 (23.08)	9.97 (16.48)	2.64 (13.72)
Mean (SD): Ohio University	5.85 (4.71)	18.31 (18.42)	10.02 (7.22)	80.79 (23.92)	10.40 (17.36)	3.17 (16.75)
Mean (SD) GVSU	3.88 (3.90)	16.19 (15.81)	18.45 (6.55)	78.83 (21.86)	9.39 (15.24)	1.93 (8.10)

Note: *$p < .05$, **$p < .01$ (two-tailed). Means and standard deviations calculated from non-transformed variables

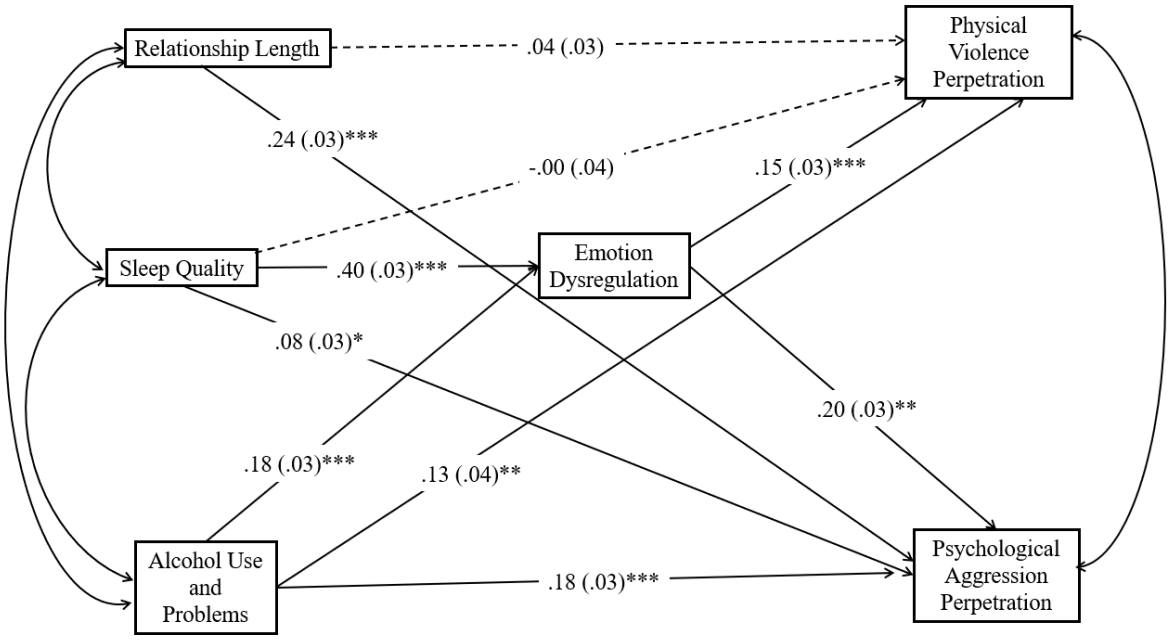

Figure 1. Within the overarching model, the direct and indirect effects of sleep quality on psychological aggression perpetration and physical assault perpetration through emotion dysregulation. Associations between independent variables and outcome variables are accounted for in addition to controlling for alcohol use/problems and relationship length. Standardized betas overlay paths with standard errors in parentheses. Significant paths ($p < .05$) are represented by solid arrows while insignificant paths ($p > .05$) are represented by dashed arrows. Level of significance is noted as follows: *$p < .05$. **$p < .01$. ***$p < .001$.

VITA

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