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Testing the Effects of Social Exclusion on Emotional Arousal: An Examination of the Effects of Psychological Pain and Rumination

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Testing the Effects of Social Exclusion on Emotional Arousal: An Examination of the Effects of
Psychological Pain and Rumination

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
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ABSTRACT

The examination of social exclusion and its impact on future emotional responding may prove to be a fruitful area of research in the prevention of suicide. Additionally, there may be other factors (such as the experience of psychological pain and rumination) that may influence how one responds to social exclusion. However, little research has explored individual differences in reactions to social exclusion. As such, the present study explored how social exclusion influences emotional responding to other environmental stimuli, as well as examining how a history of psychological pain and rumination affected how one responds to social exclusion. 503 undergraduate students at the University of South Florida completed a survey on their history of psychological pain and tendency to ruminate about stressful experiences, then were randomized to either an inclusion or an exclusion condition of a social exclusion paradigm (Cyberball) and rated the intensity of their emotional arousal towards negative, non-interpersonal related images. It was hypothesized that being socially excluded would not only increase negative affect but lead to increased emotional arousal towards other negative stimuli. Additionally, it was hypothesized that a history of psychological pain, along with a tendency to ruminate would moderate one's immediate reaction to social exclusion and one's emotional arousal towards negative stimuli following exclusion. Using structural equation modeling (SEM), a relationship between social exclusion and negative affect and negative affect and emotional arousal was observed, but no significant moderation effects emerged. Implications of this research and suggestions for future research will be discussed.

INTRODUCTION

Over the past decade, suicide has been markedly increasing across the United States (Duffy, Twenge, & Joiner, 2019; Twenge et al., 2019). One study conducted in a large college student sample noted an 81% increase in suicidal thoughts from 2007 to 2018, in addition to suicide planning rates doubling across this same time period (Duffy, Twenge, & Joiner, 2019). Despite these highly concerning statistics, there remains a general lack of ability to accurately predict suicide risk (Carter et al., 2017; Jobes, Rudd, Overholser, & Joiner, 2008). In particular, given the large number of variables shown to predict suicide, it has been difficult to identify those most at risk for future suicidal behavior (Jobes, Rudd, Overholser, & Joiner, 2008). Obviously, if individuals at risk for suicide could be identified sooner, it may be possible to intervene earlier to reduce the likelihood of someone making a suicide attempt.

The focus of this study will be to examine one such possible vulnerability factor that may put one at risk for suicide, social exclusion. Additionally, there may be other historic/concurrent factors that influence how one responds to social exclusion, thereby exacerbating the possible negative effects of social exclusion. Psychological pain and rumination may be examples of such factors that could potentially make one more responsive to social exclusion and possibly other negative events as well. Additionally, this study will explore how social exclusion influences one's emotional arousal to negative stimuli. Past psychological pain, along with one's propensity towards rumination, will be examined as moderators in this relationship.

In the following pages, a discussion of the gaps in the literature surrounding the aforementioned constructs will be presented, along with theory and an elaboration of the constructs to be used in the study. Finally, the current study and hypotheses will be discussed in more detail.

Gaps in the Literature

It is relatively understood and accepted that social exclusion and, in turn, feeling a loss of connectedness to others leads to poor mental health outcomes, such as increased depression, anxiety, and suicidality (Morgan et al., 2007; Kawachi & Berkman, 2001; Williams, 2007). However, while we know most people may have an immediate, negative psychological reaction when experiencing social exclusion (Gerber & Wheeler, 2009), it is relatively unknown whether experiencing social exclusion would make one more emotionally reactive to other negative events in one's environment. Only one study to date has explored this question. Miller et al (2018) utilized a social exclusion task to determine how adolescent girls' reactions toward negative stimuli changed from before to after exclusion. They found that the girls rated negatively valenced pictures as even more distressing after being socially excluded. However, this study did not have a comparison group that did not receive the social exclusion condition, so it cannot be assumed that social exclusion directly caused heightened emotional arousal. Additionally, considering this sample only included adolescent girls, issues of generalizability are obviously a concern. Lastly, this study used one, rather blunt form of social exclusion, whereby participants were directly told a same-aged peer did not want to meet with them after reviewing personal information about them. Ideally, to enhance our understanding of the effects of social exclusion, more than one exclusion paradigm should be utilized in the literature. Specifically, more subtle forms of social exclusion (i.e., whereby people are not directly told

they are being excluded) may enhance the generalizability of research findings by creating scenarios that may more closely mimic what social exclusion looks like in real-life settings.

Additionally, we know nothing about what factors might affect emotional arousal after social exclusion. Rumination could be one factor that may impact how one responds to social exclusion. Rumination has been linked to worse outcomes following a negative event, such as prolonged distress, reduced problem-solving ability, depression, and reduced social support (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Wesselmann, Ren, Swim, & Williams, 2013). However, we don't know how one's tendency to ruminate would impact one's emotional response directly following social exclusion.

Lastly, there may be other individual difference factors related to rumination that influence how one responds to social exclusion. Suicidality for example has been associated with increased use of rumination (Morrison & O'Conner, 2008) and may also impact how one responds to social exclusion. As such, there has been some literature on how a history of suicidality impacts responses to social exclusion. Individuals with a history of suicidal thoughts/attempts display increased sensitivity to social threat cues (Jollant et al., 2008; Olie et al., 2015). However, it is unclear why individuals with a history of suicidality would be more sensitive to social threats. Psychological pain, a construct typically experienced by suicidal individuals (Verrocchio et al., 2016), may explain this association. Considering social exclusion and psychological pain have been theoretically and empirically associated with one another (MacDonald & Leary, 2005; Williams, 2001), it is surprising that no literature has examined how one's previous history of psychological pain impacts how one responds to social exclusion. To further understand these questions, a basic overview of social exclusion and mental health is warranted.

Social Exclusion and Mental Health

The term social exclusion has been defined in various ways, however, after a review of relevant literature and an exploration of common themes among all definitions of social exclusion, Morgan et al. (2007) ultimately reported that the most comprehensive definition of social exclusion comes from Burchardt, Le Grand, and Piachaud (2002), who defined social exclusion as “an enforced lack of participation in key social activities of society”. Key activities were categorized under four dimensions, the most relevant to this paper being social interaction. Burchardt et al. (2002) also emphasized that for someone to experience social exclusion, one must desire social interaction in the first place and the individual must not be participating in social interactions due to reasons above their control. While these researchers provided a conceptual definition of social exclusion, they neglected to construct a theoretical explanation for how social exclusion directly relates to poor mental health. However, other theorists have provided a more thorough conceptual link between social exclusion and negative mental health outcomes.

Theories on Social Exclusion and Mental Health

Multiple theories attempt to explain why social exclusion leads to poor mental health outcomes and many examine the effects of social exclusion from an evolutionary perspective. Social bonds/groups are hypothesized to have contributed to human’s ability to survive by allowing for increased protection, sharing of resources, and more opportunities for reproduction (Hogan et al., 1985). Similarly, Williams (2009) argued that social relationships are necessary for survival and reproductive fitness. When individuals are excluded from a group, death was

almost certainly the result, as these individuals no longer had the support and protection of the group. As a result, humans have evolved to seek out and maintain social connections with others to aid in survival and greater reproductive opportunities. Those who were able to reproduce would most likely be individuals who would notice and respond to social exclusion to better achieve group protection. In order to facilitate this, Williams suggested that social exclusion is easily detected and sometimes is actually over-detected to protect the individual from any potential negative consequences involving social threat. He further states that the immediate reaction to exclusion is a reflexive pain signal, then a threat to one of an individual's fundamental needs, then an attempt at coping to bolster whatever need is being threatened, followed by a variety of behavioral, cognitive, and affective responses depending upon how effective one is at bolstering said need. If one is unsuccessful at fortifying the diminished need, Williams suggests that one enters a stage of resignation that is characterized by feelings of depression, hopelessness, helplessness, and unworthiness. Similarly, Eisenberger (2011) discussed how social exclusion could lead to feelings of pain through an evolutionary perspective. She argues that social isolation activates some of the same neural substrates that are linked to physical pain and this overlap evolved as a means to protect oneself against the harmful effects of being excluded.

Other theories argue that social inclusion is a need that, when absent, results in negative psychological outcomes (Baumeister & Leary, 1985; Leary & Baumeister, 2000). For example, Baumeister and Leary (1995) proposed that social bonds are a fundamental human need that results in positive effects when the need is fulfilled and negative effects when the need is thwarted. They go on to state that affective and behavioral disorders appear to stem from one's desperate attempt to gain/maintain social bonds or one's frustration or hopelessness when

attempts at establishing social bonds goes awry. Similarly, Leary and Baumeister (2000) proposed the Sociometer Theory, in which they posited that humans draw much of their self-esteem from positive social interactions, and therefore, as a means to protect one's self-esteem, developed a built-in detection system designed to monitor potential threats to one's social belongingness. When one's "sociometer" is triggered, humans experience a lowering in their feelings of self-esteem as a signal that one needs to attend to one's interpersonal relationships. They state that mental health issues can arise not due to low self-esteem per se, but more as a direct result of thoughts regarding one's relational value after experiencing social exclusion.

Similarly, Slavich, Donovan, Epel, and Kemeny (2010) described a psychobiological model whereby social rejection leads to depression through cognitions regarding self-worth, activation of brain regions associated with negative affect, elicitation of emotions related to self-consciousness, (e.g., shame and humiliation) and increased inflammatory responses in the body, which have been associated with social rejection and depression. This interaction between the various neural, cognitive, and emotional responses theoretically determines how likely one is to develop depression.

Empirical Evidence on Social Exclusion and Mental Health

Overall, social exclusion has been theorized to be linked to a variety of negative outcomes through both evolutionary pathways and through cognitive, affective, and behavioral means. Empirical evidence has also supported this link, showing that social exclusion is associated with increased stress levels and more general emotional distress (Hawley Williams, & Cacioppo, 2011; Williams, 2009), along with sadness, anxiety, frustration, and occasionally aggression (for review, see Williams, 2007). Additionally, social exclusion seems to ultimately lead to a lack of social connectedness/belonging, which in turn has been theorized to contribute

to one's desire to die by suicide (Joiner, 2005; Klonsky & May, 2015). Notably, there have also been empirical associations between social exclusion and suicidality (Arango et al., 2016; Christensen et al., 2013; Conner & Reuter, 2006; Fassberg et al., 2012). Indeed, other research supports this, with lower levels of perceived belongingness/connectedness being associated with suicidal ideation and attempts (Christensen et al., 2013; Ploskonka & Servaty-Seib, 2015; You, Van Orden, Conner, 2012). Fassberg et al., (2012) conducted a systematic review on social connectedness and suicide in older adults and found a positive association between low connectedness and suicidal ideation, attempts, and death by suicide. In adolescents, a commonly reported precipitant for suicidal behavior was perceived social exclusion, bullying, or poor parental relationships (Park et al., 2015). In psychological autopsy studies, many of those who die by suicide appeared to live alone or experienced some form of life stress related to thwarted social needs shortly before their death, such as interpersonal conflict and relationship breakdowns (De Leo, Draper, Snowdon, & Kolves, 2013; Foster, 2011).

While we know there are many negative mental health consequences that appear to result from social exclusion, there exists a paucity of research exploring some of the mechanisms by which social exclusion ultimately would lead to these more severe mental health consequences. For example, social exclusion may ultimately make one more emotionally sensitive to future negative events in one's environment. Increased negative emotions in response to stress in turn may make one more likely to develop mental health issues. Indeed, there is some evidence to support the case that social exclusion impacts one's arousal to future negative social events. For example, literature on socio-emotional processing following social rejection has found heightened emotional processing specific to social situations to be a mediator between social rejection and negative behavioral outcomes (Beyer, Munte, & Kramer, 2013). Another study

found that, after being excluded (compared to being included), participants showed a greater attentional bias to disgusted faces compared to neutral faces, suggesting that being excluded changes how one attends to negative interpersonal information (Kawamoto, Nittono, & Ura, 2014).

While individuals who have experienced social exclusion do appear to be more sensitive to social cues following the experience, it is relatively unknown whether these effects would expand to sensitivity to other areas, such as being more reactive to negative information in general. Only one study to date has explored this question, whereby adolescent females underwent a social exclusion task, then were asked to rate the intensity of their negative affect to negative stimuli following the exclusion (Miller et al., 2018). They found that the girls reported significantly higher negative emotions toward negative stimuli directly following the social exclusion compared to before the exclusion, signifying that the experience of exclusion may lead to greater emotional arousal towards a variety of negative experiences. However, given only one study has explored this phenomenon (and in a very limited sample), these results need replication. While limited, this study was a first step towards exploring how social exclusion may affect one's emotional arousal to events occurring after the exclusion.

Emotional Arousal

Emotional arousal refers to how strongly physiologically one responds emotionally to stimuli, with low arousal typically associated with certain mood states such as relaxation, calmness, and boredom, and high arousal states being associated with states of anger, excitement, or fear (Bradley & Lang, 1994). Arousal occurs when the sympathetic nervous system is activated, which is responsible for the body's fight or flight response to stressful events (Lang et al., 1997). A variety of physiological experiences occur because of this activation, such as

heightened heart rate, blood pressure, and breathing rate (Lang et al., 1997). Emotional arousal has been measured typically through physiological means, such as by skin conductance and heart rate (Dawson et al., 2005; Ravaja, 2004). However, self-report measures of emotional arousal have been highly correlated with physiological measures, and therefore have been used extensively (Cuthbert et al., 2000). For example, The Self-Assessment Manikin (SAM) asks individuals to report their levels of emotional arousal from low to high on a Likert-type scale, while giving participants a pictorial representation of low and high arousal states and describing low arousal as being associated with calm, relaxed, quiet emotional states and high arousal as being associated with anger, excitement, fear, or other high energy emotional states (Bradley & Lang, 1994).

While emotional arousal is an evolutionarily beneficial reaction, individuals who consistently respond to stimuli with heightened emotional arousal may experience negative consequences, such as depression and anxiety (O'Hara et al., 2014; Schneiders et al., 2006; Wichers et al., 2009). For example, in a longitudinal study, baseline emotional intensity in response to stress predicted the development of future depressive symptoms and a diagnosis of major depressive disorder (Wichers et al., 2009). Schneiders et al., (2006) found that adolescents who exhibited increased emotional arousal to daily stressors also displayed greater symptoms of depression and anxiety.

Considering interpersonal stress has been deemed to be extremely aversive emotionally, it may be more emotionally arousing compared to other forms of stress. Gratz et al., (2019) found that when subjected to interpersonal rejection, individuals with a diagnosis of borderline personality disorder self-reported experiencing more emotional arousal in response to the rejection compared to individuals without a diagnosis. Similarly, individuals with borderline

personality disorder features exposed to invalidation became more emotionally distressed compared to individuals without such features (Elzy, 2013). Another study found that those exposed to the exclusion condition of a task in a Cyberball paradigm (i.e., a computerized ball-tossing game designed to simulate interactions with others) compared to an inclusion condition displayed larger and more negative stress responses (Beekman, Stock, & Marcus, 2016). Similarly, other studies employing the Cyberball paradigm have found similar increases in negative affective states following exclusion compared to inclusion (Kawamoto et al., 2013; Schuck, Niedeggen, & Kerschreiter, 2018; Wirth, Lynam, & Williams, 2010).

Of note, most of the research conducted on emotional arousal and interpersonal stress has looked at individuals' emotional responses directly following a specific interpersonal stressor. It remains unclear if one would interpret non-interpersonal negative stimuli in one's environment as more arousing following an experience of social exclusion. Emotional arousal has been hypothesized to confer evolutionary benefits to humans, as high arousal states are often a sign of either very positive or very negative stimuli in one's environment (Nesse, 1990). In line with this theory, high arousal states are oftentimes associated with a narrowing in attentional capabilities, which can allow individuals to more accurately assess and remember the arousing stimulus (Lang et al., 1997). Indeed, research has shown that more emotionally arousing events tend to be encoded better in memory systems (Hamann, 2001). It could be the case that social exclusion is likely to elicit a negative emotional experience, which in turn increases one's alertness and arousal towards other negative environmental stimuli/events. Indeed, other research has found an association between negative mood and a higher likelihood of perceiving external stimuli as negative. For example, Hunter, Schellenberg, and Griffith (2011) found that after inducing a sad mood in participants, they were more likely to rate ambiguous music as sad compared to happy.

In another study, participants who were induced to experience a high-arousal negative mood (e.g., fear) exhibited higher self-reported arousal ratings to emotional news messages (Ravaja, Saari, Kallinen, & Laarni, 2006). Additionally, individuals who were currently experiencing a negative mood were more likely to over-estimate the likelihood that certain negative life events would occur (Waters, 2008).

While it makes theoretical sense that social exclusion would elicit negative affect and in turn, heightened emotional arousal, no studies to date have looked at this phenomenon. There have also been few other studies on social exclusion that have found individual differences in how people respond to interpersonal stress (Vanhalst et al., 2015; Wirth, Lynam, & Williams, 2010). A tendency to ruminate may be one individual difference factor that could alter how one responds to exclusionary experiences.

Rumination, Emotional Arousal, and Social Exclusion

Considering cognitive processes may determine how one will affectively respond to social events, rumination may be an influential moderator that may explain why some individuals may respond more strongly to social exclusion compared to others. Rumination has been conceptualized as a cognitive response style in which an individual overly focuses on experienced negative affect, the causes and consequences of said affect, and the process of making self-evaluations based upon the affective experience (Nolen-Hoeksema & Morrow, 1991). Rumination is thought to lead to negative outcomes to the extent that it thwarts active problem-solving (Nolen-Hoeksema & Morrow, 1991). Empirically, greater use of rumination has been associated with a myriad of negative mental health outcomes, such as negative affect, psychological distress, feelings of hopelessness, depression, and suicidal thoughts (Boyes,

Hasking, & Martin, 2016; Kashdan & Roberts, 2007; Morrison & O’Conner, 2008; Robinson & Alloy, 2003).

Stress-reactive rumination may partially explain why some individuals have worse mental health outcomes after a stressful event compared to others. Stress-reactive rumination (or the extent to which one makes and dwells on negative self-inferences regarding the stressful event) has been thought to relate to negative mental health outcomes through its focus on critical self-relevant thoughts. While other forms of rumination focus on repetitive thinking regarding negative affect (e.g., depressive rumination; Nolen-Hoeksema, 1991) stress-reactive rumination captures repetitive thinking regarding specific stressful events. As such, it has been purported to potentially capture ruminative thinking patterns specifically focused on negative events rather than ruminative thinking patterns focused on the actual emotional experience itself (Smith & Alloy, 2009). Additionally, stress-reactive rumination oftentimes involves negative self-referential thinking patterns, which has been theorized to lead to prolonged negative affect (Robinson & Alloy, 2003). Stress-reactive rumination has been shown to relate to a greater risk of developing depressive symptoms in the face of adverse events, along with a greater risk of having multiple and prolonged depressive episodes (Alloy et al., 2000; Connolley & Alloy, 2017; Robinson & Alloy, 2003). As such, it appears that engaging in stress-reactive rumination may exacerbate negative emotions following a stressful life event.

Similarly, rumination appears to impact one’s emotional responding in relation to interpersonal scenarios. Takano, Sakamoto, and Tanno (2011) found individuals who endorse more frequent self-rumination (defined as repetitive thoughts focused on the self) also reported experiencing more intense negative affect after encountering interpersonal stress. Similarly, in a study of adolescents, those who reported habitually ruminating reported heightened negative

affect to a social stress paradigm compared to adolescents who reported low levels of trait rumination (Aldao et al., 2014).

Rumination's negative effects on emotional responding seems to be present in social exclusion scenarios as well. For example, Wesselman, Ren, Swim, & Williams (2013) found that participants who were assigned to ruminate after experiencing social exclusion were more psychologically distressed compared to participants who were assigned a distraction technique following exclusion. Unfortunately, no other studies have looked at how rumination affects one's reaction to social exclusion, so the extent to which this finding is replicable remains to be seen. Additionally, it is unclear if having a greater tendency to engage specifically in stress-reactive rumination would lead to changes specifically in emotional arousal toward other stressful stimuli in the environment. Overall, it seems plausible that individuals who tend to use specific strategies to cognitively respond to social exclusion may have altered emotional responding following an experience of exclusion. Similarly, and as mentioned earlier in this manuscript, there may also be other historic factors (e.g., psychological pain) present for some people that could alter emotional responding to social exclusion.

Theories and Pathways Involving Psychological Pain

The term psychological pain has been defined as the subjective, aversive experience of intense negative feelings and has been considered analogous to intense physical pain (Mee et al., 2006; Schneidman, 1993; Verrochio et al., 2016). There have been numerous theories that have attempted to describe psychological pain and its origins. For example, Schneidman (1993) posited that psychological pain can consist of intense feelings such as shame, guilt, humiliation, fear, and anguish and is deemed intolerable, unbearable, or unacceptable to the individual. He conjectured that psychological pain is the result of unmet psychological needs, such as social

affiliation, the need to strive to better oneself, the ability to defend/protect oneself against assault, criticism, and blame, the need to avoid shaming experiences, and the need for order and understanding in one's life. He then posited that suicide is one's attempt at ending the psychological pain if it is not resolved by any other means (Schneidman, 1998).

Not long after, Bolger (1999) described "emotional pain" as stemming from some type of traumatic event. Interestingly, the majority of the descriptions the author gave of said traumatic events were interpersonal in nature, such as deaths, abuse, neglect, divorce, or illness of self/significant others. Similar to Schneidman, Bolger (1999) argued that these traumas influenced psychological needs such as psychological security, physical safety, and affiliation, and in turn could lead to poor outcomes through the avoidance of emotional pain. As such, she states that this avoidance of pain is ultimately what leads to poor mental health, as individuals become unable to participate fully in life when they are consistently avoiding potentially painful situations. Additionally, through avoidance of pain, individuals may never learn effective coping strategies that may help them through difficult experiences, potentially contributing to further mental health issues.

More recently, Klonsky and May (2015) posited that psychological pain is an aversive emotional state that can result from a multitude of experiences, including the experience of actual physical pain, social isolation, feelings of burdensomeness, feelings of defeat/entrapment, negative self-perceptions, or any other state that would be considered aversive to the individual experiencing it. Like Schneidman's hypothesis, they posited that high psychological pain, in combination with feelings of hopelessness, leads one to consider suicide as a possible solution to their pain. Klonsky and May (2015) were the first to suggest psychological pain may serve a moderating role in the development of suicidal ideation, with higher levels of psychological pain

strengthening the association between hopelessness and suicide risk. However, while they provided a thorough account of the causal factors that may lead to the development of psychological pain, they did not explicitly define psychological pain. In fact, the definition of psychological pain (and even the use of the term psychological pain) has been variable among researchers (Meerjwick & Weiss, 2011). Indeed, other theorists have utilized the terms “emotional suffering”, “emotional pain”, or “psychache” to all refer to concepts very similar to psychological pain (Bolger, 1999; Joffe & Sandler, 1967; Morse, 2001; Rhensfeldt & Erikson, 2004).

As such, Meerjwick and Weiss (2011) conducted a concept analysis to create a unifying definition of psychological pain, considering all previous definitions used in the literature. They define psychological pain as an “intense, lasting, unsustainable, or unpleasant feeling resulting from a negative appraisal of an inability or deficiency of the self”. They state that psychological pain is typically brought on by a loss of/inability to achieve a core psychological need (e.g., social belonging). Additionally, they add that psychological pain cannot be sustained over time without some sort of severe negative consequence, such as severe depression, anxiety, or suicide. Similarly, the frequency, intensity, and severity of the psychological pain is hypothesized to directly impact the likelihood of negative consequences occurring. However, Meerjwick and Weiss predicted that everyone has different thresholds that psychological pain must exceed before negative consequences arise. In turn, this threshold could impact how much pain/how many stressful events one is able to bear before experiencing adverse consequences. Unfortunately, the authors do not conjecture on factors that could influence this threshold, so it remains unclear how exactly certain negative events would impact these thresholds to induce psychological pain. Additionally, while Meerjwick and Weiss synthesized theories on

psychological pain and created a more standard definition, they did not address psychological pain's differentiation from other, similar constructs.

Psychological Pain and Similar Constructs

Considering the definition of psychological pain may have conceptual overlap with similar constructs, such as depression and negative affect, one may question if this construct is distinct from these other phenomena. Psychological pain, while moderately correlated with depressive symptoms ($r=0.56$), does appear to be a construct separate from depression (Mee-Bunney et al., 2011). Indeed, other researchers have found no significant association between psychological pain and depression severity (van Heerigan et al., 2010). Mee-Bunney et al. (2011) found that their scale of psychological pain only shared 31.6% of its variance with depressive symptoms. One can also have depressive symptoms and not experience psychological pain (Caceda et al., 2014), further suggesting that these constructs do not always co-occur. Additionally, psychological pain in and of itself has been shown to differentially predict outcomes, such as suicide attempt likelihood, over and above what is predicted by depressive symptoms alone (Holden et al., 2001; Mee-Bunney et al., 2011). Psychological pain has also differentiated those who attempt suicide versus those who only think about suicide (Caceda et al., 2014), something severity of depressive symptoms alone may not do. For example, in a sample of those diagnosed with major depressive disorder, Li et al. (2014) found no differences in severity of depression symptoms between individuals with a history of suicide attempts and those without. However, psychological pain did distinguish these two groups, with higher pain being present in the suicide attempt group. Similarly, psychache, hopelessness, and depression also separate into different constructs using factor analytic techniques (DeLisle & Holden, 2009;

Troister & Holden, 2013). As such, psychological pain appears to be distinct from severe depressive symptomology and also serves some utility as a separate construct.

Next, whether psychological pain is a different construct from extremely aversive negative affect is a question that has yet to be answered by empirical literature. Indeed, considering the definition of psychological pain is “the aversive experience of intense negative feelings”, negative affect may naturally be part of this construct. However, general negative affect may conceptually differ from psychological pain in a few ways. In the theoretical literature, some individuals have conceptually differentiated psychological pain from negative emotional states. For example, Schneidman (1993) hypothesized extremely negative emotional states were related to psychological pain only through their ability to create feelings of pain (Schneidman, 1993). For example, people may experience intense negative affect without necessarily describing it as “painful”, possibly lending some support to the differentiation of these constructs. Similarly, considering psychological pain has been suggested to result from thwarted psychological needs (Bolger, 1999; Meerjwick & Weiss, 2011; Schneidman, 1993), there may be differences in exactly what events can trigger psychological pain versus what events would only trigger negative affect. For example, an event may only trigger painful feelings to the extent that it relates to psychological needs. Additionally, psychological pain seems to have an additional component to its definition that negative affect does not. Meerjwick and Weiss (2011) state that psychological pain is “an extremely unpleasant feeling resulting from negative appraisal of an inability or deficiency of the self”, suggesting that psychological pain goes beyond just negative affect and encompasses cognitions regarding the self as well. However, the extent to which this is empirically true has yet to be examined.

Varied Role of Psychological Pain

Overall, it appears that psychological pain is an intense, negative emotional state that results from thwarted psychological needs. In order for psychological needs to be thwarted, across theories, there seems to need to be some sort of environmental event that is subjectively appraised. This appraisal in turn then could influence how the event blocks, interferes, achieves, or maintains a specific psychological need (e.g. social affiliation). Meerjwick and Weiss (2011) also added a critical addition to prior theories in that they suggest psychological pain becomes particularly problematic when the initial psychological pain one experiences is left unresolved. Indeed, this chronically experienced psychological pain itself may then ultimately influence how one responds to additional environmental events (or internal events). As Klonsky and May (2015) theorized, psychological pain could serve a moderating role, whereby having psychological pain makes one more susceptible to developing suicidal ideation in the face of internal stressors, particularly hopelessness. However, this theory is lacking in terms of describing how/why individuals respond to stressful experiences with psychological pain. There may be mediating or individual factors, such as emotional arousal to stressful events, that may influence outcomes and how one responds to stress. For example, if experiencing psychological pain over time causes one to be more sensitive/emotionally reactive to stressful events, one may interpret stressful events as even more distressing than they might otherwise. In turn, repeated, heightened distress in response to stressors may influence how one views their future and could further contribute to feelings of hopelessness. So, while it may be true that acute psychological pain is a more proximal predictor of certain negative outcomes, such as suicidal ideation, Klonsky & May's theory does not consider how chronic experiences with psychological pain impact suicidality. Indeed, it could be that the chronic experience of psychological pain itself

may be an individual difference factor that, over time, influences how one reacts to negative events. Indeed, other theories mentioned thus far also fail to account for how the experience of psychological pain impacts one's response to stressors/psychologically painful events.

Overall, most of the psychological pain theories propose psychological pain is a mediator between negative events and poor outcomes. However, the role psychological pain plays in mental health may be more complicated than that. It could be that repetitive, intense psychological pain not only serves a proximal role in the development of poor mental health outcomes, but also a more distal role by influencing how one responds in the face of stress. By ignoring the potential moderating effect of psychological pain, we may be missing out on an individual difference factor that could be impacting how certain individuals respond to future stressful, potentially painful events.

While current psychological pain theories barely touch on the moderating role of psychological pain relative to an individual's response to future events, in other fields, there are potentially related constructs that may serve as good examples for how psychological pain may influence one's response to other stressors. For example, in the depression literature, the scarring hypothesis refers to how a history of depression alters future susceptibility to appraising environmental/life events as being particularly stressful or unpleasant (Lewinsohn, Steinmetz, Larson, & Franklin, 1981). Lewinsohn et al. posited that experiencing a depressive episode leaves behind certain characteristics (i.e., particularly negative cognitive styles) that may impact how one functions daily and increase one's vulnerability to re-trigger future depression. With a negative cognitive style, one may be particularly sensitive to looking for negative stimuli in one's environment, thereby making one more likely to experience negative mood states that may trigger depression. Similarly, experiencing severe/chronic psychological pain may leave behind

certain cognitive/emotional changes that impacts one's functioning and increases vulnerability to experiencing psychological pain in the future. For example, one may become more sensitive to cues in the environment that may be related to psychological pain (e.g., poor social interaction) and may therefore be more likely to experience future pain as a result.

Similarly, Post (1992) hypothesized that a type of sensitization occurs in those with depression, whereby subsequent episodes of depression are triggered by less stressful events than was needed previously to trigger an episode. In particular, he suggested that this sensitization to other stressors becomes encoded at the cellular level, and ultimately leads to changes in biochemical receptivity to stressful events, whereby the production of neurotransmitters, receptors, and neuropeptides are increased in response to future stress. Indeed, psychological pain may function in a similar manner, whereby over time, less psychologically painful events are needed to trigger future feelings of pain.

Additionally, other theories have argued that this sensitization occurs over time because of one's learning history and results in increased potential to generate negative cognitions even in response to small changes in depressed mood states (Segal et al., 2008; Teasdale, 1988). This in turn makes it easier for maladaptive patterns of thoughts and emotions to return and contributes to future depressive symptoms (Segal et al., 2008). Similarly, more frequent/intense experiences with psychological pain may create stronger associations between pain and whatever event(s) one perceives to have caused it (Sandkuhler, 2000), making one even more likely to respond to and avoid such events associated with pain.

Other researchers have suggested that exposure to emotionally taxing events can alter one's biological chemistry and therefore potentially lead to changes in emotional responding to stressful events in the future (Adams, 2012). For example, Adam (2012) suggested that

cumulative emotional stress triggers changes in the hypothalamic-pituitary axis, which in turn may alter one's perceived emotional response to stressful situations. Indeed, chronic social stress has been associated with changes in biological stress responses (Adam, Klimes-Dougan, & Gunnar, 2007; Repetti, Taylor, & Seeman, 2002). In a study of adolescents, those who experienced chronic interpersonal stress over the last year displayed higher cortisol responses to momentary feelings of loneliness compared to adolescents without that same history of interpersonal stress (Doane & Adam, 2010). Other studies have also found that chronic experiences of loneliness have been associated with a hypersensitivity to interpersonal rejection (i.e., higher negative emotional response) and an attenuated positive emotional response to social inclusion (Vanhalst et al., 2015). Overall, experiences with negative, emotionally salient events could change how one responds to future stressful events.

In particular, one such event that seems to be closely associated with psychological pain, and, in particular, has been theorized to play a causal role in the development of psychological pain (Klonsky & May, 2015; Meerjwick & Weiss, 2011; Schneidman, 1993) is social exclusion. Numerous studies have documented a link between social exclusion and feelings of pain (Eisenberger, 2012; Eisenberger & Lieberman, 2004; Eisenberger et al., 2003; Macdonald & Leary, 2005). Additionally, social exclusion in particular may be linked to the experience of psychological pain considering social connections are a fundamental human need necessary for human survival (Baumeister & Leary, 1995; Williams, 2007). As such, it may universally be associated with painful emotions. Indeed, in one study, three out of four individuals endorsed scenarios involving a loss of connectedness to others have been described as the most negative emotional event of their lives (Jaremka, Gabriel, & Carvallo, 2011), indicating that, for many individuals, social disconnection is extremely aversive. While other life events produced

negative emotional responses in this study (i.e., financial problems, academic/work failure or difficulty, personal illness/injury, and experiencing mental illness/drug abuse), they were not rated nearly as aversive as the events that involved a loss of social connections (Jaremka et al., 2011). Therefore, social exclusion may have particularly pervasive effects on mental health.

Overall Summary/Hypothesized Theoretical Model

In sum, social exclusion has been associated with a variety of poor mental health outcomes (Williams, 2007), however the extent to which it triggers heightened emotional reactions towards other negative stimuli in one's environment has been largely understudied. Considering social exclusion has been deemed an extremely aversive emotional event, it may trigger heightened negative emotions that extend beyond the actual exclusion experience.

Additionally, the relationship between exclusion and emotional arousal may be altered by pre-existing factors that individuals possess. However, very few studies have explored moderators that might differentially explain how one emotionally responds following social exclusion. As such, this study also aims to look at two potential moderators that may alter one's response to social exclusion and their subsequent emotional arousal: psychological pain and rumination. It may be the case that repeated exposure to painful events (events that may produce similar, aversive emotional experiences as social exclusion) may make one more sensitive to future scenarios that may induce emotional pain (Sandkuhler, 2000). Considering pain is a noxious stimulus that people in general tend to avoid, individuals with a history of heightened psychological pain may exhibit a stronger emotional response to exclusion in order to alert themselves to potential threat and avoid painful emotions.

Similarly, stress-reactive rumination may have comparable consequences, whereby individuals who tend to think excessively about the causes/implications of stressful events may

have stronger negative emotional responses to social exclusion and may furthermore respond more strongly to other negative stimuli following exclusion. Using stress-reactive rumination involves thinking excessively and negatively about how the stressful event (e.g., social exclusion) relates to the self, which in turn may exacerbate and prolong negative emotions (Robinson & Alloy, 2003). However, no literature has explored how stress-reactive rumination influences one's emotional reaction to social exclusion and subsequent reactions to other environmental stimuli.

See Figure 1 for the proposed theoretical model. It is hypothesized that experiencing a psychologically painful event, such as social exclusion, will lead to an increase in reported negative affect directly following the event. In particular, individuals who endorse a history of high psychological pain and/or individuals who endorse frequently ruminating on stressful situations will experience greater negative affect following social exclusion compared to individuals with a history of low psychological pain and a lower tendency to ruminate on stressful situations. In turn, greater negative affect from social exclusion will lead to heightened emotional arousal towards negative stimuli. Similarly, individuals with a history of high psychological pain and/or individuals high in stress-reactive rumination will show heightened emotional arousal to other stimuli after being socially excluded. Lastly, it is hypothesized that participants in the social inclusion condition will not experience a rise in negative affect following the exclusion, and therefore will not experience heightened emotional arousal towards negative stimuli following the experimental paradigm.

Study Hypotheses

Based upon the available literature and the proposed theoretical model (see Figure 1), the following hypotheses will be tested.

1. Participants who are socially excluded will display greater negative affect following exclusion compared to participants who are socially included.
 - a. One's history of psychological pain will moderate the association between social exclusion and negative affect following exclusion.
 - b. One's tendency to participate in stress-reactive rumination will moderate the association between social exclusion and negative affect following exclusion.
2. Following the Cyberball task, participants who are socially excluded, when presented next with negatively valenced stimuli, will then rate these stimuli as more emotionally arousing compared to participants who are socially included.
 - a. Negative affect following the Cyberball task will mediate the relationship between social exclusion condition and increased emotional arousal to later presented negatively valenced stimuli.
 - b. One's history of psychological pain will moderate the relationship between negative affect following the Cyberball task and arousal ratings to later presented negatively valenced stimuli.
 - c. One's tendency to participate in stress-reactive rumination will moderate the relationship between negative affect following the Cyberball task and arousal ratings to later presented negatively valenced stimuli.

METHODS

Participants

A total of 658 undergraduate students at the University of South Florida were recruited through the online Psychology SONA participant management system. Criteria for study inclusion was anyone over the age of 18, fluent in reading English, and provided informed consent. Since this study was conducted online, exclusions included people who do not have access to a computer and/or internet. There were no other exclusionary criteria. In exchange for study participation, students received psychology course credit. Attention checks were included in the study and individuals who did not pass all attention checks were removed from analyses. Twenty-three participants were also removed from analyses due to an error with the Cyberball servers that rendered the task unusable for a short period of time. This resulted in 155 participants being removed, leaving a total sample of 503. Chi-square tests of independence and independent t-tests were performed to examine the relation between categorical and continuous demographic variables between participants that did or did not pass attention checks. Participants in the final sample did not significantly differ from excluded participants on any demographic variables.

See Table 1 for demographics of the final sample. 68.4% of the sample was female, 77.3% were heterosexual, 24.9% identified as Hispanic, and 63% were Caucasian. About half of participants were either a freshman or sophomore (55.6%) and 87% lived either at home with family or in off-campus housing.

Procedure

Participants were recruited from the University of South Florida SONA participant pool. Those who showed interest in participating in the study were first directed to the informed consent page, which detailed the background of the study, purpose, procedures, risks and benefits, participant rights, and confidentiality policies. To ensure that the study remained unbiased, participants were kept blind to the true purpose of the study. They were informed that the study was examining the effects of mental visualization on emotional experience (like what has been told to participants in prior experiments with the Cyberball paradigm; Williams et al., 2000). After giving informed consent, participants were directed to complete the online survey. Participants completed a demographics questionnaire, the Stress-Reactive Rumination Scale (SRRS; Robinson & Alloy, 2003), The Psychache Scale (Holden, Mehta, Cunningham, & McLeod, 2001), a novel psychological pain scale, and the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The order of presentation was randomized within Qualtrics to reduce the chances of order effects on questionnaire responses. When these questionnaires were completed, survey participants then rated 3 randomly selected negative photos from the Open Affective Standardized Image Set (OASIS; Kurdi, Lozano, & Bajani, 2017) picture system (once each from each of the three categories: mean arousal rating between 1.0-1.99, 2.0-2.99, and 3.0-3.99) to control for baseline emotional arousal. As an attention check item, one picture was of an animal and following the initial picture ratings, participants were asked “What type of animal was present in the previous photo?”. Participants were then randomly assigned to either the social exclusion condition or the social inclusion condition of the Cyberball task. The Cyberball task was completed directly within the survey platform.

Immediately following the task, another attention check item was presented: “How many people played in the game with you?”. To ensure that the paradigm was effective in inducing feelings of exclusion, participants completed the Perceived Exclusion scale. Following this, participants completed the PANAS once more, then were directed to rate negative emotionally valenced pictures taken from the OASIS picture bank. Participants were asked to respond to each of the 21 photos presented using the Self-Assessment Manikin (SAM; Bradley & Lang, 1994), to measure how much arousal they experienced in response to viewing each photo. When the survey was completed, two items designed to assess the effectiveness of the deception were presented (“What do you remember the purpose of the study to be?”, “How well do you think the study adhered to that purpose?”). Next, a debriefing page was presented to participants informing them of the true purpose of the study and the contact information of the principal investigator. Participants were asked to not reveal the study purpose to any other USF undergraduates so as not to spoil the study to other potential participants. Since this survey contained manipulation of social exclusion and the presentation of negative emotional stimuli, mental health resources (including campus, community, and national resources) were provided to all participants. Students received 1 point of course credit for their participation and were allowed to discontinue the study at any point without penalty or loss of course credit. Participant data were de-identified and assigned an anonymous participant number. It was stored on a secured, password protected server accessible only by authorized research personnel.

Cyberball 5 (Williams, Cheung, & Choi, 2000)

The Cyberball paradigm was developed to simulate a social exclusion experience. In this paradigm, participants were informed they are participating in a mental visualization task involving two other participants over the internet that involved tossing a computerized ball back

and forth among players. While the study participant was told the two other participants are fellow students also participating in the study, they were computer-generated participants engaging in predetermined actions. Before the start of the game, participants were given instructions on how to toss the ball to the other players. There was a total of 30 ball throws throughout the entire game. If an individual was assigned to the exclusion condition of the experiment, they received only two of the first five ball throws, then received no further throws and instead had to watch the two computer-generated characters toss the ball between themselves. If the participant was assigned to be in the inclusion condition, they received 33% of all throws throughout the game. To further increase the believability of an interaction occurring among real participants, the timing of the computerized throws ranged anywhere between 200 – 1500 milliseconds to simulate the time it would take a human player to throw the ball.

Research done using this paradigm has observed, following exclusion, significant decreases in self-reported ratings of fundamental needs (e.g., belonging, self-esteem, control, and meaningful existence), along with increases in feelings of sadness/anger (Hartgerink et al., 2015; Williams et al., 2000; Zadro et al., 2004). Interestingly, these effects remain significant even when participants believe or are told they are not playing with real humans, but rather are playing against computers (Zadro et al., 2004).

Open Affective Standardized Image Set (OASIS; Kurdi, Lozano, & Bajani, 2017)

The Open Affective Standardized Image Set (OASIS) is comprised of 900 color images all with normative ratings of valence (degree of positivity or negativity of each picture) and arousal (intensity of the emotional response picture produces). Pictures are categorized as either objects, animals, people, or scenes. Interrater reliability for both the valence and arousal dimensions was excellent ($r = .984$ and $.929$ respectively; Kurdi, Lozano, & Bajani, 2017). For

the purposes of this study, 21 pictures rated as negative in valence will be utilized. In the original validity study, pictures were rated on a scale between 1 (very negative) to 7 (very positive). Negatively valenced pictures that received ratings of 3 (Somewhat negative) or less (even more negative) were randomly selected to be used in this study. To ensure adequate variability in the ratings, 7 pictures were randomly selected from each of the three rating categories (7 pictures out of 35 whose mean rating was between 1.0-1.99, 7 pictures out of 125 whose mean rating was between 2.0-2.99; and 7 pictures out of 144 whose rating was between 3.0-3.99). Reliability of the arousal ratings in this study was excellent ($r = 0.91$). To determine if social exclusion affected emotional arousal towards stimuli non-interpersonal in nature, only negatively valenced images from the objects, animals, and scenes categories were utilized in this study.

Materials

Demographics

Basic demographics such as age, gender, sexual orientation, education (year in school), living situation (alone, with others, resident/commuter), and race/ethnicity were collected. This questionnaire took approximately three minutes to complete. See Appendix A.

The Psychache Scale (Holden, Mehta, Cunningham, & McLeod, 2001)

The Psychache Scale is a 13-item scale measuring past psychological pain. Example questions included, “I seem to ache inside”, “I can’t take my pain anymore”, and “My psychological pain seems worse than any physical pain”. Each question was answered using a Likert response scale ranging from 1 (never) to 5 (always) or a Likert response scale ranging from 1 (strongly disagree) to 5 (strongly agree). The Psychache Scale has established discriminative validity, as it successfully distinguishes between suicide attempters and non-attempters (effect size = .66; Holden et al., 2001). The scale also displayed concurrent validity as

it had strong, positive correlations with other scales measuring suicidal ideation ($r=.52$) and suicide attempts ($r=.30$) (Holden et al., 2001). Internal consistency for the scale has been reported in other literature as good ($\alpha = .92$; Holden et al., 2001). For the purposes of this study, participants were asked to respond to each question in general across their lifetime. To facilitate responding, stems were added to each question to orient participants to the time frame they were responding to. For lifetime responses, the stem “When I think back on my life...” was added for clarity. The measure took approximately 5 minutes to complete. Internal consistency of this measure for this study was excellent ($\alpha = 0.95$). See Appendix B for individual items.

Integrated Psychological Pain Scale (IPPS)

Previous psychological pain measures have been lacking in their operationalization of psychological pain. In order to better adhere to theoretical definitions of psychological pain, new items, in addition to items taken from other scales, were included in the battery of measures. Items were formed to correspond to the following definition in the literature that was derived from multiple theoretical conceptualizations of the psychological pain concept (Mee et al., 2006; Meerjwick and Weiss, 2011; Schneidman, 1993): “Aversive experience of intense negative affect, analogous to physical pain, that is deemed intolerable or unbearable to the individual. Brought on due to the loss of some basic psychological need that results in negative appraisals of inabilities/deficiencies of the self”. This definition resulted in five hypothesized dimensions of psychological pain; intense negative affect, analogous to physical pain, deemed intolerable/unbearable, is the result of unmet psychological needs, includes a negative appraisal of an inability/deficiency of the self. A total of 44 items were included in this new measure. Four items assessed intense negative affect (with one item taken from the Mental Pain Scale [Orbach & Mikulincer, 2003], one item from the Psychache Scale [Holden et al., 2001], one from the

Psychic Pain Scale [Lewis et al., 2020], and one developed by the author). Six items assessed how analogous psychological pain is to physical pain (five items developed by the author, one item taken from the Psychic Pain Scale). Seven items assessed intolerability/unbearability of the psychological pain (one item from the Psychache Scale, one from the Psychic Pain Scale, three from the Tolerance of Mental Pain Scale [Meerjwick et al., 2019], and two developed by the author). 18 items assessed unmet psychological needs and were all taken from the Balanced Measure of Psychological Needs Scale (Sheldon & Hilpert, 2012). Lastly, four items assessed negative appraisals or inability/deficiencies of the self, with two items taken from the Psychic Pain Scale and two items developed by the author. Internal consistency of this measure for this study was excellent ($\alpha = 0.95$).

CFA of Integrated Psychological Pain Scale

To test the hypothesized fit of the five-dimensional factor structure of the Integrated Psychological Pain Scale, a CFA was conducted using maximum likelihood estimation in SAS 9.4. A CFA model with the five latent factors allowed to covary was estimated. The five-factor model had poor overall model fit according to each model fit index examined ($\chi^2(702) = 4046.47, p < .01, RMSEA = 0.10, SRMR = 0.11, CFI = 0.74$).

Given the very poor model fit observed with the hypothesized five-factor structure, an EFA with maximum likelihood estimation and oblique rotation was conducted to determine if other factor structures would better fit the data. Oblique rotation was chosen over orthogonal rotation as to allow correlations between factors. In social sciences research in particular, this has been the suggested method of rotation, given that psychological constructs tend to theoretically be correlated with one another (Fabrigar et al., 1999). Parallel analysis was used to determine the number of factors to retain. Parallel analysis has been shown to be a more accurate method of

factor selection compared to the Kaiser criterion, the more commonly used approach (Velicer & Jackson, 1990). Parallel analysis works by comparing obtained eigenvalues for any given number of factors and compared them to eigenvalues that would be obtained at random. The total number of factors obtained would then be those with eigenvalues greater than those expected from random data (Costello & Osbourne, 2005; Fabrigar, Wegener, MacCallum, & Strahan, 1999). Scree plots and factor interpretability were also used to determine the overall number of factors to retain.

According to the parallel analysis, a total of four factors was to be retained. The scree plot was also consistent with the four-factor structure. Eigenvalues, critical values from the parallel analysis, proportion of variance, and cumulative variance can be seen in Table 5. In interpreting the rotated factor pattern, an item was deemed to load onto a given factor if the factor loading was 0.40 or greater for that specific factor and subsequently, if it was less than 0.40 for another factor (Young & Pierce, 2013; see Table 6 for factor loadings).

In the four-factor solution, factor one encompassed items related to intense negative affect, similarity of the emotional experience to physical pain, unbearability, and negative appraisals of the self. Factor two encompassed items suggesting lack of autonomy, loneliness, and feeling unappreciated. Factor three was made up of items related to positive experiences with challenging tasks and factor four was related to the presence of positive social connections. Three items did not significantly load onto any factor (27. I was free to do things my own way; 28. My choices expressed my “true self”; 37. I hated the person I became) and were subsequently removed for the measurement model. Each of the four latent factors were included in the subsequent measurement model.

For the purposes of the study hypotheses, the original Psychache Scale was also included in a separate EFA with items from the IPPS. These two scales were combined in order to form one latent factor (psychological pain) to be used in subsequent SEM analyses. As two items overlapped between the scales, a correlation was run to ensure the same items were highly correlated with one another before creating an average of each of the two items to be used in the subsequent EFA ($r = .79$, $r = .78$).

Maximum likelihood estimation and oblique rotation was again utilized in this second EFA. According to the parallel analysis, four factors were again determined to be retained. The scree plot was also consistent with the four-factor structure. Eigenvalues, critical values from the parallel analysis, proportion of variance, and cumulative variance can be seen in Table 7. In interpreting the rotated factor pattern, an item was deemed to load onto a given factor if the factor loading was 0.40 or greater for that specific factor and subsequently, if it was less than 0.40 for another factor (Young & Pierce, 2013; see Table 8 for factor loadings of combined scales). Overall, all items from the Psychache Scale significantly loaded onto factor 1 of the IPPS.

Stress-Reactive Rumination Scale (SRRS; Robinson & Alloy, 2003)

The SRRS is a 25-item measure assessing the frequency of stress-reactive ruminative thinking. It is comprised of three separate scales (Negative Inferential Rumination, Hopelessness Rumination, and Active Problem Solving). For the purposes of this study, only the Negative Inferential Rumination scale (9 items) was utilized, as previous research has used this subscale to specifically assess how frequently one ruminates on specific negative life events (Robinson & Alloy, 2003). Examples of items from this scale included “I think about how the negative event will affect my future”, “I think about the causes of the stressor”, and “I think about how the event

will impact other areas of my life”. Individuals respond on a scale from “0” (do not think about it at all) to “100” (think about this very frequently). The SRRS has shown good internal consistency ($\alpha = .89$; Robinson & Alloy, 2003), along with test-retest reliability ($r = .71$; Robinson & Alloy, 2003). It has also shown concurrent validity with other measures of inferential style and depressive rumination ($r = .36$ and $.69$ respectively; Robinson & Alloy, 2003), along with incremental validity, as it better predicted the frequency and duration of depressive episodes compared to depressive rumination (Robinson & Alloy, 2003). The measure took approximately three minutes to complete. Internal consistency of this measure for this study was good ($\alpha = 0.88$). See Appendix C.

Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988)

The PANAS is a 20-item measure assessing positive and negative affect. Each item is a positively or negatively valenced adjective that participants rate how much they are currently feelings on a scale from 1 (very slightly or not at all) to 5 (extremely). For the purposes of this study, only the negative affect (NA) subscale was utilized. Example of the negative affect items include “distressed”, “upset”, “hostile”, and “afraid”. The PANAS has demonstrated good internal consistency ($\alpha = .84 - .90$; Watson, Clark, & Tellegen, 1988), along with high test-retest reliability ($r = .79 - .81$; Watson, Clark, & Tellegen, 1988). It has also shown concurrent validity with other brief measures of affect (e.g., distress, depression, and anxiety; $r = .51 - .82$; Watson, Clark, & Tellegen, 1988). It took approximately 5 minutes to complete. Internal consistency of these negative affect items pre- and post-Cyberball for this study was good respectively ($\alpha = 0.89, 0.88$). See Appendix D.

Perceived Exclusion (Williams et al., 2000)

To determine if participants in the exclusion condition notice the exclusion during the Cyberball paradigm, following the game participants were asked on a 1-9 scale how excluded they felt during the task (1 = not at all to 9= very much so). This measurement scale has been inversely correlated with the number of ball throws that participants receive in the Cyberball task (lower number of received throws, higher rating of perceived exclusion; Williams et al., 2000). Additionally, concurrent validity of this rating scale has been established, as it also has been correlated with ratings of negative mood and perceptions of group cohesiveness following the task ($r = 0.49 - 0.53$; Williams et al., 2000). Individuals in the inclusion condition were given this same measure to ensure that the experimental groups display differences in the amount of perceived exclusion they experience.

The Self-Assessment Manikin (SAM; Bradley & Lang, 1994)

Participants were instructed to look at each photo from the OASIS picture system and rate the level of emotional arousal they are currently experiencing while viewing each photo. Participants were given a non-verbal, pictorial scale (the SAM) of emotional arousal and asked to rate their arousal on a scale from 1 (low) to 9 (high). The SAM has been used to measure individual's reactions to affective pictures in previous studies (Bradley & Lang, 1994; Cuthbert et al., 2000). The scale has successfully distinguished emotional from neutral pictures (Lang et al., 1993; Cuthbert et al., 2000) and has been highly correlated with physiological measures of arousal (Cuthbert et al., 2000). Additionally, the SAM is highly correlated with other, verbal-based measures of arousal (Bradley & Lang, 1994). For this study, the combined ratings of arousal had excellent internal consistency ($\alpha = 0.94$).

Preliminary Analyses

Upon retrieval of the data from the online survey platform, composite scores were calculated for all measures. Descriptive statistics on all demographic items and total measure scores were run to calculate frequencies for categorical data and means (including standard deviations and ranges) for continuous data. Data for continuous variables were examined for outliers and tested for normality using the Shapiro-Wilk test and homoscedacity using Levine's test for Equality of Variance. If skewness was between -1 and +1 and kurtosis was between +3 and -3, then scores were considered normally distributed (Joanes & Gill, 1998). Missing data was dealt with using Maximum Likelihood (ML) estimation. Each measure was also checked for reliability (Cronbach's alpha; Cronbach, 1951). Lastly, multivariate normality was examined using the variable inflation factor (VIF). VIF values of 10 or greater are evidence of multicollinearity (Cohen, Cohen, West, & Aiken, 2003).

Analyses for Respective Study Hypotheses

Structural equation modeling (SEM) was utilized to test the hypothesized model. SEM is a statistical technique whereby linear relationships between variables can be tested. SEM is preferred over other multivariate linear modeling techniques in that it allows for the assessment of measurement error within a model, which increases statistical power to detect effects. Additionally, SEM can estimate latent or unobserved variables within the dataset, which also allows for the inclusion of measurement error within observed variables. Lastly, an overall structure that assesses the fit of the data can be produced in SEM rather than only having individual coefficients that are produced with other modeling techniques.

To test the proposed hypotheses, moderated mediation using SEM was implemented using the PROCESS macro for R (Hayes, 2013; R Core Team, 2020). A two-staged approach

was conducted (Anderson & Gerbing, 1988), whereby first a measurement model was estimated (to develop an acceptable latent variable structure). Item parceling was performed in this step to estimate each latent factor. Parceling refers to using the aggregate of a subset of items on a scale and using that aggregate as indicators of the latent construct (Kishton & Widaman, 1994). Parceling has been shown to be beneficial when constructing latent variables with many items. For example, parceling can stabilize parameter estimates and improve model fit (Bandalos, 2002; Holbert & Stephenson, 2002). Parceling may also more adequately estimate the underlying latent factor as aggregated scores better approximate the distribution of a variable compared to individual items (Boyle, 1991). Lastly, including more items in the construction of a latent variable inherently also increases the amount of measurement error introduced into the model, which in turn adversely impacts model fit (Matsunaga, 2008). By employing parceling techniques, measurement error can be reduced, and model fit can be improved (Matsunaga, 2008).

Items were divided up randomly into three parcels per latent factor, as has been recommended to balance adequate model fit and accurate parameter estimation (Bandalos, 2002; Matsunaga, 2008). The goodness of overall model fit was evaluated using the comparative fit index (CFI), Tucker-Lewis Index (TLI), root-mean square error of approximation (RMSEA), and the chi-square statistic. A non-significant chi-square index ($p > 0.05$; Hu & Bentler, 1999) suggested good model fit, along with a CFI greater than .90, TLI greater than .90, and an RMSEA of .08 or less (Hu & Bentler, 1999). The significance of the path coefficients was examined to ensure that the observed variables significantly contributed to the measurement of the latent factors. This model was modified, if needed/if appropriate, to achieve acceptable model fit. Additionally, given the sample was largely female, measurement invariance was

examined within the measurement model to ensure that latent constructs were being measured the same amongst males and females, before running the structural model. Following this, a moderated mediation analysis was conducted using SEM. Full information maximum likelihood (FIML) estimation methods were utilized to generate parameter estimates, as this method is robust to violations of multivariate normality and works well for model estimation with missing data (Okleshen-Peters & Enders, 2002). Like step one, the goodness of overall model fit was evaluated using the previously mentioned criteria. The significance of the path coefficients was then evaluated.

Two moderated mediation models and a mediation model without the moderators were run to test the proposed hypotheses (see Figure 4, Figure 5, and Figure 6). The model was split in this manner to avoid introducing biased parameter estimates, since when the same moderator is utilized at two separate points in the same model, it can bias the indirect effect when testing moderated mediation (Hayes, 2018). Social exclusion condition was used as the independent variable for analyses. The main effect of social exclusion on negative affect following Cyberball was first determined by examining the significance of the social exclusion pathway with the dependent variable (negative affect following Cyberball paradigm), as indicated in the SEM model (Hypothesis 1). Similarly, the moderation effects of one's history of psychological pain (Hypothesis 1a) and rumination (Hypothesis 1b) on the relationship between social exclusion condition and negative affect following Cyberball was determined by examining the significance of the parameter estimates of each variable's main effect and the interaction of each variable with social exclusion. Similarly, the direct effect of social exclusion on emotional arousal ratings (as measured by arousal ratings towards 21 negatively valenced photos) following Cyberball was determined by including a direct pathway from social exclusion condition to post-Cyberball

emotional arousal ratings and examining its significance and parameter estimate (Hypothesis 2). Additionally, the mediating effect of negative affect following social exclusion on post-Cyberball emotional arousal was examined (Hypothesis 2a). Lastly, the moderation effect of psychological pain (Hypothesis 2b) and rumination (Hypothesis 2c) on post-Cyberball emotional arousal ratings was tested in the SEM model by again examining the significance of the parameter estimates for each main effect and interaction effect. Baseline emotional arousal (as measured by arousal ratings towards three negatively valanced photos) and baseline negative affect (as measured by the PANAS) were controlled for throughout the model to control for any arousal/affect effects not due to the Cyberball paradigm.

RESULTS

A total of 503 undergraduate students were included in the final analyses. In terms of missing data, 17% of the sample had at least one missing data point, which is common in psychological sciences (Enders, 2003). Descriptive statistics for each of the variables in this study are included in Table 2. All scales had good to excellent internal consistency (Cronbach's $\alpha = 0.88-0.95$) and skewness/kurtosis were within normal limits for all variables. See Table 3/Table 4 for bivariate correlations amongst all variables.

Measurement Model

A measurement model was first developed using confirmatory factor analysis (CFA) to ensure that parcels purposed to measure the study's latent constructs were highly correlated with one another and mapped onto their respective latent constructs (see Figure 2 for the measurement model). Overall, the measurement model produced good model fit across most indices examined ($\chi^2 (153) = 7585.93$, $p < .001$, $TLI = .91$, $RMSEA = 0.08$, $CFI = 0.95$). Standardized path coefficients and covariance estimates are presented in Figure 3. All path coefficients significantly contributed to the measurement of their respective latent factors.

Measurement Invariance by Gender

Given the sample was largely female, measurement invariance was tested for using multigroup structural equation modeling. The stepwise procedure for invariance testing recommended by Thompson and Green (2006) was utilized, whereby differences in factor means under partial invariance are examined. Fit indices are then examined across models to determine

if invariance across groups is present. Configural invariance (assurance that items load on same latent factor across groups) was examined in the first step (model 1). This was done by examining the model fit of the same pattern of factor loadings in each group with no between-groups constraints placed on parameter estimates. Next, metric invariance (equivalence of factor loadings) was examined in the second step (model 2). This was done by constraining factor loadings across groups to be equal and comparing model 2 with model 1. Lastly, scalar invariance (equivalence of item intercepts) was examined in the third step (model 3). This was done by constraining item intercepts to be equal. Fit was examined using the chi-square statistic, CFI, TLI, and RMSEA. Meeting configural, metric, and scalar invariance allows researchers to examine latent factor means, latent factor variances, and latent factor covariances across groups (Meredith, 1993).

First, configural invariance was determined by conducting two CFAs, one for each group. The CFA tested in each group was the same CFA as employed in the measurement model. For males, the model produced an acceptable fit to the data ($\chi^2(288) = 673.89, p < .001, TLI = 0.92, RMSEA = 0.08, CFI = 0.89$). Similarly, for females, the model also was a good fit to the data ($\chi^2(351) = 753.56, p < .001, TLI = 0.91, RMSEA = 0.07, CFI = 0.93$). Considering the reasonable overall model fit for both males and females, it was concluded that there was support for configural invariance.

Second, metric invariance was tested. Results showed that the model fits the data adequately ($\chi^2(594) = 1,245.50, p < .001, CFI = 0.93, RMSEA = 0.07, TLI = 0.92$). The model comparison test (configural vs. metric) suggested metric invariance, as model fit did not deteriorate.

Lastly, scalar invariance was tested. Results showed that the model fits the data adequately ($\chi^2(406) = 1,273.41$, $p < .001$, CFI = 0.93, RMSEA = 0.07, TLI = 0.92), and the model fit did not deteriorate, therefore scalar invariance was also supported. Given configural, metric, and scalar invariance were all supported, it was deemed that full measurement invariance existed between males and female

Structural Model

After ensuring the validity of the latent constructs and measurement invariance between genders, one mediation model and two moderated mediation models using SEM were developed to assess the hypothesized causal relationships among the study variables (see Figure 4, Figure 5, and Figure 6 for the structural models). In addition to using the IPPS, hypotheses were tested using the Psychache Scale alone and results were not significantly different from what is presented.

For the mediation model, the model fit was good ($\chi^2(33) = 2934.92$, $p < .001$, TLI = .99, RMSEA = 0.05, CFI = 0.99). In the subsequent models with the moderators included, model fit remained excellent (Figure 5 model: $\chi^2(207) = 9620.45$, $p < .001$, TLI = .95, RMSEA = 0.07, CFI = 0.96; Figure 6 model: $\chi^2(207) = 8008.65$, $p < .001$, TLI = 0.90, RMSEA = 0.08, CFI = 0.92). Standardized path coefficients are presented in Figure 7, Figure 8, and Figure 9.

Hypothesis Testing

Hypothesis 1. Participants who are socially excluded will display greater negative affect following exclusion compared to participants who are socially included. The pathway from the social exclusion condition to negative affect as measured by the PANAS following Cyberball was significant ($M_{\text{exclusion}} = 17.62$, $M_{\text{non-excluded}} = 15.92$; $\beta = 0.15$, $p = 0.01$, Cohen's $D = 0.31$),

whereby individuals in the exclusion condition had higher negative affects scores following Cyberball compared to individuals in the non-excluded condition.

Hypothesis 1a. One's history of psychological pain will moderate the association between social exclusion and negative affect following exclusion. Controlling for the effects of rumination, psychological pain did not significantly moderate the relationship between social exclusion and negative affect following exclusion ($\beta = 0.04$, $p = 0.33$, Cohen's $D = 0.08$).

Hypothesis 1b. One's tendency to participate in stress-reactive rumination will moderate the association between social exclusion and negative affect following exclusion. Controlling for the effects of psychological pain, rumination did not significantly moderate the relationship between social exclusion and negative affect following exclusion ($\beta = 0.02$, $p = 0.55$, Cohen's $D = 0.06$).

Hypothesis 2. Following the Cyberball task, participants who are socially excluded, when presented next with negatively valenced stimuli, will then rate these stimuli as more emotionally arousing compared to participants who are socially included. Controlling for baseline negative affect and baseline arousal, the pathway from social exclusion condition to emotional arousal ratings of negative stimuli was not significant ($\beta = -0.004$, $p = 0.97$, Cohen's $D = 0.001$), suggesting that emotional arousal ratings did not differ between those who were in the exclusion condition and those in the non-exclusion condition.

Hypothesis 2a. Negative affect following the Cyberball task will mediate the relationship between social exclusion condition and increased emotional arousal to later presented negatively valenced stimuli. Both the "a" pathway, or the pathway between social exclusion condition and negative affect following Cyberball ($\beta = 0.15$, $p = 0.01$, Cohen's $D = 0.31$) and "b" pathway, or the pathway between negative affect following Cyberball and

emotional arousal ratings of negative stimuli ($\beta = 0.10$, $p = 0.01$, Cohen's $D = 0.20$) were significant. However, the direct effect ("c", or the pathway between exclusion condition and emotional arousal) was non-significant ($\beta = -0.07$, $p = 0.53$, Cohen's $D = 0.14$). Additionally, the "c" or total pathway (the pathway between exclusion condition and emotional arousal considering the mediator, negative affect) was non-significant ($\beta = -0.05$, $p = 0.68$, Cohen's $D = 0.10$). Lastly, the indirect pathway or "ab" pathway was non-significant ($\beta = 0.02$, $p = 0.06$, Cohen's $D = 0.04$), suggesting that negative affect following Cyberball did not mediate the relationship between social exclusion condition and emotional arousal to negative stimuli.

Hypothesis 2b. One's history of psychological pain will moderate the relationship between negative affect following the Cyberball task and arousal ratings to later presented negatively valanced stimuli. Controlling for the moderation effects of rumination, psychological pain did not moderate the relationship between negative affect following exclusion and emotional arousal ($\beta = 0.04$, $p = 0.35$, Cohen's $D = 0.08$).

Hypothesis 2c. One's tendency to participate in stress-reactive rumination will moderate the relationship between negative affect following the Cyberball task and arousal ratings to later presented negatively valanced stimuli. Controlling for the moderation effects of psychological pain, rumination did not moderate the relationship between negative affect following exclusion and emotional arousal ($\beta = -0.08$, $p = 0.09$, Cohen's $D = 0.16$).

DISCUSSION

This study explored the effects of social exclusion on emotional arousal towards negative stimuli, while examining the role of two possible moderators (i.e., psychological pain and rumination). Few studies have looked at how social exclusion may alter emotional responses towards non-socially related stimuli. Similarly, no studies have attempted to examine if certain factors affect how emotional arousal responses change in the face of social exclusion. It was hypothesized that participants who are socially excluded will display greater negative affect following exclusion compared to participants who are socially included. Additionally, it was hypothesized that a history of psychological pain and rumination would moderate the relationship between social exclusion condition and negative affect following social exclusion. It was also hypothesized that individuals who are socially excluded will display greater emotional arousal towards negative stimuli, and that negative affect following the social exclusion task would mediate this relationship. Lastly, it was predicted that history of psychological pain and rumination would moderate the relationship between negative affect following social exclusion and emotional arousal towards negative stimuli following exclusion.

Notably, a significant positive relationship was found between negative affect following Cyberball and emotional arousal towards negative stimuli. This finding was novel, as few studies to date have examined how experimentally induced negative affect may prime individuals to respond with greater than typical emotional arousal to negatively valenced cues. Somewhat similarly, Saladin et al., (2012) found that women smokers, after engaging in a negative imagery exercise, reported higher levels of emotional arousal towards smoking cues compared to women

who first engaged in a neutral imagery condition. While this study did not specifically examine reactions to negative cues following a negative mood induction, it showed that alterations in mood did increase individuals' arousal levels towards smoking cues for individuals that smoked. Other correlational studies have shown a positive relationship between negative affect and level of arousal when rating pictorial stimuli (Bradley & Lang, 1994; Constantinou, Bogaerts, Van Diest, & Van den Bergh, 2013; Kuppens et al., 2013; Reich & Zautra, 2002). Heightened negative affect may serve to make individuals more sensitive to responding more strongly to certain cues, such as future negative information, to protect oneself from further negative situations. Indeed, one study looking at autobiographical recall of memories found that when asked to recall negative memories, individuals reported greater detail in negative memories associated with higher emotional arousal compared to low emotional arousal (Ford, Addis, & Giovanello, 2012). Results such as these suggest that highly arousing negative events may be more important for individuals to vividly remember, therefore heightened negative affect may prime individuals to be on high alert for other potentially negative or harmful scenarios. It could also be the case that reporting on negative affect first primes individuals to be more aware of their physiological arousal than they may otherwise be. Given the hypotheses for this study, negative affect was measured immediately following the social exclusion task before individuals rated their arousal towards the negative pictorial stimuli. The nature of this presentation may mean that participants were cued to think about their current negative emotional state, which may in turn have made participants more aware of any physiological arousal. Indeed, other research has shown that order effects exist when giving self-report questionnaires, whereby the presentation of certain questionnaires themselves may alter how individuals respond to future questionnaires (Mackinnon & Wang, 2020). If participants were made to be more aware of their

current emotional state, they may have tended to report greater arousal than they would have if they were not asked about their negative emotions beforehand.

Another significant finding, as hypothesized, was individuals who were socially excluded had significantly greater negative affect following the exclusion task. This finding is consistent with a myriad of literature showing social exclusion is linked to negative emotional outcomes (Arslan, 2021; Miller et al., 2018; van Bergen et al., 2019; Williams, 2007). With other studies employing Cyberball specifically, the exclusion condition of this task has been shown to lead to increased negative affect, including increased feelings of anger and sadness (Hartgerink et al., 2015; Zadro et al., 2004).

Despite the statistically significant difference between the two groups, this difference in negative affect was quite small (negative affect PANAS rating of 1.77 for excluded individuals versus 1.59 for non-excluded individuals). This relatively small difference may reflect the lack of effectiveness of the exclusion task itself. Indeed, other more recent studies have noted relatively small changes or no significant changes in negative affect between exclusion and non-exclusion conditions (Kroll et al., 2019, Lambe, Craig, & Hollenstein, 2019, Szkody, Steele, & McKinney, 2020, von Mohr, Kirsch, & Fotopoulou, 2017). There could be multiple explanations for these mixed findings regarding Cyberball's impact on negative affect. For example, it may be due to the timing of measurement that greater effects aren't found. Participants may be experiencing more negative affect during the game than what they report following the game. Indeed, some have suggested that negative affect in the exclusion condition may actually decrease immediately following the game, as participants may be relieved that the paradigm is over (Szkody, Steele, & McKinney, 2020). Other researchers have noted that participants report less negative affect immediately following Cyberball compared to several hours later (Hartgerink et al., 2015).

Additionally, considering this data was collected at the beginning of the COVID-19 pandemic (May 2020-October 2020), there may have been effects from this event, considering many individuals were quarantined and unable to engage in their usual social activities. For example, the Cyberball paradigm, which involves playing a ball-tossing game with perceived strangers online, this form of exclusion may have seemed relatively unimportant compared to many individuals' current states of social isolation during the pandemic. This stark comparison between a computer game and the stressors participants may have been experiencing at the time may have made participants less vulnerable to the paradigm's effects. Additionally, Cyberball may not always produce changes in mood due to how participants interpret the game's effect on their lives. Almeida, McGonagle, & King (2009) found that stressors that were interpreted to be particularly disruptive to one's daily routine or posed a risk to one's physical health/safety were the most likely to result in increased negative affect. It may be the case that Cyberball was not deemed to be particularly impactful on participants' individuals lives, therefore resulting in smaller changes in negative affect.

The relative ineffectiveness of the Cyberball paradigm may also be a reason why no significant mediation or moderation effects were observed. Indeed, ratings of perceived exclusion following the task were not largely different between the excluded and non-excluded groups ($M = 5.62$ vs $M = 3.18$) In terms of mediation, significant relationships were seen between social exclusion and negative affect following Cyberball, along with negative affect following Cyberball and emotional arousal to negative stimuli. However, there was no direct relationship between social exclusion and emotional arousal to negative stimuli. This may indicate that while the Cyberball paradigm may have been able to induce small changes in negative affect, it may not have been powerful enough to lead to direct changes in emotional

arousal. This is contrary to similar studies looking at how social exclusion alters emotional arousal. For example, Miller et al., (2018) examined how social exclusion impacted emotional arousal in adolescent females and found an effect of exclusion on arousal. However, the paradigm that was used may have been a more effective means of inducing feelings of exclusion, as it was more personal in nature (participants were directly told another person chose not to meet them based upon their description of themselves). Additionally, adolescents are more prone to report changes in mood following social exclusion paradigms compared to adults (Sebastian, Viding, Williams, & Blakemore, 2010), so the specific sample utilized may have made it more likely that effects were found.

Similarly, no significant moderation effects were found for either of the measured moderators. However, given the small-sized relationships that these moderators were proposed to effect, the lack of observed statistical significance is not surprising. However, given that there was a small but significant difference between groups on negative affect following the task, it could be a possibility that more meaningful social exclusion leads to far greater deleterious outcomes. For example, if individuals were excluded by people they knew or cared about, they would probably respond with much greater changes in negative affect compared to this study's task. This highlights that social exclusion in a laboratory setting, while having the effect of producing negative outcomes, only captures a small piece of what social exclusion truly is like. If similar studies could potentially be conducted that more closely simulate social exclusion in real-world settings, these observed findings would likely be much larger and the potential to find mediation or moderation effects may be enhanced.

Given the previously mentioned significant, but weak findings, the uniqueness of this study sample (collected during a pandemic) seems to stand out. Interestingly, compared to

undergraduate samples from other studies at non-pandemic times, levels of reported psychological pain may have been higher than what has been reported in previous literature. In this study, participants reported an average sum score of 30.09 on the Psychache Scale (Holden, Mehta, Cunningham, & McLeod, 2001). Troister, Agata, and Holden (2015) found lower levels of psychological pain in undergraduates in their study ($M = 20.35$, $SD = 8.25$). Lambert et al., (2020) found comparable levels of psychological pain in their sample of undergraduates just beginning college ($M = 28.82$, $SD = 11.47$). Interestingly, in their study, levels of psychological pain starting college predicted suicide attempter status in a 10-week follow-up in samples of students with and without previous suicide attempts. Those students who reported having suicide attempts at follow-up had average psychological pain scores at baseline closer to the current study's sample ($M_{\text{no previous attempts}} = 31.78$, $M_{\text{previous attempt}} = 30.21$). This could indicate that current samples of students may be at higher risk than previous students were. Given this data was collected at the beginning of the COVID-19 pandemic, this potentially reflects the harmful mental health effects the quarantine and pandemic has had on individuals. Many other researchers have hypothesized that the pandemic could lead to greater rates of suicidal behavior due to increased social isolation, fear/anxiety, depression, insomnia, and general stress levels (Sher, 2020). Empirical evidence so far suggests this may be the case. For example, in a study conducted in Japan, suicide rates were higher in 2020 compared to previous years (Sakamoto et al., 2021). However, other studies have found no differences in suicide rates during the pandemic compared to previous years (Radeloff et al., 2021). In terms of suicide risk, in the United States, 17.5% of individuals reported active suicidal ideation during the month of April 2020 (Ammerman, Burke, Jacobucci, & McClure, 2021). This number is significantly higher compared to the year 2019, where 4.8% of adults in the United States reported suicidal thoughts

at some point throughout the year (National Survey on Drug Use and Health, 2019). Further empirical evidence on suicide rates during the pandemic will need to be gathered before hard conclusions can be drawn, but preliminary evidence suggests that the pandemic may be increasing suicide risk. The current study's sample may reflect this phenomenon, given the higher reported rates of psychological pain than prior studies.

Similarly, stress-reactive rumination in this sample also appeared to be higher in this study ($M = 50.37$, $SD = 17.66$) compared to previous samples of undergraduates. Connolly & Alloy (2017) found lower levels of stress-reactive rumination in their study sample of undergraduates ($M = 39.83$, $SD = 15.56$), as did Vanderhasselt et al., (2016) ($M = 42.08$, $SD = 12.80$). Like psychological pain, this higher stress-reactive rumination may be the result of the pandemic and quarantine mandates during the study period. Participants may have been more stressed and therefore may have been more likely to report thinking repeatedly about their stress.

The seemingly higher-risk sample in this study may have affected study findings in a few ways. First off, as previously mentioned, COVID-19 and other mental health concerns may have made the social exclusion paradigm in this study less effective, as participants may have deemed the social exclusion relatively unimportant compared to other stressful events in their lives. Similarly, as participants reported higher than typical levels of stress-reactive rumination, they may have been less engaged during the study. Indeed, while participants may have been attentive enough to pass attention check items, they still may have not been fully engaged in the social exclusion task.

While this study had multiple strengths, including an experimental study design and large sample size, there are some limitations to note. As noted earlier, the paradigm used to simulate social exclusion may not have been strong enough to produce the desired effects. Future studies

should attempt to utilize more realistic social exclusion paradigms. For example, Miller et al., (2018) utilized a social evaluation task to induce feelings of exclusion, where adolescents were asked to complete a questionnaire about their personal lives and were then told the questionnaire would be passed along to a peer in another room, who could choose to either chat online with them during the study or not based upon their questionnaire responses. This paradigm produced large effects on self-reported feelings of rejection. This paradigm may have produced large effects given the personal nature of the rejection (study participants may have felt they were not chosen to chat with directly because of their personality or their preferences as assessed on the questionnaire). Larger effects on psychological outcomes may also be observed when using paradigms that utilize direct rejection, rather than passive exclusion. Future studies should continue to explore how reactions to social exclusion change due to utilizing more personal paradigms or more direct paradigms. Similarly, there may be differing outcomes depending on who the social exclusion is stemming from. In the Miller et al., (2018) study, participants were informed they were being rejected by peers. Other studies have found the effects of social exclusion may be stronger when participants face rejection from in-group rather than out-group members (Sacco, Bernstein, Young & Hugenberg, 2014). Future exclusion paradigms should alter who the social exclusion is stemming from to determine when exclusion exerts the strongest effects on outcomes. Future studies should also attempt to study the effects of social exclusion in-vivo. For example, ecological momentary assessment studies could be designed to assess social exclusion individuals may experience in their daily lives and examine the mental health sequelae of that exclusion.

The small effect may also be due to the paradigm being employed online rather than in a laboratory setting. Completing the Cyberball game while alone or in a more comfortable

environment may lead to different effects on negative affect compared to completing the game in an unfamiliar environment, where other people may potentially be present. For example, completing the paradigm in a laboratory setting may make the paradigm more believable, which may have influenced how effective it was at inducing negative affect. Being in a laboratory setting may also limit the number of distractions that people have while completing the study. It may have been the case that weak effects were observed due to participants multi-tasking or being distracted within their home. Future research should attempt to explore the differences in outcomes when the Cyberball paradigm is utilized in different settings. Secondly, while a relatively large sample was used in the current study, results from an undergraduate sample may not generalize to other populations. Populations with higher rejection sensitivity for example may have responded more strongly to the exclusion task. Similarly, populations that possess difficulties with processing social information, such as individuals with schizophrenia or on the autism spectrum, may react differently when confronted with social exclusion. Future research should continue to look at the downstream effects of social exclusion in clinical populations.

Lastly, this study utilized self-report measures, which come with their own limitations. For example, accuracy of self-report due to distraction or lack of attentiveness may be of concern. However, this study attempted to account for this by including multiple attention-check items throughout the study. Social desirability can also be a concern when conducting self-report studies (Arnold & Feldman, 1981). This may be particularly concerning when asking questions about mental health, as participants may not want to endorse experiencing mental health difficulties or concerns (Corrigan & Watson, 2002). However, given the study was conducted online and anonymously, and considering the study sample reported rather high rates of rumination and psychological pain, social desirability may not be a particular concern in the

current study. Additionally, while self-report is typically an accepted means of gathering information on internal states (Manassis, Tannock, & Monga, 2009), physiological measures may provide a more accurate account of emotional states, particularly emotional arousal, which has been defined by its physiological properties. However, studies have shown high correlations between self-report and physiological measures of emotional arousal (Cuthbert et al., 2000), suggesting that self-report measures of emotional experiences may be just as accurate as physiological measures.

Despite the forementioned limitations, this study possessed several strengths. This was one of the first studies to examine the effects of social exclusion on negative affect and emotional arousal to negative stimuli. The results were in line with existing theories that suggest social exclusion is linked to negative psychological outcomes (Baumeister & Leary, 1985; Leary & Baumeister, 2000). However, this study expanded on existing theory by suggesting that social exclusion may also alter how individuals emotionally respond to other negative stimuli, depending on how their negative affect changes following exclusion. These findings suggest that social exclusion may exert additional effects on emotional responding beyond immediate negative affect, as some people may continue to respond differently to negative cues in their environment following an exclusionary experience.

In addition to expanding current theories, by exploring potential pathways that could lead to poor mental health following exclusion, we can better identify spots to intervene on these pathways. For example, this study indicated that social exclusion may lead to increased negative affect, which in turn may alter arousal levels towards other negative stimuli. Clinical interventions may focus on reducing negative affect following social exclusionary experiences or helping individuals become more aware of how they are responding to other negative

information in their environment because of their current mood states. Future research should continue to explore other pathways that may connect social exclusion experiences to poor mental health outcomes.

This study was also one of the first to attempt to examine moderators that may impact the effects of social exclusion. If factors could be found that indicate someone is particularly prone to responding poorly to social exclusion, interventions may be better directed to individuals who may experience more severe negative health sequelae in the face of exclusion. For example, social exclusion may make certain individuals, such as those with less positive social connections in their lives, more likely to have prolonged effects from those experiences. There may also be certain clinical populations that respond differently to social exclusion, such as individuals with depression, social anxiety, or borderline personality disorder. Future research should attempt to explore the effects of social exclusion on these clinical populations. Additionally, although the moderators of stress-reactive rumination and psychological pain were not found to have effects in this study, they should be further explored in future studies, potentially utilizing one of the other suggested social exclusion paradigms.

Table 1: *Demographics*

Variable		N (%)	Mean	SD
Age		498 (99%)	20.55	4.10
Education	Freshman	138 (27.4%)	-	-
	Sophomore	142 (28.2%)	-	-
	Junior	119 (23.7%)	-	-
	Senior	87 (17.3%)	-	-
	5 th Year or Above	12 (2.4%)	-	-
Race/Ethnicity	Asian	62 (12.3%)	-	-
	Black/African American	53 (10.5%)	-	-
	Caucasian	317 (63%)	-	-
	American Indian/Alaskan Native	2 (0.4%)	-	-
	More than 1 race	60 (12%)	-	-
	Hispanic/Latina(o)	125 (24.9%)	-	-
Sexual Orientation	Heterosexual	389 (77.3%)	-	-
	Homosexual	20 (4%)	-	-
	Bisexual	68 (13.5%)	-	-
	Unsure	11 (2.2%)	-	-
	Other	9 (1.8%)	-	-

Table 1 (Continued)

Variable		N (%)	Mean	SD
Gender Identity	Female	344 (68.4%)	-	-
	Male	144 (28.6%)	-	-
	Other	9 (1.8%)	-	-
Marital Status	Married	12 (2.4%)	-	-
	Single	479 (95.2%)	-	-
	Widowed	0 (0%)	-	-
	Divorced	6 (1.2%)	-	-
	Separated	1 (0.2%)	-	-
Living Situation	On-campus residence hall	54 (10.7%)	-	-
	Fraternity/sorority house	4 (0.8%)	-	-
	Off-campus housing	212 (42.1%)	-	-
	At home with family	226 (44.9%)	-	-
	Other	2 (0.4%)	-	-

Table 2: *Descriptive Statistics*

	Exclusion Condition				Non-Exclusion Condition			
	Mean	SD	Skewness	Kurtosis	Mean	SD	Skewness	Kurtosis
1. Psychache Scale	2.37	0.99	0.47	-0.67	2.27	0.93	0.59	-0.43
2. Integrated Psychological Pain Scale	2.42	0.64	0.68	0.10	2.32	0.59	0.60	-0.11
3. Stress-Reactive Rumination Scale	56.47	19.42	-0.46	-0.09	56.46	19.47	-0.24	-0.11
4. Baseline Arousal	4.79	1.79	-0.18	-0.47	4.62	1.76	-0.11	-0.60
5. PANAS Pre-Cyberball	1.93	0.78	0.69	-0.38	1.82	0.76	0.90	-.09
6. PANAS Post-Cyberball	1.77*	0.70	0.86	-0.22	1.59*	0.65	1.55	2.31
7. Post-Cyberball Arousal	4.74	1.58	-0.14	-0.60	4.67	1.56	-0.11	-0.49

*Significant between-group difference at $p < .05$

Table 3. *Bivariate Correlations – Exclusion Condition*

	Exclusion Condition										
	1	2	3	4	5	6	7	8	9	10	11
1. Psychache Scale	-										
2. Integrated Psychological Pain Scale	0.87**	-									
3. IPPS – Factor 1	0.89**	0.93**	-								
4. IPPS – Factor 2	0.69**	0.833**	0.70**	-							
5. IPPS – Factor 3	0.12	0.34**	0.09	0.14*	-						
6. IPPS – Factor 4	0.20**	0.36**	0.11	0.22**	0.51**	-					
7. Stress-Reactive Rumination Scale	0.39**	0.42**	0.39**	0.41**	0.12	0.11	-				
8. Baseline Arousal	0.05	0.01	0.03	-0.08	-0.02	-0.11	0.23**	-			
9. PANAS Pre-Cyberball	0.44**	0.52**	0.41**	0.43**	0.20**	0.23**	0.24**	0.06	-		
10. PANAS Post-Cyberball	0.44**	0.49**	0.47**	0.45**	0.15*	0.09	0.27**	0.10	0.74**	-	
11. Post-Cyberball Arousal	0.06	0.01	0.033	-0.07	0.05	-0.06	0.21**	0.70**	0.12	0.15*	-

*Significant correlation at $p < 0.05$

**Significant correlation at $p < 0.001$

Table 4. *Bivariate Correlations – Non-Exclusion Condition*

	Non - Exclusion Condition										
	1	2	3	4	5	6	7	8	9	10	11
1. Psychache Scale	-										
2. Integrated Psychological Pain Scale	0.84**	-									
3. IPPS – Factor 1	0.88**	0.92**	-								
4. IPPS – Factor 2	0.68**	0.82**	0.69**	-							
5. IPPS – Factor 3	0.16**	0.42**	0.17**	0.16**	-						
6. IPPS – Factor 4	0.20**	0.46**	0.22**	0.25**	0.52**	-					
7. Stress-Reactive Rumination Scale	0.43**	0.44**	0.41**	0.40**	0.10	0.18**	-				
8. Baseline Arousal	0.10	0.09	0.12	0.01	-0.01	-0.02	0.17*	-			
9. PANAS Pre-Cyberball	0.34**	0.43**	0.37**	0.33**	0.32**	0.16*	0.31**	0.13*	-		
10. PANAS Post-Cyberball	0.29**	0.37**	0.34**	0.30**	0.22**	0.11	0.28**	0.09	0.80**	-	
11. Post-Cyberball Arousal	0.09	0.05	0.08	0.04	-0.02	-0.05	0.15*	0.67**	0.13*	0.14*	-

*Significant correlation at $p < 0.05$

**Significant correlation at $p < 0.001$

Table 5. *Factor solutions for the Integrated Psychological Pain Scale.*

# Of Factors	Eigenvalues from ML estimation	Observed Eigenvalue	Simulated Critical Value	Proportion of Variance	Cumulative Variance
1	44.77	15.04*	1.65	0.65	0.65
2	11.52	4.52*	1.57	0.17	0.81
3	4.59	2.28*	1.51	0.07	0.88
4	3.56	1.59*	1.46	0.05	0.93
5	2.22	1.28	1.42	0.03	0.96
6	1.51	1.01	1.38	0.02	0.98
7	1.34	0.91	1.34	0.02	1.0
8	1.16	0.86	1.31	0.02	1.02
9	0.84	0.81	1.28	0.01	1.03
10	0.71	0.77	1.25	0.01	1.04

*Indicates observed eigenvalue exceeds the simulated critical value

Table 6. *Rotated factor loadings for IPPS 4 factor model*

Items	Factor 1	Factor 2	Factor 3	Factor 4
Experiencing my feelings was like receiving a physical beating.	100*	0	0	0
I could not contain the pain inside me.	98*	0	0	0
My emotional pain was as bad as the worst physical pain that I have experienced.	98*	1	0	0
My emotions felt so painful, I couldn't breathe.	96*	1	0	0
My emotions made me feel like I was dying inside.	95*	1	0	0
I didn't know if I could stand my feelings one more day.	95*	1	0	0
The pain was too much to take.	93*	2	0	0
My emotional experience felt as bad as if I was stabbed with a knife.	92*	3	0	0
I had to get rid of my painful feelings immediately.	90*	3	0	0
My emotions were like an agonizing stomachache.	88*	4	0	0
I would have done anything to escape my painful feelings.	85*	5	0	0
My emotional experience was pure torment.	85*	4	0	0
My feelings were so intense I couldn't think straight.	82*	6	0	0
I felt too damaged to get better.	76*	5	0	3
I felt like I was drowning in my terrible feelings.	71*	10	0	0
I seemed to ache inside.	68*	13	0	0
My feelings made me want to scream.	66*	15	0	0
My life was just absolute misery.	62*	9	0	3
I felt like my life was garbage.	48*	17	0	3
I experienced some kind of failure.	2	100*	0	0
I did something that made me feel incompetent.	4	84*	2	0
I struggled doing something I should be good at.	8	79*	1	0
There were people telling me what I had to do.	11	76*	0	0
I had disagreements or conflicts with people.	10	58*	-3	1
I felt unappreciated by one or more important people.	18	57*	0	1
I had a lot of pressures I could do without.	25	54*	0	0
I was lonely.	17	52*	0	4
I had to do things against my will.	26	49*	0	1

Table 6 (Continued)

Items	Factor 1	Factor 2	Factor 3	Factor 4
Although it was tough to bear the pain, I knew it would go away.	0	-47*	13	10
I took on and mastered hard challenges.	0	0	100*	1
I did well even at the hard things.	0	0	100*	1
I was successfully completing difficult tasks.	0	0	94*	2
I was really doing what interests me.	1	0	45*	26
I felt a strong sense of intimacy with people.	0	0	1	100*
I felt close and connected with other people.	0	0	2	97*
I felt a sense of contact with people who care for me.	0	0	7	83*
¹ I was free to do things my own way.	1	0	32	39
¹ My choices expressed my “true self”.	2	0	38	31
¹ I hated the person I became.	37	17	5	3

*All loadings were significant, $p < 0.05$.

¹These items did not adequately load onto any factor and were subsequently removed from analyses

Table 7. *Factor solutions for the Integrated Psychological Pain Scale/Psychache Scale.*

# Of Factors	Eigenvalues from ML estimation	Observed Eigenvalue	Simulated Critical Value	Proportion of Variance	Cumulative Variance
1	70.65	21.33*	1.75	0.68	0.68
2	12.23	4.62*	1.66	0.12	0.80
3	5.20	2.41*	1.61	0.05	0.85
4	3.94	1.64*	1.56	0.04	0.89
5	3.11	1.37	1.52	0.02	0.92
6	2.54	1.26	1.48	0.02	0.94
7	2.16	1.02	1.45	0.01	0.96
8	1.40	0.97	1.41	0.01	0.98
9	1.32	0.88	1.38	0.00	0.00
10	1.12	0.81	1.35	0.00	1.01

*Indicates observed eigenvalue exceeds the simulated critical value

Table 8. *Rotated factor loadings for combined IPPS-Psychache Scale 4 factor model*

Items	Factor 1	Factor 2	Factor 3	Factor 4
I could not contain the pain inside me.	100*	0	0	0
Experiencing my feelings was like receiving a physical beating.	100*	0	0	0
My emotional pain was as bad as the worst physical pain that I have experienced.	99*	0	0	0
I didn't know if I could stand my feelings one more day.	97*	1	0	0
My emotions made me feel like I was dying inside.	96*	1	0	0
The pain was too much to take.	96*	1	0	0
My emotions felt so painful, I couldn't breathe.	95*	1	0	0
I couldn't take my pain anymore.	93*	0	0	1
My emotional experience felt as bad as if I was stabbed with a knife.	93*	2	0	0
I had to get rid of my painful feelings immediately.	93*	2	0	0
Because of my pain, my situation was impossible.	90*	1	1	1
I would have done anything to escape my painful feelings.	89*	3	0	0
My emotional experience was pure torment.	87*	4	0	0
My emotions were like an agonizing stomachache.	87*	4	0	0
My psychological pain seemed worse than any physical pain.	86*	4	0	0
My feelings were so intense I couldn't think straight.	84*	5	0	0
I couldn't understand why I suffer.	83*	4	0	1
My pain made me fall apart.	81*	4	0	1
I felt too damaged to get better.	79*	5	0	3
My soul ached.	79*	6	0	0
My psychological pain affected everything I did.	77*	6	0	1
My pain made my life seem dark.	74*	8	0	1
I felt like I was drowning in my terrible feelings.	73*	10	0	0
My feelings made me want to scream.	71*	12	0	0
I seemed to ache inside.	69*	12	0	0
Psychologically, I felt terrible.	67*	13	0	0
My life was just absolute misery.	66*	8	0	2
I felt psychological pain.	66*	14	0	0
I hurt because I felt empty.	66*	13	0	0
I felt like my life was garbage.	51*	18	0	2

Table 8 (Continued)

Items	Factor 1	Factor 2	Factor 3	Factor 4
I experienced some kind of failure.	3	100*	0	0
I did something that made me feel incompetent.	5	82*	2	0
I struggled doing something I should be good at.	7	80*	1	0
There were people telling me what I had to do.	12	78*	0	0
I had disagreements or conflicts with people.	10	62*	-3	1
I felt unappreciated by one or more important people.	21	55*	0	1
I had to do things against my will.	27	51*	0	1
I was lonely.	20	51*	0	4
I had a lot of pressures I could do without.	29	50*	0	0
Although it was tough to bear the pain, I knew it would go away.	0	-48*	13	10
I did well even at the hard things.	0	0	100*	1
I took on and mastered hard challenges.	0	0	99*	1
I was successfully completing difficult tasks.	0	0	93*	2
I was really doing what interests me.	2	0	44*	25
I felt a strong sense of intimacy with people.	0	0	1	100*
I felt close and connected with other people.	0	0	2	95*
I felt a sense of contact with people who care for me.	0	0	8	80*
¹ I was free to do things my own way.	1	0	32	39
¹ My choices expressed my “true self”.	1	0	39	31

*All loadings were significant, $p < 0.05$.

¹These items did not adequately load onto any factor and were subsequently removed from analyses

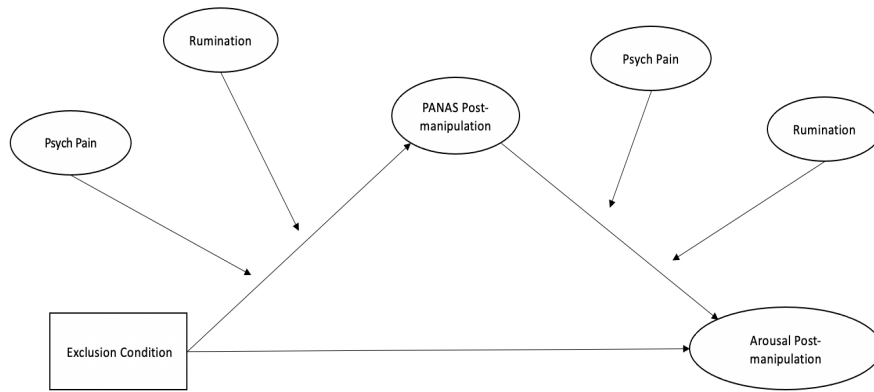


Figure 1. Theoretical Model

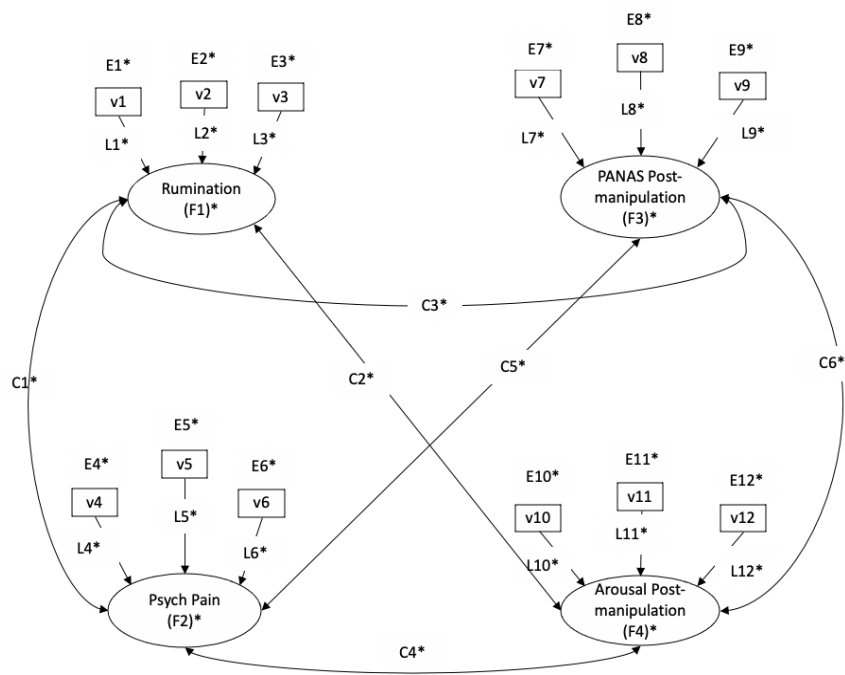


Figure 2: Measurement Model

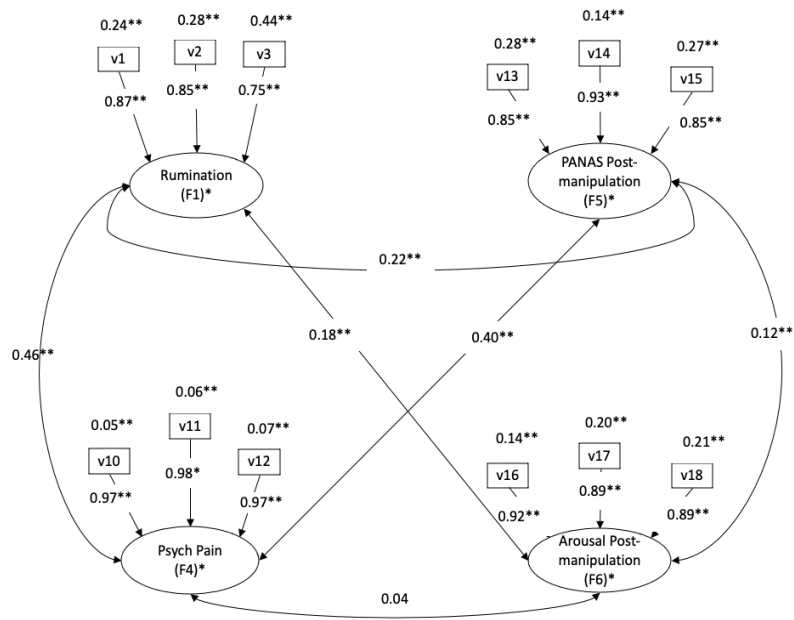


Figure 3. Standardized Factor Loadings, Errors, and Covariance Estimates

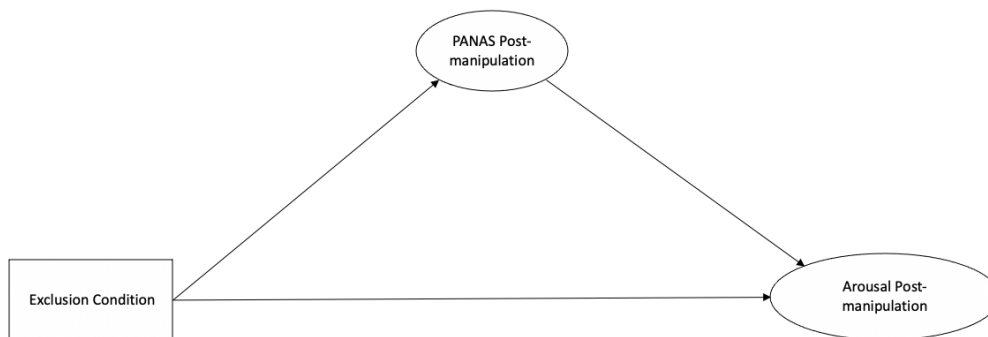


Figure 4. Structural Mediation Model

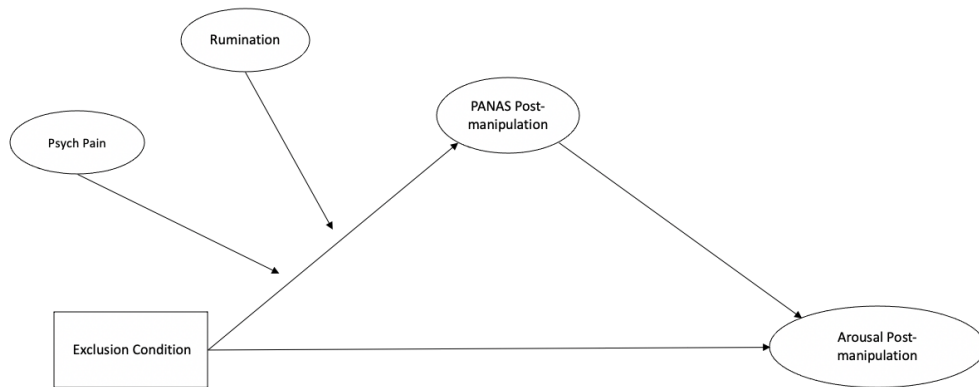


Figure 5. Structural Moderation Model – Moderators on “a” pathway

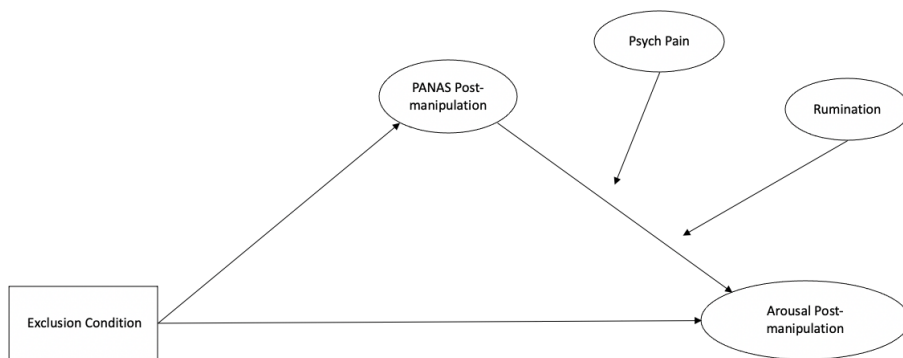


Figure 6. Structural Moderator Model – Moderators on “b” pathway

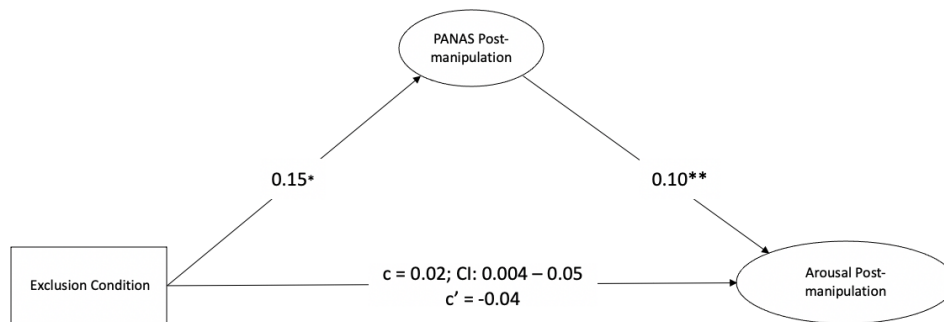


Figure 7. Structural Mediation Model with Standardized Path Coefficients

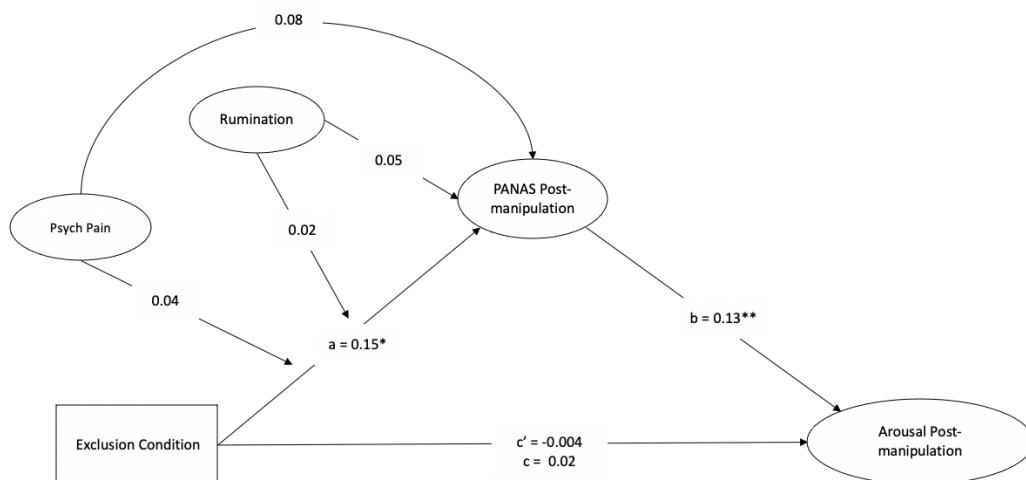


Figure 8. Structural Moderation Model with Standardized Path Coefficients– “a” pathway

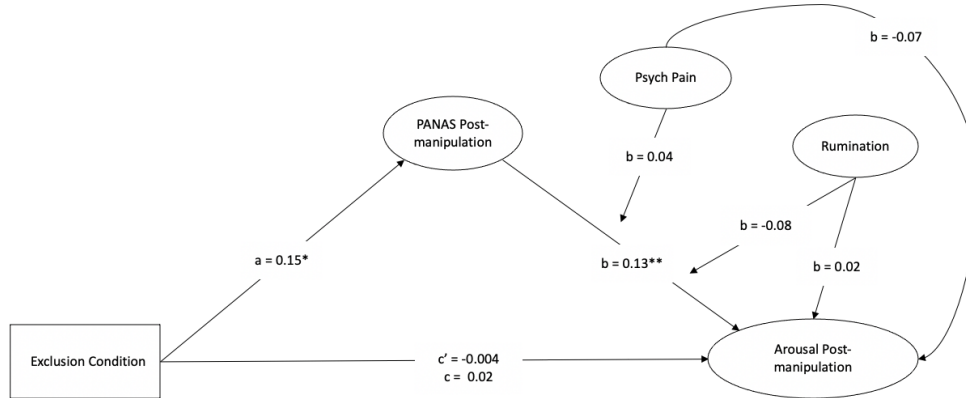


Figure 9. Structural Moderation Model with Standardized Path Coefficients – “b” pathway

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