

SYMBOLIC SOCIAL BONDS MAY REDUCE THE NEGATIVE EFFECTS OF  
SELF-CONTROL DEPLETION ON RISKY SEXUAL BEHAVIOR

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## ABSTRACT

Impulsivity and lack of self-control predict risky sexual behavior, contributing to negative outcomes for sexual health. To restore self-control, and thus potentially decrease sexual risk taking, people can engage with *symbolic social bonds*—unacquainted, fictional, or non-human entities that can be used as a complement to “real,” or traditional, human relationships. If symbolic social bonds can restore self-control, they may also buffer against the negative effects of self-control depletion on risky sexual behavior. Accordingly, I expected that engaging in effortful self-control on a given day would predict risky sexual behavior later that day, consistent with a self-control depletion effect. However, I expected that using symbolic social bonds would prevent risky sexual behavior after enacting effortful tasks, consistent with a self-control restoration effect. In the current set of analyses, the main effects of effortful tasks on risky sexual behavior were not significant, but the benefits of different types of symbolic social bonds on risky sexual behavior were partially supported. Analysis Set 1 revealed that immersion in narrative social worlds for restoration motives after enacting effortful tasks reduced the likelihood of engaging in risky sexual behavior. Analysis Sets 2 and 3 revealed potential benefits of parasocial relationships and non-human entities for people with low self-esteem and people with a high general tendency to anthropomorphize, respectively, but these benefits were mostly independent of self-control restoration processes. Finally, Analysis Set 4 revealed that using reminders of others reduced participation in risky sexual behavior after engaging in effortful tasks for people with high attachment anxiety. Therefore, symbolic social bonds may offer useful means to prevent risky sexual behavior, but each type of symbolic social bond may do so for different people under different circumstances.

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## **Symbolic Social Bonds May Reduce the Negative Effects of Self-Control Depletion on Risky Sexual Behavior**

“It is hard to fight against impulsive desire. Whatever it wants it will buy at the cost of the soul.”

–Heraclitus, *On Nature* (c.535-c.475 BCE)

Lower self-control and greater impulsivity are associated with participation in negative and risky health behaviors, such as risky sexual behavior (Lejuez et al., 2005; Raffaelli & Crockett, 2003; Winters et al., 2008). For instance, people who act rashly and irrationally when experiencing negative emotions (i.e., negative urgency) or crave exciting and novel situations (i.e., sensation seeking) are most likely to engage in risky sexual behavior (Deckman & DeWall, 2011). There are multiple strategies that people can use to restore self-control: engaging in activities that restore positive mood (e.g., watching humorous and fun videos), self-affirming personal values and characteristics, or enhancing motivation for self-control tasks through thinking about the benefits they can have for the self or others (Masicampo et al., 2014; Muraven & Slessareva, 2003; Schmeichel & Vohs, 2009; Tice et al., 2007). However, these strategies may not be available to everyone, and people may not be equally capable of engaging in such strategies. The purpose of this project was to examine whether engaging with *symbolic social bonds* can serve as a method of restoring self-control in order to prevent risky sexual behavior.

### **Symbolic Social Bonds**

Symbolic social bonds are unacquainted, fictional, or non-human entities that can be used as a complement to “real,” or traditional, human relationships (Gabriel et al., 2016; Paravati et al., 2020). For example, people may feel connected to celebrities or religious

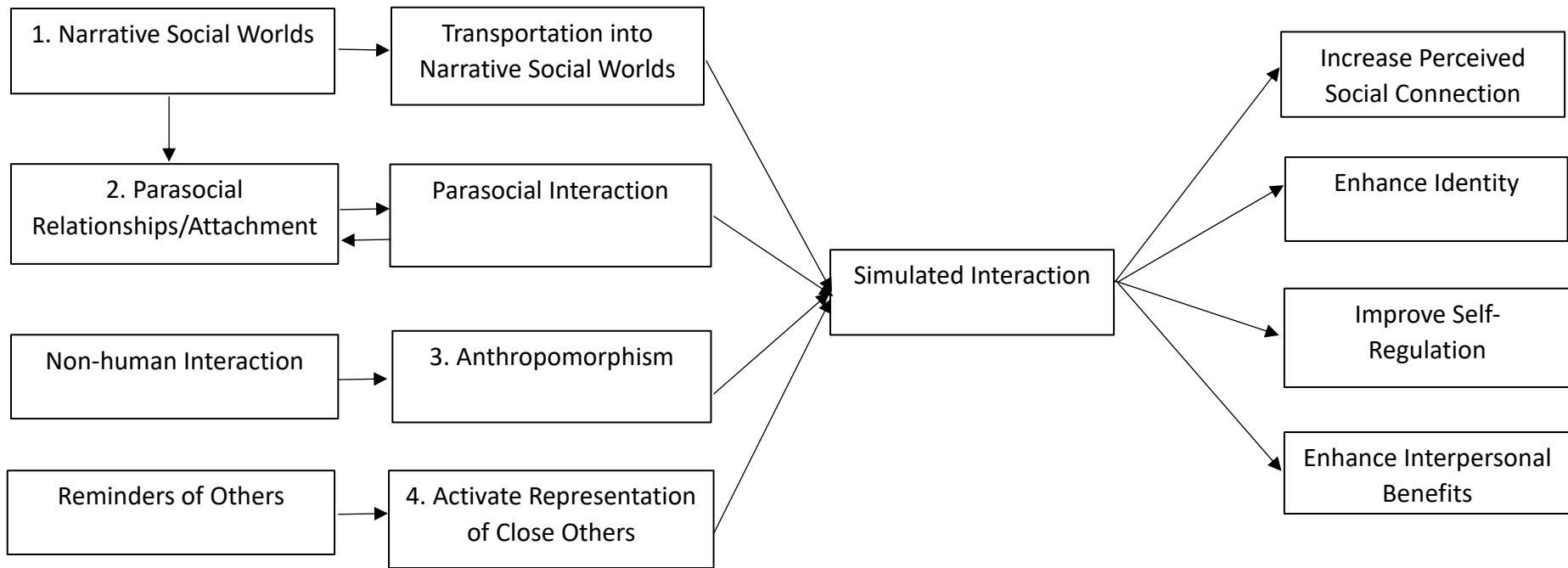


deities (e.g., God). The connection provided by symbolic social bonds occurs within the minds of people and not because of the literal presence of others. However, symbolic social bonds may provide psychological benefits that people do not receive from their traditional relationships. For instance, symbolic social bonds can restore a sense of social connection (e.g., Derrick et al., 2009), enhance identity (e.g., Derrick et al., 2008), and improve interpersonal outcomes (e.g., Twenge et al., 2007).

A conceptual model of how symbolic social bonds influence psychological outcomes, “The Symbolic Bonds Interaction Model” (Vahedi & Derrick, in prep), is depicted in Figure 1. Symbolic social bonds can be categorized into four major groups: (1) narrative social worlds, (2) parasocial relationships, (3) anthropomorphism of non-human entities, and (4) reminders of others. Note that all four types of symbolic social bonds are thought to exert their influence through simulated social interaction. People can imagine interaction with real or virtual agents, and through that simulated interaction, attain psychological benefits associated with traditional social contacts such as perceived social support or trust (Chattaraman et al., 2012; Crisp & Turner, 2009; Mar & Oatley, 2008). For instance, in the same way that intergroup contacts promote positive intergroup attitudes (Pettigrew & Tropp, 2006), mentally simulating a positive intergroup interaction generates positive perceptions of and reduces stereotyping toward outgroups (Crisp & Turner, 2009). This simulated social interaction influences multiple psychological outcomes, including providing social connection, enhancing people’s identities, improving self-regulation, and improving interpersonal interactions. In my dissertation, I focus on the four types of symbolic social bonds and the different routes through which each type leads to positive outcomes.

**Figure 1**

*The Symbolic Bonds Interaction Model*



*Note.* This model demonstrates how different types of symbolic social bonds, including (1) narrative social worlds, (2) parasocial relationships, (3) non-human entities, and (4) reminders of others generate positive psychological outcomes. Through transportation into a narrative, parasocial interaction, anthropomorphism, and activating representations of close others, all symbolic social bonds should lead to simulated interaction. In turn, I anticipate that simulated social interaction will lead to positive outcomes. A test of the central mechanism (simulated interaction) is beyond the scope of the current project, which uses an existing dataset.

### *Narrative Social Worlds*

The first type of symbolic social bond includes narrative social worlds. Readers of a story or viewers of a media program engage in a simulation process to understand and develop a deep mental representation of incidents that happened in the narrative (Green, 2004; Mar & Oatley, 2008). They may then imagine themselves in—or transport themselves into—this narrative social world, becoming emotionally involved and “interacting” with story characters (Brown, 2015, 2021; Green & Brock, 2000). Transportation into a narrative world may also lead people to exchange their own perspective for that of story characters and assimilate the characteristics of story characters to the self (Chung & Slater, 2013; Cohen, 2006; Slater, 2002; Slater & Rouner, 2002). Such a deep involvement with narrative social worlds and their characters may provide a sense of social connection. For instance, when people read a fictional story, they assimilate its characters and become a part of the collective depicted in the story (Gabriel & Young, 2011), potentially enhancing social connection. Additionally, when people feel lonely, they are more likely to engage with their favorite television programs. Doing so buffers against the feelings of rejection, increases in negative mood, and decreases in state self-esteem elicited by a relationship threat (Derrick et al., 2009).

Importantly, narrative social worlds should only lead to transportation when people feel deeply connected to or engaged with the narrative. When people engage with narratives that they like, they are more likely to imagine the events of the story, make connections with story characters, and experience emotions (Hall & Coles, 1999; Lawson, 1972). It would seem unlikely that people would become immersed in narratives that they find boring or

alienating. Thus, transportation into narrative worlds should be most likely to happen when people enjoy those worlds, as is the case with favorite books, movies, or television shows.

### ***Parasocial Relationships***

The second type of symbolic social bond includes parasocial relationships: one-sided pseudo-relationships with unacquainted or fictional media personae (Horton & Wohl, 1956). People may form a parasocial bond with a favorite celebrity that performs a media program (e.g., hosts a television show or news) or plays a role in a literary or visual narrative such as a favorite movie (Hartmann, 2016; Rubin et al., 1985). For example, people may develop a parasocial relationship with television show performers and local newscasters (Cole & Leets, 1999; Levy, 1979; Rubin et al., 1985), athletes and sports celebrities (Brown & deMatviuk, 2010), political figures (Cohen & Holbert, 2021; Gabriel et al., 2018), and even fictional characters (Bond & Calvert, 2014). When people follow a media persona who performs in an attractive way, they may experience a sense of proximity and closeness, allowing them to experience a parasocial interaction with that character (Hartmann, 2016; Hartmann & Goldhoorn, 2011).

After repeated exposure, parasocial interactions can extend beyond the viewing experience and become a long-term and persistent bond, known as a parasocial relationship (Dibble et al., 2016; Rosaen & Dibble, 2016; Tukachinsky & Sangalang, 2016). In a parasocial relationship, people may come to feel similar to, share the perspectives of, and feel close to their favorite celebrity or fictional character (Rosaen & Dibble., 2016; Slater et al., 2018). People experiencing a parasocial relationship come to believe that they know the parasocial companion intimately and profoundly. They assimilate characteristics of the media persona to the self (Derrick et al., 2008; Young et al., 2012), and demonstrate feelings of

intimacy and closeness toward their parasocial companions as if they are real friends (Hartmann, 2016; Hartmann et al., 2008). Indeed, a parasocial relationship with a favorite media persona may provide a sense of social connection, acting as an antidote for feelings of isolation and loneliness (Brown, 2021; Levy, 1979), and providing psychological recovery from a social threat (Timeo et al., 2020).

On the other hand, it seems that people who have a difficult time with actual interpersonal relationships (e.g., low self-esteem people) may benefit more than high self-esteem people from a parasocial relationship with their favorite celebrity. For instance, low self-esteem people are afraid of rejection and are not able to trust their relationship partner easily (Murray et al., 2000; Murray et al., 2002). However, they can assimilate their favorite celebrity to the self, allowing them to feel closer to their ideal self. However, high self-esteem people can get these benefits from their traditional relationship partners and hence, do not need to get them from a parasocial relationship partner (Derrick et al., 2008).

### ***Nonhuman Entities***

A third type of symbolic social bond includes anthropomorphized non-human entities. People may attribute humanlike traits to non-human entities (i.e., anthropomorphism) such as technological devices, pets, or religious deities, to perceive them as more humanlike and develop a sense of social connection with them (Epley, Akalis, et al., 2008; Waytz et al., 2010). The desire for social interaction and affiliation is one of the major factors motivating anthropomorphism (Epley et al., 2007; Epley, Waytz, et al., 2008). People who feel lonely and socially disconnected participate in anthropomorphism more than non-lonely and socially connected people (Epley, Akalis, et al., 2008). For instance, people who experience greater chronic loneliness are more likely to anthropomorphize their smartphones

and to be aware of their smartphone's agency (Wang, 2017). Furthermore, exposure to and interaction with anthropomorphic products contributes to the satisfaction of belongingness needs and buffers against rejection and exclusion (Brown et al., 2016; Mourey et al., 2017). For instance, when people interact with consumer products such as vacuum cleaners or cellphones with humanlike characteristics, their need to connect with others after experiencing social exclusion is mitigated (Mourey et al., 2017). Therefore, anthropomorphizing non-human entities may offer a useful means to support a sense of social connection.

However, mere interaction with non-human entities should not support such positive psychological outcomes. In order to perceive a non-human entity as a symbolic social bond and attain the psychological benefits associated with that bond, people must anthropomorphize them. For instance, when people who tend to anthropomorphize non-human entities watch photos of dogs or cats after experiencing a social threat, they experience reduced feelings of social rejection and improved well-being. This benefit is not experienced by those who do not anthropomorphize (Brown et al., 2016). Therefore, people should only attain positive psychological outcomes through interacting with non-human entities if they engage in anthropomorphism, something that some people are more likely to do than others (i.e., possess a high or low general tendency to anthropomorphize).

### ***Reminders of Others***

A fourth type of symbolic social bond includes reminders of others. Sometimes a material object is just an object, but sometimes people imbue objects with greater meaning (Rozin et al., 1986, 1994). When material objects remind people of their positive and rewarding relationships (e.g., comfort foods, photos of friends or romantic partners, wedding

bands), they can provide a sense of social connection (Niemyjska, 2014; Troisi & Gabriel, 2011; Troisi et al., 2015; Vahedi, 2019). For instance, after experiencing social exclusion, looking at photos of loved ones on Facebook can satisfy belongingness needs (Knowles et al., 2015). Similarly, consuming comfort foods after a relationship threat predicts the cognitive activation of relationship-related concepts and buffers against feelings of loneliness (Troisi & Gabriel, 2011).

However, people's attachment style may determine if reminders of others affect positive psychological outcomes. People who tend to be more securely attached in their relationships are optimistic about intimate relationships; they are motivated to engage in such relationships and do not fear being abandoned or hurt in their intimate relationships (Bartholomew & Horowitz, 1991). On the other hand, people who tend to be more anxiously or avoidantly attached (i.e., insecurely attached) have difficulty becoming close to or relying on relationship partners and fear rejection or lack of acceptance in their relationships (Bartholomew & Horowitz, 1991; Bartholomew & Shaver, 1998). Therefore, securely attached people are more likely than insecurely attached people to be able to activate representations of secure relationships (Mikulincer et al., 2002). Being able to activate these representations of secure relationships allows more securely attached people to use reminders of others to attain a sense of social connection (Troisi & Gabriel, 2011; Troisi et al., 2015).

### ***Benefits of Interacting with Symbolic Social Bonds***

In addition to providing a sense of social connection (Gabriel et al., 2016; Paravati et al., 2020), symbolic social bonds may provide a variety of other positive psychological outcomes. For instance, symbolic social bonds can regulate interpersonal interactions by mitigating prejudice toward members of stigmatized minority groups (Schiappa et al., 2005,

2006). They can also improve interpersonal interactions through reducing aggressive behaviors after people experience a social threat, such as social exclusion (Twenge et al., 2007). Symbolic social bonds can also increase relationship quality and enhance relationship functioning. Sharing symbolic social bonds (e.g., books, movies, and television shows) with romantic partners can compensate for a lack of mutual friends and increase interdependence, confidence, and closeness in romantic relationships (Gomillion et al., 2017). They can also contribute to people's well-being by improving positive affect (Lakey et al., 2014), improving people's body image, and increasing body satisfaction (Young et al., 2012, 2013). Furthermore, symbolic social bonds may facilitate self-regulation by decreasing self-discrepancies, i.e., narrowing the gap between people's actual and ideal selves (Derrick et al., 2008), as well as restoring depleted self-control (Derrick, 2013).

### **Symbolic Social Bonds and Restoring Self-Control**

According to the self-control strength model, involvement with an activity that requires effortful self-control (e.g., regulating negative mood, suppressing thoughts, or coping with stress) will decrease self-control and impair performance on subsequent effortful tasks (Baumeister et al., 1998; Muraven & Baumeister, 2000; Muraven et al., 1998). Indeed, the executive aspect of the self (the aspect that regulates emotion, initiates and interrupts behaviors, and makes decisions) requires self-control and is influenced by participation in effortful tasks (Muraven & Baumeister, 2000). For example, when people resist temptations or suppress emotion, they subsequently perform less well on tasks requiring attention control or perseverance (Baumeister et al., 1998). Similarly, when people regulate emotion (either suppressing or magnifying responses), they subsequently demonstrate less perseverance



(Muraven et al., 1998, Study 1). When people suppress their thoughts, they are subsequently less able to control emotional expression (Muraven et al., 1998, Study 3).

The strength model of self-control and the concept of “ego depletion” or “self-control depletion” have become a point of contention for the field of social psychology (for reviews see, Hagger et al., 2016; Inzlicht & Friese, 2019; Vohs et al., 2021). Some meta-analyses have found that self-control depletion effect sizes are certainly much smaller than initially thought (Carter & McCullough, 2014; Carter et al., 2015), and preregistered multi-laboratory replication projects have found small-to-zero effect sizes for certain procedures formerly used to induce self-control depletion (Hagger et al., 2016; Vohs et al., 2021). However, other preregistered experiments applying different procedures have found a medium-level effect size for self-control depletion (Dang et al., 2021). Therefore, the extent to which self-control depletion is actually a real phenomenon is still very much in question, and only additional research into self-control depletion effects can resolve this dispute (Carter et al., 2015; Hagger et al., 2016). It may be the case that studying self-control depletion in daily life as in the present dissertation, rather than in laboratory experiments, would provide some confirmation for the existence of the self-control depletion phenomenon.

Controlling attention, regulating emotions, and suppressing behaviors have all been shown to deplete self-control (Baumeister et al., 1998; Muraven & Baumeister, 2000). However, engaging with symbolic social bonds may restore depleted self-control (Chen et al., 2020; Derrick, 2013). For instance, participating in a task requiring attention control leads people to perceive stories as more suspenseful and moving, and to transport themselves into narratives to a greater extent (Johnson et al., 2015). Similarly, people seek familiar fictional worlds after engaging in tasks requiring attention control or emotion regulation, and

engaging with familiar fictional worlds restores mood and energy (Derrick, 2013). In addition, anthropomorphizing emotions (e.g., thinking of sadness as a person) creates a feeling of detachment between the self and the anthropomorphized emotion, enhances emotion regulation, and leads people to choose healthier food options (e.g., a salad) over unhealthy and indulgent food options such as cheesecake (Chen et al., 2020). The positive outcomes of symbolic social bonds on self-control may be due to the contribution of symbolic social bonds to satisfying belongingness needs. Research shows that fulfilled belonging and perceived acceptance can boost self-control (Blackhart et al., 2011; Seeley & Gardner, 2003). For instance, people with a higher sense of belonging avoid consuming unhealthy foods and delay gratifications more than people with a lower sense of belonging (Blackhart et al., 2011). Therefore, symbolic social bonds may offer useful means to enhance feelings of energy and improve the ability to exert self-control.

### **Self-Control, Risky Sexual Behavior, and Health**

Self-control is thought to be comprised of at least three facets: attention control, inhibitory control, and emotion regulation (Baumeister et al., 1998; Muraven et al., 1998). Emotion regulation difficulties (e.g., lack of emotional clarity, lack of emotional awareness) and reduced inhibitory control can impair rational decision-making abilities and increase the likelihood of participation in risk-taking behaviors including risky sexual behavior (Crockett et al., 2006; Schuster et al., 2012; Tull et al., 2012). Therefore, people with greater self-control may be better at inhibiting risky sexual behavior than people with lower self-control. Although people may find risky sexual behavior enjoyable, it can lead to adverse consequences for health and well-being (Connors et al., 2017; Malhotra, 2008). Risky sexual behaviors include early sexual intercourse, having multiple sexual partners, non-use or

inconsistent use of condoms, or using drugs or alcohol before sex (Centers for Disease Control and Prevention [CDC], 2020). Risky sexual behavior can lead to the spread of sexually transmitted diseases (e.g., syphilis, gonorrhoea, chlamydial infection) and HIV (Connors et al., 2017; Holmes et al., 2004; Malhotra, 2008; Thomas et al., 1999).

Additionally, risky sexual behavior is associated with unwanted pregnancy, decreased self-esteem, and impaired ability to create a healthy long-term relationship (Malhotra, 2008).

Furthermore, risky sexual behavior may increase anxiety and depressive symptoms (Agardh et al., 2012).

People with higher self-control may be less likely to engage in risky sexual behavior (Griffin et al., 2012; Quinn & Fromme, 2010), but impulsivity and lack of self-control are associated with greater risky sexual behavior (Crockett et al., 2006; Tull et al., 2012; Winters et al., 2008). For instance, high school students with poor inhibitory control are more likely to have sex at an early age, have more sexual partners, and use alcohol or marijuana before sex (Donohew et al., 2000). Likewise, greater impulsivity in the form of negative urgency (i.e., performing rashly when experiencing negative emotion) is associated with participating in a one-night stand, having anal sex, or having sex with a drug user, a stranger, or a partner who has had many lifetime partners (Deckman & DeWall, 2011). Therefore, increasing self-control, even temporarily, may help to buffer against risky sexual behavior and consequently may lead to more positive sexual health outcomes.

### **Overview of the Current Research**

Given that engaging with symbolic social bonds can restore self-control (Chen et al., 2020; Derrick, 2013), people who use symbolic social bonds after self-control depletion should be less likely to engage in risky sexual behavior. Accordingly, I conducted this set of

analyses to answer the major question of this project, whether using different types of symbolic social bonds would reduce the likelihood of participating in risky sexual behavior after enacting effortful tasks. I used data from an existing ecological momentary assessment (EMA) study to examine whether symbolic social bonds can weaken the effects of self-control depletion on risky sexual behavior in daily life. Specifically, on days when participants enacted more effortful self-control, I expected that they would be more likely to engage in risky sexual behavior. However, I expected that engaging with a symbolic social bond would buffer against this negative consequence.

Ecological momentary assessment (EMA) is a method that uses repeated sampling of people's behaviors in-the-moment in a natural environment and improves inferences about the association of these behaviors within a given period of time (Shiffman et al., 2008). EMA increases ecological validity, reduces recall biases that usually occur in cross-sectional surveys, and addresses microprocesses that may influence behavior in a real-world context (Shiffman et al., 2008; Stone et al., 1999). The use of existing EMA data in the current project allowed me to examine how the naturally occurring use of symbolic social bonds influenced risky sexual behavior in participants' daily life. I used EMA methods in this project to obtain multiple, immediate reports of effortful behaviors, engagement with symbolic social bonds, and risky sexual behavior.

I conducted four separate sets of analyses to examine how different types of symbolic social bonds influence the association between self-control and risky sexual behavior. In Analysis Set 1, I examined the possible buffering effect of engaging in narrative social worlds (i.e., favorite television shows or movies). In Analysis Set 2, I examined the possible buffering effect of engaging with a parasocial relationship partner (i.e., a favorite celebrity).

In Analysis Set 3, I examined the effects of engaging with commonly anthropomorphized non-human entities. Finally, in Analysis Set 4, I examined the outcomes of interacting with reminders of others. Each type of symbolic social bond may have different antecedents or pre-requisites to function as expected. Therefore, I also examined moderators specific to each type of symbolic social bond.

### **Analysis Set 1: Narrative Social Worlds**

Through engagement with narrative social worlds, people may simulate the elements of that narrative in their mind and transport themselves into an imaginary social world (Green, 2004; Green & Brock, 2000), leading to a sense of social connection (Derrick, et al., 2009; Gabriel & Young, 2011). However, research shows that social worlds supported by favorite media programs (vs. non-favorite programs) are more likely to lead to a sense of social connection (Derrick et al., 2009; Gargurevich Espinoza & Vahedi, 2020). Narrative social worlds may also improve self-control. For instance, people seek narrative social worlds (e.g., television show reruns) after engaging in effortful tasks, and using these narrative social worlds appears to restore people's self-control (Derrick, 2013). Therefore, using the narrative social worlds provided by favorite media programs for restorative reasons may enhance the positive outcomes of narrative social worlds on self-control restoration and risky sexual behavior.

In Analysis Set 1, I examined the potential protective effects of narrative social worlds. I expected to find that when people exerted more effortful self-control on a given day, they would also be more likely to engage in risky sexual behavior later that day. However, I expected that engaging with narrative social worlds would mitigate the negative effects of self-control depletion on risky sexual behavior. More specifically, using narrative

social worlds for restorative reasons after engaging in effortful tasks should prevent risky sexual behavior. I did not expect to observe this association when people used narrative social worlds for non-restorative reasons (because people use television for many reasons, and not all of them involve engaging in symbolic social bonds).

## **Method**

### ***Dataset***

Data were drawn from an EMA study that examined the naturally-occurring use of symbolic social bonds; detailed information about the study procedures have been published previously (Derrick et al., 2019). Briefly, participants ( $n = 129$ ) were recruited from three universities, including a public southern university ( $n = 69$ ), a private southern university ( $n = 8$ ), and a private northern Catholic university ( $n = 52$ ). Participants were required to own a smart phone running either an iOS or Android operating system. Participants initially attended an orientation session where they completed a series of background questionnaires, including individual and personal characteristics (e.g., self-esteem, attachment orientations). They also downloaded a survey application called mEMA by ilumivu (<https://mema.ilumivu.com/>) to their personal smart phones and received training on how to complete their daily activity reports through the application.

For the following 14 days, participants completed randomly prompted reports four times per day (stratified in blocks from 9 AM–12 PM, 12 PM–3 PM, 3 PM–6 PM, and 6 PM–9 PM), and a participant-initiated evening report every night (available from 9 PM–3 AM). Both the randomly prompted reports and evening reports included items relevant to the use of symbolic social bonds, participation in effortful tasks, and participants' mood, as well as other questions unrelated to the current analyses (e.g., social activities). The evening

reports also included questions about health behaviors, including risky sexual behaviors and questions about alcohol use. At the end of the study, participants received either course credit or payment (up to \$30), depending on their level of compliance.

Sixteen participants (12%) withdrew from the study and one person (<1%) did not complete the background questionnaires, leaving a final sample of 112 people. The sample included 28 men (25%) and 84 women (75%). The average age of participants was 20.06 ( $SD = 1.85$ ) years. They identified as White (45%), Asian American or Pacific Islander (23%), Hispanic or Latino (13%), Black (7%), and other or multiracial (11%). Also, 52.68% ( $n = 59$ ) of the sample were in a romantic relationship, 29.46% ( $n = 33$ ) were not in a romantic relationship, and 17.86% ( $n = 20$ ) missed the relationship question. Participants provided data on 1518 out of 1680 possible days (90.4%)

### ***Baseline Measures***

**Demographics.** Demographic questions were completed by participants at the orientation session, including questions about gender, age, ethnicity, religious affiliation, and romantic relationship status.

### ***EMA Measures***

**Daily Effortful Tasks.** In both randomly prompted reports and evening reports, participants completed a checklist about their individual daily activities, including daily effortful tasks (adapted from Ciarocco et al., 2007; Derrick et al., 2015; Muraven et al., 2005). Specifically, participants indicated whether they had participated in six tasks requiring forms of executive function: “I stopped myself from doing something” (inhibition); “I controlled my thoughts” (attention control); “I controlled my feelings” (emotion regulation); “I made myself do something I didn’t feel like doing” (initiation); “I had to make hard

choices” (decision-making); and “I was interrupted or distracted” (shifting). For the current analyses, I created a variable capturing daily effortful tasks by summing these six items. The final variable ranged from 0 (engaged in no effortful tasks) to 6 (engaged in all effortful tasks). I only used activities reported in the randomly prompted reports, and not the evening reports, to provide temporal ordering.

**Risky Sexual Behavior.** In the evening reports, participants indicated whether or not they had sex that day. If yes, they completed three no/yes questions relevant to the current analyses regarding their risky sexual behavior: “Did you have unprotected sex?”; “Were you under the influence of drugs or alcohol when you had sex?”; “Was your partner under the influence of drugs or alcohol when you had sex?” They also indicated whether their partner was a long-term partner or a casual partner. I used these items to create a dichotomous variable tapping risky sexual behavior, with 0 indicating that the participant did not demonstrate any risky sexual behavior and 1 indicating that the participant demonstrated at least one risky sexual behavior (unprotected sex, own intoxication, partner intoxication, casual partner).

**Narrative Social World Use.** In both randomly prompted reports and evening reports, participants responded to a no/yes question about their media use (i.e., “Since my last report, I watched television or a movie”). If yes, participants completed follow-up questions to differentiate use of narrative social worlds (i.e., symbolic social bonds) from other media use. The items for narrative social worlds were “a new episode of a favorite television show,” “a rerun of a favorite television show,” or “a favorite movie.” I used these items to create a dichotomous variable tapping engagement in a narrative social world, with 0 indicating that



the participant did not use any of the items related to narrative social worlds and 1 indicating that the participant used at least one media item related to narrative social worlds.

**Restoration Motives.** When participants indicated that they had engaged in media use, a follow-up question asked participants why they used that media (i.e., “I watched the show/movie because...”). Participants responded by selecting any motives that applied, including motives related to self-control restoration (i.e., “I wanted to avoid thinking about things” [attention control]; “I felt bad emotionally” [emotion regulation]; “I wanted to avoid doing things” [initiation/perseverance], and other motives (e.g., “It was the only show/movie that was on”; “I needed it to help me fall asleep”). I used the restoration items to create a dichotomous variable for self-control restoration motives, with 0 indicating that the participant did not use media to restore self-control and 1 indicating that the participant used media for at least one self-control motive.

**Mood.** In the randomly prompted reports, participants completed questions about their feelings (i.e., “Right now, I feel ...”) on a scale from 1 (not at all) to 4 (very much). A principal component analysis indicated that there were three separate factors for mood. Participants’ responses to three positive mood items (i.e., happy, relaxed, energetic) were averaged to create a positive mood scale, with higher scores indicating higher positive mood ( $M = 2.90$ ,  $SD = 0.90$ ). Participants’ responses to two high energy negative mood items (i.e., anxious, angry) were averaged to create an irritable mood scale, with higher scores indicating greater irritable mood ( $M = 2.02$ ,  $SD = 0.94$ ). Participants’ responses to four low energy negative mood items (i.e., sad, drained, lonely, hurt) were averaged to create a depressed mood scale, with higher scores indicating greater depressed mood ( $M = 1.38$ ,  $SD = 0.55$ ).

**Alcohol Intoxication.** In the evening reports, participants responded to a no/yes question about their alcohol use (i.e., “Did you drink any alcoholic beverages today?”). If participants responded positively to the alcohol use question, a follow-up question asked about their feelings of intoxication (i.e., “How intoxicated did you feel after drinking?”) on a scale from 1 (not at all) to 4 (very much). Zeros were imputed as responses for participants who did not respond to the intoxication item because they did not consume alcohol. Final scores ranged from 0 to 4, with higher scores indicating higher feelings of intoxication ( $M = 0.18$ ,  $SD = 0.65$ ).

### ***Analysis Plan***

As preliminary analyses, I calculated descriptive statistics including frequencies, means, and standard deviations for all variables. I also calculated intraclass correlation coefficients (ICC) for all variables to determine the extent to which variation in study variables occurred at the within- vs. between-person levels (i.e., variation from day-to-day vs. from person-to-person).

I conducted the primary analyses using mixed effects generalized linear models (MEGLMs) in Stata 15, with days (Level 1) nested within individual (Level 2). Because the primary outcome variable, risky sexual behavior, was dichotomous, I used a binomial distribution with a logit link. Allowing the slopes to vary randomly did not significantly improve model fit ( $AIC = 265.4771$ ;  $BIC = 335.0557$ ;  $df = 15$ ), so the slopes were set as fixed effects. In addition to gender, age, race, and relationship status, I included mood and alcohol intoxication variables as covariates to the model. However, since the mood variables were heavily intercorrelated (see Table 1), I included only the mood variable that was most correlated with the dependent and independent variables (i.e., irritable mood). Also, I

controlled for participants' risky sexual behavior on the previous day (i.e., the lagged variable of risky sexual behavior).

I could not use a three-level model (reports within days within person) since the outcome, risky sexual behavior, was assessed only one time per day. To provide one "daily" value for each predictor and control variable, I collapsed all random reports within a day by summing the event variable of daily effortful tasks, taking the maximum of dichotomous variables (i.e., narrative social world use, restoration motives), and averaging the continuous variable of irritable mood. I person-mean centered daily effortful tasks, irritable mood, and alcohol intoxication, but left narrative social world use and restoration motives uncentered. I also included the Level 2 component of the EMA predictors (i.e., the grand-mean centered [GMC] person-mean of daily effortful tasks, the GMC person-total of narrative social world use, and the GMC person-total of restoration motives) as covariates in the model.

## **Results**

Descriptive statistics and intercorrelations for the independent, dependent, moderator, and control variables are included in Table 1. The bivariate correlations demonstrated that effortful tasks were negatively (but only marginally) correlated with risky sexual behavior. However, they were positively correlated with narrative social world use, restoration motives, and the two negative mood scales (i.e., irritable mood and depressed mood), and negatively correlated with positive mood. Risky sexual behavior was correlated only with alcohol intoxication (which makes sense, given that one of the risky behavior items is about own drinking). Intraclass correlation coefficients (ICC) demonstrated that for the three mood subscales, about half of the variation occurred at the between-person levels. For all other variables, most of the variation occurred at the within-person levels (see Table 1).

**Table 1***Descriptive statistics and intercorrelations for the Study 1 variables.*

	1	2	3	4	5	6	7	8
1. Effortful tasks	--							
2. Risky sexual behavior	-.05 <sup>+</sup>	--						
3. Narrative social world	.10 <sup>***</sup>	-.04	--					
4. Restoration motives	.18 <sup>***</sup>	.00	.35 <sup>***</sup>	--				
5. Positive mood	-.19 <sup>***</sup>	.01	-.00	-.15 <sup>***</sup>	--			
6. Irritable mood	.23 <sup>***</sup>	.00	-.03	.18 <sup>***</sup>	-.53 <sup>***</sup>	--		
7. Depressed mood	.17 <sup>***</sup>	.01	.01	.14 <sup>***</sup>	-.38 <sup>***</sup>	.48 <sup>***</sup>	--	
8. Alcohol intoxication	-.03	.11 <sup>***</sup>	-.04	-.02	.08 <sup>**</sup>	-.10 <sup>**</sup>	-.06 <sup>+</sup>	--
<b>Mean</b>	1.35	0.05	0.36	0.12	2.90	2.02	1.38	0.18
<b>SD</b>	2.25	0.21	0.48	0.33	0.90	0.94	0.55	0.65
<b>Range</b>	0.00-19.00	0.00-1.00	0.00-1.00	0.00-1.00	1.00-4.00	1.00-4.00	1.00-4.00	0.00-4.00
<b>ICC</b>	0.33	0.20	0.25	0.16	0.55	0.48	0.55	0.12

*Note.* Degrees of freedom = 1678; SD = standard deviation; ICC = intraclass correlation coefficient.

+  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .00$

After calculating descriptive statistics, I examined whether the main effect of daily effortful tasks on risky sexual behavior was significant. The results demonstrated that engaging in effortful tasks on a given day was not significantly associated with a greater likelihood of engaging in risky sexual behavior later that day, and in fact, was marginally associated with a *decrease*,  $OR = 0.83$ ,  $95\% CI = [0.66, 1.03]$ ,  $p = .089$ . Although engaging in effortful tasks did not predict an increase in the likelihood of engaging in risky sexual behavior, I still examined the Daily Effortful Tasks X Narrative Social World Use X Restoration Motives interaction predicting risky sexual behavior because a significant main effect is not required to obtain a significant interaction. In other words, two-way and three-way interactions can still be significant when main effects are not. Therefore, I examined the three-way interaction.

The three-way Daily Effortful Tasks X Narrative Social World Use X Restoration Motives interaction predicting risky sexual behavior was significant (see Table 2). Following procedures recommended by Aiken and West (1991), I then broke down this interaction by examining the Daily Effortful Tasks X Narrative Social World Use interaction on days when people used media programs for restoration motives vs. for other motives. When people used media programs for motives other than restoration, the two-way Daily Effortful Tasks X Narrative Social World Use interaction was not significant,  $OR = 0.93$ ,  $95\% CI = [0.67, 1.31]$ ,  $p = .694$  (see the left panel of Figure 2). However, when people used media programs for restoration motives, the two-way Daily Effortful Tasks X Narrative Social World Use interaction was significant,  $OR = 0.18$ ,  $95\% CI = [0.08, 0.41]$ ,  $p < .001$  (see the right panel of Figure 2). Consistent with my hypotheses, on days when people participated in *non-narrative program viewing*, engaging in a greater number of effortful tasks was associated with a

greater likelihood of engaging in risky sexual behavior,  $OR = 2.14$ ,  $95\% CI = [1.27, 3.63]$ ,  $p = .005$ . However, on days when people immersed themselves in *narrative social worlds*, engaging in a greater number of effortful tasks was associated with a lower likelihood of engaging in risky sexual behavior,  $OR = 0.39$ ,  $95\% CI = [0.21, 0.71]$ ,  $p = .002$ .

### ***Exploratory Analyses***

I also examined whether self-esteem, attachment orientations, and general anthropomorphic tendencies influenced the effects of immersion in narrative social worlds on the association between daily effortful tasks and risky sexual behavior. I ran separate analyses replacing restoration motives with each of these variables in three-way Daily Effortful Tasks X Narrative Social World Use X Exploratory Moderator interactions. None of those interactions were significant. Furthermore, I examined the moderating role of gender and relationship status. I ran separate analyses replacing restoration motives with each of these variables in three-way Daily Effortful Tasks X Narrative Social World Use X Exploratory Moderator interaction. Neither of those interactions were significant.

**Table 2**

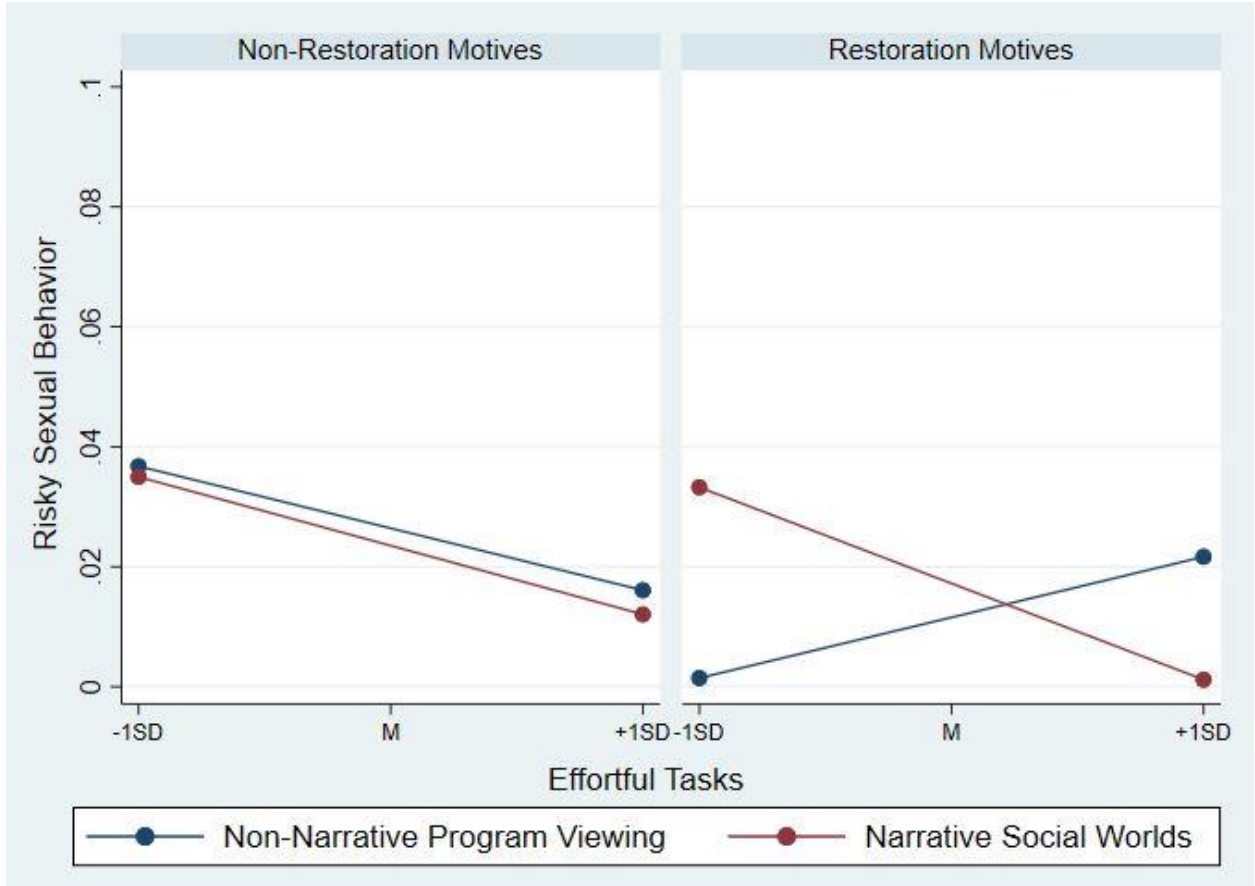
*Results of the Three-way Daily Effortful Tasks X Narrative Social World Use X Restoration Motives Interaction Predicting Risky Sexual Behavior*

Fixed Effects	<i>OR</i>	<i>p</i>	<i>95% CI</i>	
Intercept	0.02	.000	[0.00	0.12]
Study day	0.94	.303	[0.85	1.05]
Gender	0.64	.416	[0.22	1.87]
Age	1.01	.926	[0.79	1.29]
Relationship Status	3.63	.028	[1.15	11.44]
Race				
Biracial or Multicultural	3.07	.237	[0.48	19.80]
Latino	2.51	.254	[0.52	12.24]
Other	0.49	.517	[0.06	4.23]
White	1.03	.967	[0.22	4.96]
Lagged Risky Sexual Behavior	5.68	.011	[1.49	21.60]
PMC Irritable Mood	0.99	.983	[0.61	1.62]
PMC Alcohol Intoxication	1.17	.607	[0.65	2.10]
GMC Daily Effortful Tasks	1.02	.945	[0.64	1.60]
GMC Narrative Social World Use	0.93	.354	[0.79	1.09]
GMC Restoration Motives	1.07	.678	[0.77	1.51]
GMC Daily Effortful Tasks X GMC Narrative Social World Use	0.96	.598	[0.82	1.12]
GMC Daily Effortful Tasks X GMC Restoration Motives	1.08	.553	[0.83	1.42]
GMC Narrative Social World Use X GMC Restoration Motives	0.96	.359	[0.88	1.05]
GMC Daily Effortful Tasks X GMC Narrative Social World Use X GMC Restoration Motives	0.97	.376	[0.90	1.04]
PMC Daily Effortful Tasks	0.79	.085	[0.60	1.03]
TV Narrative Social World Use	0.84	.724	[0.32	2.19]
TV Restoration Motives	0.23	.069	[0.05	1.12]
TV Narrative Social World Use X PMC Daily Effortful Tasks	0.93	.694	[0.67	1.31]
TV Restoration Motives X PMC Daily Effortful Tasks	2.74	.003	[1.41	5.30]
TV Narrative Social World Use X TV Restoration Motives	1.34	.767	[0.19	9.34]
TV Narrative Social World Use X TV Restoration Motives X PMC Daily Effortful Tasks	0.19	.000	[0.08	0.46]
Random Effects				
Intercept Variance	0.85		[.060	12.05]

*Note.* The reference group for race was Asian or Asian American. *95% CI* = 95% confidence interval. GMC = grand-mean centered; PMC = person-mean centered; TV = uncentered time-varying; *OR* = Odds ratio.

**Figure 2**

*The Three-way Daily Effortful Tasks X Narrative Social World Use X Restoration Motives Interaction Predicting Risky Sexual Behavior*



*Note.* Effortful tasks were graphed at 1 SD below and above the mean (i.e., -1.78, 1.78).



## **Discussion**

The findings of Analysis Set 1 demonstrated the positive outcomes that immersion in narrative social worlds can have on participating in risky sexual behavior after enacting effortful tasks. Previous research has demonstrated that people seek narrative social worlds after participating in tasks requiring emotion regulation or attention control, and engagement in such familiar fictional worlds restores mood and energy (Derrick, 2013; Johnson et al., 2015). Accordingly, I expected that when people engaged in narrative social worlds for restoration motives after enacting effortful tasks, they would be less likely to participate in risky sexual behavior. The findings of Study 1 supported this hypothesis. Specifically, I found that using narrative social worlds for restoration motives (e.g., to avoid thinking about things, to avoid doing things) after engaging in effortful tasks reduced the likelihood of engaging in risky sexual behavior, consistent with a restoration of self-control explanation. However, using non-narrative program viewing increased the likelihood of participation in risky sexual behavior. Therefore, it can be concluded that the first category of symbolic social bonds (i.e., narrative social worlds) may be able to mitigate participation in risky sexual behavior.

### **Analysis Set 2: Parasocial Relationships**

A parasocial relationship is a unidirectional relationship with fictional or non-fictional media personae (Horton & Wohl, 1956), such as television show performers (Cohen, 2003, 2004), sports celebrities (Brown & Basil, 1995, 2010), or fantasy cartoon characters (Bond & Calvert, 2014). As with narrative social worlds (e.g., Derrick, 2013), parasocial relationships may restore depleted self-control. However, individual differences in self-esteem may influence the degree to which people experience the positive psychological outcomes

associated with parasocial relationships. For instance, when low self-esteem people think about a favorite celebrity, they assimilate that celebrity to the self and experience decreases in discrepancies between their actual and ideal selves. High self-esteem people, who tend to gain this benefit from traditional social relationships, do not show this tendency (Derrick et al., 2008). Therefore, I hypothesized that self-esteem may also influence the effects of parasocial relationships on restoring depleted self-control and inhibiting risky sexual behavior.

In Analysis Set 2, I expected that engaging in parasocial relationships would restore self-control and, therefore, would decrease the likelihood of engaging in risky sexual behavior, at least for some people. More specifically, for low self-esteem people, engaging in a parasocial relationship after engaging in effortful tasks should prevent risky sexual behavior. I did not expect that parasocial relationships would provide such effects for high self-esteem people (because high self-esteem people should already derive this benefit from their traditional social relationships).

## **Method**

### ***Dataset***

I used the same EMA dataset (Derrick et al., 2019) as in Analysis Set 1 to test my hypotheses. At baseline, participants completed several questionnaires, including self-esteem. I used the assessment of self-esteem as a Level 2 moderator in the current analyses. I used the EMA measures of “daily effortful tasks” and “risky sexual behavior” described in Analysis Set 1. In addition, I used “parasocial relationships” as another EMA measure in the current analyses.

### ***New Baseline Measures***

**Self-Esteem.** To assess self-esteem, I used participants' responses to the 10-item Rosenberg (1965) Self-Esteem scale. At baseline, participants responded to statements about their personal reactions and feelings about themselves (e.g., "I feel that I am a person of worth, at least on an equal basis with others"; "I take a positive attitude toward myself") on a 5-point scale (1 = *not at all like me*, 5 = *very much like me*). I averaged responses to the self-esteem items to create the final self-esteem scores, with higher scores indicating higher self-esteem ( $M = 3.82$ ,  $SD = 0.83$ ). The self-esteem scale is presented in Appendix A.

### ***New EMA Measures***

**Parasocial Relationships.** In both randomly prompted and evening reports, participants completed two no/yes questions relevant to parasocial relationships. First, as a follow-up question to the television/movie item introduced in Analysis Set 1 (i.e., "Since my last report, I watched television or a movie"), participants indicated whether they watched the program for a parasocial relationship (i.e., "the show/movie included one of my favorite celebrities"). Second, participants indicated whether they had engaged in a parasocial relationship in general (i.e., "Since my last report, I watched or sought information about my favorite celebrity"). I created a dichotomous variable tapping parasocial relationship engagement, with 0 indicating that the participant did not engage in either behavior and 1 indicating that the participant enacted at least one of the behaviors, thereby engaging in a parasocial relationship.

### ***Analysis Plan***

Preliminary analyses were conducted as in Analysis Set 1. As the primary analyses, I again conducted MEGLMs in Stata 15, with days (Level 1) nested within people (Level 2). As in Analysis Set 1, I used a binomial distribution with a logit link, and the slopes were set

as fixed effects. Centering and covariates were also nearly identical to Analysis Set 1, with the exception that I grand-mean centered the moderator, self-esteem, given that it was a Level 2 (time invariant) variable in Analysis Set 2.

## **Results**

Descriptive statistics and intercorrelations for the independent, dependent, moderator, and control variables are included in Table 3. Some new bivariate correlations emerged with the examination of new variables. Effortful tasks were positively correlated with engaging in a parasocial relationship. Furthermore, self-esteem was negatively correlated with effortful tasks, engaging in a parasocial relationship, and the two negative mood scales, and positively correlated with positive mood and alcohol intoxication. The ICC demonstrated that for the parasocial relationships variable, most of the variation occurred at the within-person level (see Table 3).

**Table 3***Descriptive statistics and intercorrelations for the Study 2 variables.*

	1	2	3	4	5	6	7	8
1. Effortful tasks	--							
2. Risky sexual behavior	-.05 <sup>+</sup>	--						
3. Parasocial relationship	.08 <sup>**</sup>	.02	--					
4. Self-esteem	-.13 <sup>***</sup>	-.01	-.06 <sup>*</sup>	--				
5. Positive mood	-.19 <sup>***</sup>	.01	.01	.36 <sup>***</sup>	--			
6. Irritable mood	.23 <sup>***</sup>	.00	-.05 <sup>+</sup>	-.25 <sup>***</sup>	-.53 <sup>***</sup>	--		
7. Depressed mood	.17 <sup>***</sup>	.01	-.04	-.23 <sup>***</sup>	-.38 <sup>***</sup>	.48 <sup>***</sup>	--	
8. Alcohol intoxication	-.03	.11 <sup>***</sup>	-.04	.05 <sup>+</sup>	.08 <sup>**</sup>	-.10 <sup>**</sup>	-.06 <sup>+</sup>	--
<b>Mean</b>	1.35	0.05	0.17	3.82	2.90	2.02	1.38	0.18
<b>SD</b>	2.25	0.21	0.38	0.83	0.90	0.94	0.55	0.65
<b>Range</b>	0.00-19.00	0.00-1.00	0.00-1.00	1.30-5.00	1.00-4.00	1.00-4.00	1.00-4.00	0.00-4.00
<b>ICC</b>	0.33	0.20	0.17	--	0.55	0.48	0.55	0.12

*Note.* Degrees of freedom = 1678; SD = standard deviation; ICC = intraclass correlation coefficient.

+  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .00$

Next, I examined the influence of engaging in a parasocial relationship on the association between effortful tasks and risky sexual behavior for low self-esteem people. To do so, I examined the three-way Daily Effortful Tasks X Parasocial Relationship X Self-Esteem interaction predicting risky sexual behavior. Unexpectedly, the interaction was not significant (see Table 4). Thus, the hypothesis was not supported that for low self-esteem people, engaging in a parasocial relationship would reduce the likelihood of participating in risky sexual behavior after enacting effortful tasks.

Although I included the GMC Level 2 version of the Level 1 variables primarily for control purposes, I observed three significant two-way interactions at this level. First, the GMC Daily Effortful Tasks X GMC Parasocial Relationships interaction was significant (see Table 4). I broke down this interaction by examining the effects of how much participants *typically* enacted effortful tasks on risky sexual behavior for people who typically engaged in parasocial relationships to a lesser (1 *SD* below the mean) and greater (1 *SD* above the mean) extent than the rest of the sample (see Figure 3). Among people who generally engaged less in parasocial relationships, those who also typically enacted more effortful tasks were less likely to participate in risky sexual behavior,  $OR = 0.41$ ,  $95\% CI = [0.25, 0.67]$ ,  $p < .001$ . However, among people who generally engaged more in parasocial relationships this association was not significant,  $OR = 1.42$ ,  $95\% CI = [0.92, 2.20]$ ,  $p = .114$ . In examining Figure 3, it is apparent that they tended to have consistently low levels of risky sexual behavior. Overall, these results are not consistent with my hypotheses, but they are still consistent with the idea that people who engage in parasocial relationships to a greater extent may be somehow protected against risky sexual behavior.

Second, the GMC Daily Effortful Tasks X GMC Self-Esteem interaction was significant (see Table 4). I broke down this interaction by examining the effects of how much participants typically enacted effortful tasks on risky sexual behavior for people with lower (1 *SD* below the mean) and higher (1 *SD* above the mean) self-esteem than the rest of the sample (see Figure 4). For low self-esteem people, those who typically enacted more effortful tasks were less likely to participate in risky sexual behavior,  $OR = 0.53$ ,  $95\% CI = [0.33, 0.82]$ ,  $p = .007$ . For high self-esteem people, this association was not significant,  $OR = 1.09$ ,  $95\% CI = [0.76, 1.58]$ ,  $p = .628$ . These results are not consistent with my hypotheses. They demonstrate that for low self-esteem people, typically enacting more effortful tasks is associated with a lower likelihood of participating in risky sexual behavior.

Finally, the GMC Parasocial Relationships X GMC Self-Esteem interaction was significant (see Table 4). I broke down this interaction by examining the effects of typical engagement with parasocial relationships on risky sexual behavior for people with lower and higher self-esteem than the rest of the sample (see Figure 5). For low self-esteem people, those who engaged to a greater extent with parasocial relationships were less likely to participate in risky sexual behavior,  $OR = 0.46$ ,  $95\% CI = [0.22, 0.94]$ ,  $p = .033$ . For high self-esteem people, this association was not significant,  $OR = 1.20$ ,  $95\% CI = [0.96, 1.50]$ ,  $p = .105$ . These results are consistent with the idea that parasocial relationships protect against risky sexual behavior for low self-esteem people, although not through self-control restoration.

### ***Exploratory Analyses***

Previous research has demonstrated that developing a parasocial relationship can be associated with attachment anxiety (Cole & Leets, 1999; Derrick et al., 2019; Rosaen &

Dibble, 2016). Accordingly, attachment anxiety, rather than low self-esteem, may influence the effects of parasocial relationships on risky sexual behavior after enacting effortful tasks. I ran another analysis replacing self-esteem with attachment anxiety and attachment avoidance in the same model. The three-way Daily Effortful Tasks X Parasocial Relationship X Attachment Anxiety interaction predicting risky sexual behavior was not significant,  $OR = 0.90$ ,  $95\% CI = [0.73, 1.11]$ ,  $p = .338$ . Similarly, the three-way Daily Effortful Tasks X Parasocial Relationships X Attachment Avoidance interaction predicting risky sexual behavior was not significant,  $OR = 1.14$ ,  $95\% CI = [0.82, 1.60]$ ,  $p = .432$ . Therefore, neither attachment anxiety nor attachment avoidance served as a stronger predictor than self-esteem.

Furthermore, I examined the moderating role of gender and relationship status. I ran separate analyses replacing self-esteem with each of these variables in three-way Daily Effortful Tasks X Parasocial Relationships X Exploratory Moderator interactions. Neither of those interactions was significant.



**Table 4**

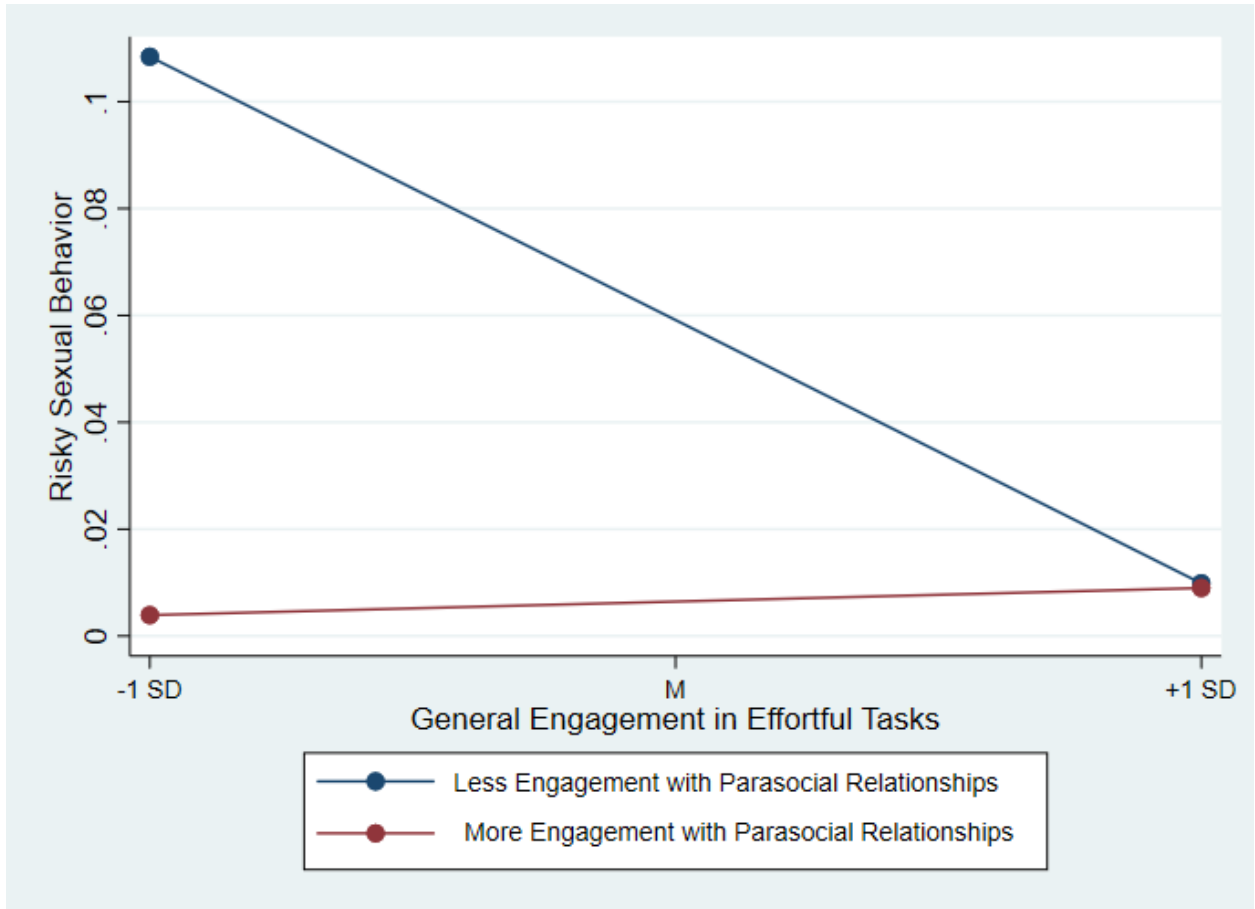
*Results of the Three-way Daily Effortful Tasks X Parasocial Relationship X Self-Esteem Interaction Predicting Risky Sexual Behavior*

Fixed Effects	<i>OR</i>	<i>p</i>	<i>95% CI</i>	
Intercept	0.01	.000	[0.00	0.07]
Study day	0.94	.228	[0.86	1.04]
Gender	0.72	.454	[0.30	1.72]
Age	0.95	.607	[0.77	1.16]
Relationship Status	5.45	.030	[1.18	25.19]
Race				
Biracial or Multicultural	1.75	.514	[0.32	9.48]
Latino	2.04	.304	[0.52	7.98]
Other	0.40	.474	[0.03	4.87]
White	0.69	.660	[0.13	3.67]
Lagged Risky Sexual Behavior	6.95	.000	[3.24	14.88]
PMC Irritable Mood	0.99	.979	[0.63	1.57]
PMC Alcohol Intoxication	1.38	.364	[0.69	2.75]
GMC Daily Effortful Tasks	0.76	.069	[0.57	1.02]
GMC Parasocial Relationship	0.74	.108	[0.52	1.07]
GMC Self-Esteem	1.43	.212	[0.82	2.49]
GMC Daily Effortful Tasks X GMC Parasocial Relationship	1.27	.001	[1.11	1.46]
GMC Daily Effortful Tasks X GMC Self-Esteem	1.55	.017	[1.08	2.21]
GMC Parasocial Relationship X GMC Self-Esteem	1.79	.015	[1.12	2.86]
GMC Daily Effortful Tasks X GMC Parasocial Relationship X GMC Self-Esteem	1.07	.431	[0.90	1.28]
PMC Daily Effortful Tasks	0.82	.205	[0.61	1.11]
TV Parasocial Relationship	0.98	.941	[0.50	1.90]
TV Parasocial Relationship X PMC Daily Effortful Tasks	0.87	.467	[0.59	1.27]
GMC Self-Esteem X PMC Daily Effortful Tasks	0.99	.936	[0.76	1.29]
TV Parasocial Relationship X GMC Self-Esteem	1.72	.264	[0.66	4.48]
TV Parasocial Relationship X GMC Self-Esteem X PMC Daily Effortful Tasks	1.29	.318	[0.78	2.15]
Random Effects				
Intercept Variance	0.00		[0.00	0.00]

*Note.* The reference group for race was Asian or Asian American. *95% CI* = 95% confidence interval. GMC = grand-mean centered; PMC = person-mean centered; TV = uncentered time-varying; *OR* = Odds ratio.

**Figure 3**

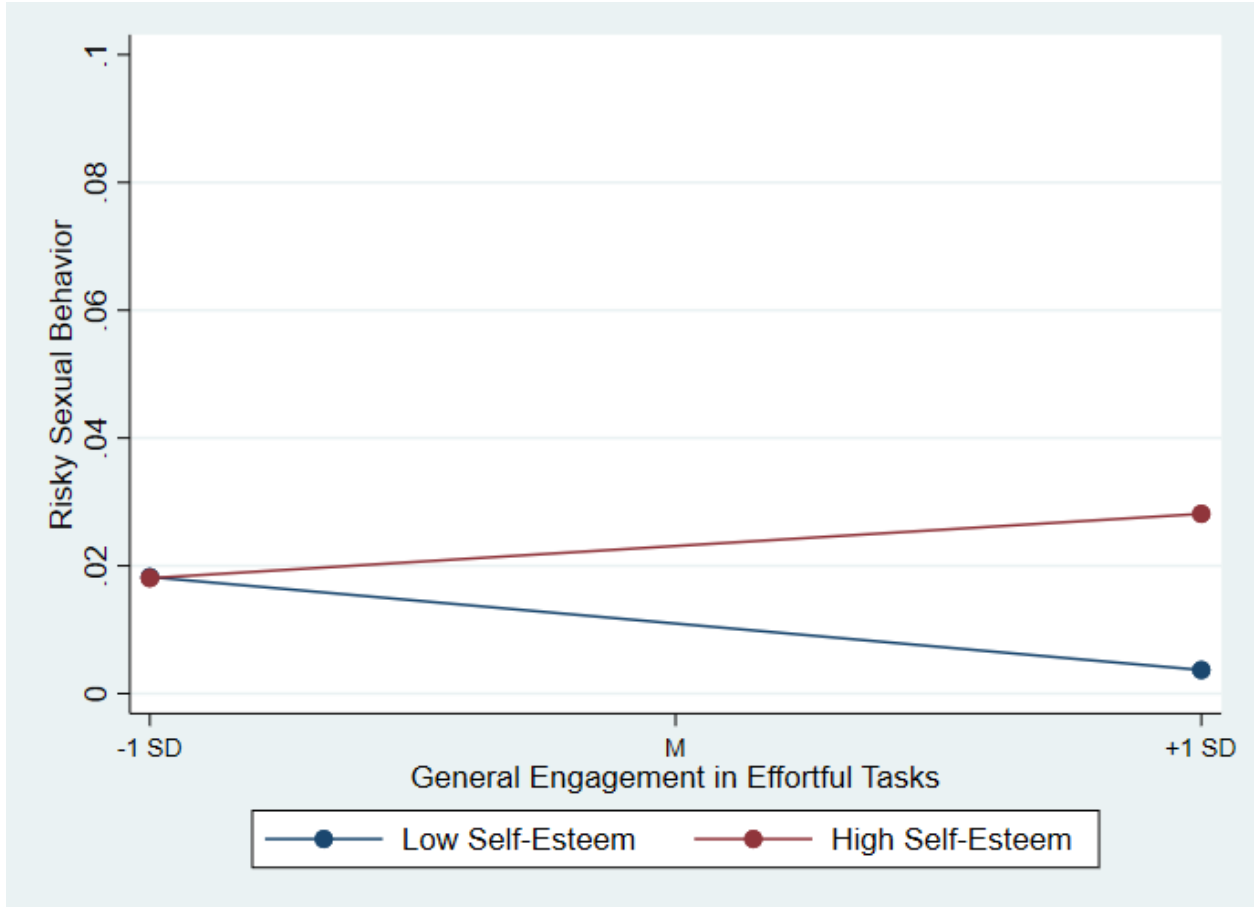
*The Two-way GMC Daily Effortful Tasks X GMC Parasocial Relationships Interaction Predicting Risky Sexual Behavior*



*Note:* General Engagement in Effortful Tasks was graphed at 1 SD below and above the mean.

**Figure 4**

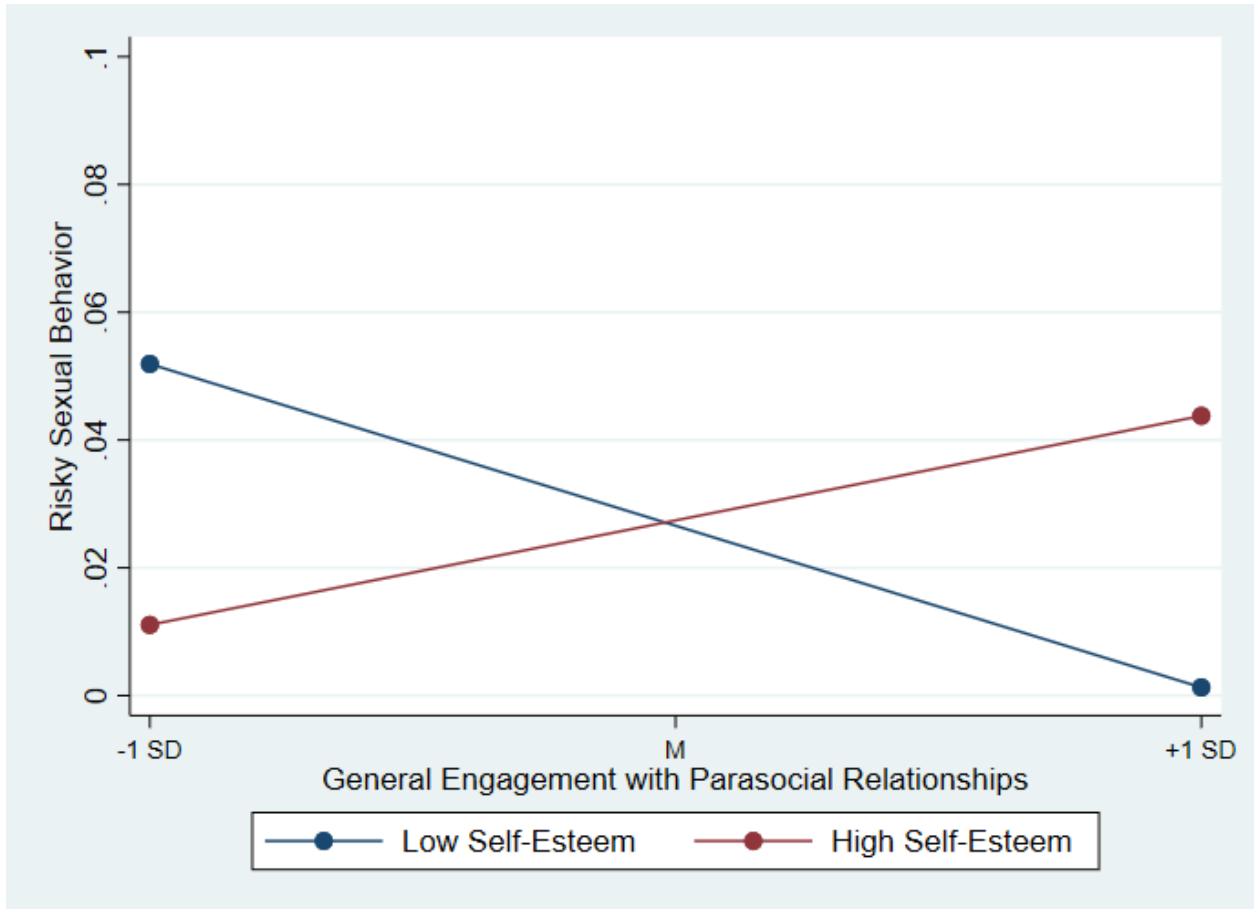
*The Two-way GMC Daily Effortful Tasks X GMC Self-Esteem Interaction Predicting Risky Sexual Behavior*



*Note:* General Engagement in Effortful Tasks was graphed at 1 SD below and above the mean.

**Figure 5**

*The Two-way GMC Parasocial Relationships X GMC Self-Esteem Interaction Predicting Risky Sexual Behavior*



*Note:* General Engagement with parasocial relationships was graphed at 1 SD below and above the mean.

## Discussion

As with narrative social worlds (e.g., Derrick, 2013), I expected that parasocial relationships would restore depleted self-control and reduce the likelihood of engaging in risky sexual behavior after enacting effortful tasks. However, previous research has demonstrated that individual differences in self-esteem may influence the positive psychological outcomes associated with parasocial relationships. For instance, low self-esteem people assimilate their favorite celebrity to the self and experience decreases in their self-discrepancies. High self-esteem people, who can get this benefit from their traditional relationship partners, do not show this tendency (Derrick et al., 2008). Accordingly, I expected that engaging in a parasocial relationship after enacting effortful tasks would restore depleted self-control and prevent risky sexual behavior for low vs. high self-esteem people. The findings of Study 2 did not support this hypothesis.

Although my primary hypotheses focused on the Level 1 effects (i.e., within-person changes), I also included the Level 2 effects (i.e., between-person differences) in the analyses to parse apart within- and between-person sources of variance. Analyses of the Level 2 effects revealed some interesting results. Among people who generally engaged less in parasocial relationships, those who generally enacted fewer vs. more effortful behaviors than the rest of the sample were more likely to engage in risky sexual behavior. However, people who generally engaged more in parasocial relationships tended to have consistently low levels of participation in risky sexual behavior. Furthermore, among low self-esteem people, those who engaged in fewer effortful tasks than the rest of the sample were more likely to engage in risky sexual behavior compared to those who generally engaged in more effortful tasks. Finally, among low self-esteem people, those who generally engaged more with

parasocial relationships than the rest of the sample were less likely to engage in risky sexual behavior compared to those who generally engaged less with parasocial relationships. Therefore, it can be concluded that parasocial relationships can be protective against participation in risky sexual behavior at least for some people.

In exploratory analyses, I also examined whether attachment insecurity (i.e., attachment anxiety, attachment avoidance) influenced the effects of parasocial relationships on the association between daily effortful tasks and risky sexual behavior. The findings did not support these exploratory analyses.

### **Analysis Set 3: Anthropomorphic Entities**

Attributing humanlike traits to non-human entities such as technological devices, religious deities, or pets, is defined as anthropomorphism (Epley, Akalis, et al., 2008; Waytz et al., 2010). Anthropomorphism can boost self-control through emotion regulation or inhibition (Chen et al., 2020). In Analysis Set 3, I hypothesized that anthropomorphizing non-human entities would restore self-control after enacting effortful tasks and, therefore, would decrease the likelihood of engaging in risky sexual behavior. More specifically, for people high in the general tendency to anthropomorphize, interacting with non-human entities after engaging in effortful tasks should buffer against participation in risky sexual behavior. I did not expect to observe such effects for people low in the general tendency to anthropomorphize (because engaging with non-human entities would not lead to anthropomorphism, and thus, would not lead to these positive consequences).

## **Method**

### ***Dataset***

I used the same EMA dataset as in the previous analyses (Derrick et al., 2019). At baseline, participants completed several questionnaires, including an assessment of the tendency to anthropomorphize non-human entities and their religious affiliation. I used the general tendency to anthropomorphize scale as a Level 2 moderator in the current analyses. I used the EMA measures of “daily effortful tasks” and “risky sexual behavior” described in Analysis Set 1. In addition, I used “non-human entities” as another EMA measure in the current analyses.

### *New Baseline Measures*

**Anthropomorphism.** To assess the general tendency to anthropomorphize non-human objects and entities (i.e., anthropomorphism), I used participants’ responses to the Individual Differences in Anthropomorphism Questionnaire (IDAQ; Waytz et al., 2010). At baseline, participants completed 15 items about the extent to which they attribute consciousness, emotions, mindfulness, intentions, and free will to animals, inanimate natural objects, or technologies (e.g., “To what extent does a television set experience emotions?”; “To what extent does the average fish have free will?”) on a 10-point scale (1 = *not at all*, 10 = *very much*). I summed responses to the IDAQ items, with higher scores indicating higher anthropomorphism. The IDAQ scale is presented in Appendix B.

**Religious Affiliation.** I included religious affiliation as a covariate in the current analyses. At baseline, participants completed one question about their religious affiliation (i.e., “Please select the religion with which you most strongly identify”) with 11 response options (i.e., Agnostic, Atheist, Buddhist, Catholic, Hindu, Islam, Jewish, Protestant, Other Christian, Other, None). I created a dichotomous variable tapping religious affiliation, with 0 indicating that the participant did not identify with a religion and 1 indicating that the

participant identified with at least one religion that posits a personal relationship with God or prophets or saints. Buddhist, Catholic, Hindu, Islam, Jewish, Protestant, and other Christians were coded as 1, and other response options were coded as 0.

### *New EMA Measures*

**Non-human Entities.** In both randomly prompted and evening reports, participants completed two no/yes questions relevant to engagement with non-human entities. First, participants indicated whether they had connected with a pet (i.e., “Since my last report, I spent time with a pet”). Second, participants indicated whether they had connected with (a) religious deity/ies (i.e., “Since my last report, I prayed, worshipped, or meditated”). I created a dichotomous variable tapping engagement with non-human entities, with 0 indicating that the participant did not report contact with any non-human entities and 1 indicating that the participant used at least one non-human entity.

### *Analysis Plan*

Preliminary analyses were conducted as in the previous analyses. As the primary analyses, I again conducted MEGLMs in Stata 15, with days (Level 1) nested within people (Level 2). As in the previous analyses, I used a binomial distribution with a logit link, and the slopes were set as fixed effects. Centering and covariates were also nearly identical to previous analyses, with the exception that I grand-mean centered the moderator, anthropomorphism, given that it was a Level 2 (time invariant) variable in Analysis Set 3.

### **Results**

Descriptive statistics and intercorrelations for the independent, dependent, moderator, and control variables are included in Table 5. Some new bivariate correlations emerged with the examination of new variables. The bivariate correlations demonstrated that engaging with



non-human entities was positively correlated with risky sexual behavior and anthropomorphism. Furthermore, anthropomorphism was positively correlated with effortful tasks and negatively correlated with positive mood. The ICC demonstrated that for engaging with non-human entities, most of the variation occurred at the within-person level (see Table 5).

**Table 5***Descriptive statistics and intercorrelations for the Study 3 variables.*

	1	2	3	4	5	6	7	8
1. Effortful tasks	--							
2. Risky sexual behavior	-.05 <sup>+</sup>	--						
3. Non-human entities	.03	.11 <sup>***</sup>	--					
4. Anthropomorphism	.08 <sup>***</sup>	.01	.07 <sup>**</sup>	--				
5. Positive mood	-.19 <sup>***</sup>	.01	.02	-.04 <sup>+</sup>	--			
6. Irritable mood	.23 <sup>***</sup>	.00	-.01	.03	-.53 <sup>***</sup>	--		
7. Depressed mood	.17 <sup>***</sup>	.01	-.01	.02	-.38 <sup>***</sup>	.48 <sup>***</sup>	--	
8. Alcohol intoxication	-.03	.11 <sup>***</sup>	.00	-.02	.08 <sup>**</sup>	-.10 <sup>**</sup>	-.06 <sup>+</sup>	--
<b>Mean</b>	1.35	0.05	0.33	65.43	2.90	2.02	1.38	0.18
<b>SD</b>	2.25	0.21	0.47	22.19	0.90	0.94	0.55	0.65
<b>Range</b>	0.00-19.00	0.00-1.00	0.00-1.00	21.00-128.00	1.00-4.00	1.00-4.00	1.00-4.00	0.00-4.00
<b>ICC</b>	0.33	0.20	0.32	--	0.55	0.48	0.55	0.12

*Note.* Degrees of freedom = 1678; SD = standard deviation; ICC = intraclass correlation coefficient.

+ p &lt; .10, \* p &lt; .05, \*\* p &lt; .01, \*\*\* p &lt; .00

Next, I examined the influence of engaging with non-human entities on the association between effortful tasks and risky sexual behavior for people with a high general tendency to anthropomorphize. To do so, I examined the three-way Daily Effortful Tasks X Non-Human Entities X Anthropomorphism interaction predicting risky sexual behavior. This three-way interaction was marginally significant ( $p = .074$ ; see Table 6). Given that the three-way interaction was hypothesized, I still proceeded to examine the nature of the interaction. I broke down this interaction by examining the Daily Effortful Tasks X Non-Human Entities interaction for people with low (1 SD below the mean) and high (1 SD above the mean) general tendency to anthropomorphize (see Figure 6).

For people with low general tendency to anthropomorphize, the two-way Daily Effortful Tasks X Non-Human Entities interaction was not significant,  $OR = 0.94$ ,  $95\% CI = [0.37, 2.44]$ ,  $p = .907$ . For people with high general tendency to anthropomorphize, the two-way Daily Effortful Tasks X Non-Human Entities interaction also unexpectedly failed to reach significance,  $OR = 3.17$ ,  $95\% CI = [0.52, 19.15]$ ,  $p = .209$ . Examining the conditional main effects (see the right side of Figure 6), when people with a high general tendency to anthropomorphize did *not* engage with non-human entities, enacting a greater number of effortful tasks was associated with a lower likelihood of engaging in risky sexual behavior, although this effect failed to reach significance,  $OR = 0.30$ ,  $95\% CI = [0.06, 1.56]$ ,  $p = .154$ . However, when they engaged with non-human entities, this association was not significant,  $OR = 0.96$ ,  $95\% CI = [0.72, 1.29]$ ,  $p = .810$ . In examining Figure 6, it is apparent that on days when people high in anthropomorphism engaged with non-human entities, they tended to have consistently low levels of risky sexual behavior.

Given that the three-way interaction was only marginally significant, and I observed that the two-way Non-Human Entities X GMC Anthropomorphism interaction was significant (see Table 6), I also examined this interaction. I broke down this interaction by examining the effects of engaging with Non-Human Entities on risky sexual behavior for people with low and high general tendency to anthropomorphize (see Figure 7). For people with low general tendency to anthropomorphize, the effects of engaging with non-human entities on risky sexual behavior failed to reach significance,  $OR = 2.92$ ,  $95\% CI = [0.74, 11.64]$ ,  $p = .127$ . However, for people with high general tendency to anthropomorphize, greater engagement with non-human entities was marginally associated with a lower likelihood of participating in risky sexual behavior,  $OR = 0.34$ ,  $95\% CI = [0.09, 1.18]$ ,  $p = .090$ . Therefore, engagement with non-human entities can still be protective against risky sexual behavior for people with high anthropomorphic tendencies, but the effect is independent of enacting effortful tasks.

Although I included the GMC Level 2 version of the Level 1 variables primarily for control purposes, I observed a marginally significant ( $p = .051$ ) three-way GMC Daily Effortful Tasks X GMC Non-Human Entities X GMC Anthropomorphism interaction (see Table 6). I broke down this interaction by examining the GMC Daily Effortful Tasks X GMC Non-Human Entities interaction for people with low and high general tendency to anthropomorphize (see Figure 8). For people with low anthropomorphic tendencies, the two-way GMC Daily Effortful Tasks X GMC Non-Human Entities interaction was not significant,  $OR = 0.92$ ,  $95\% CI = [0.82, 1.03]$ ,  $p = .167$ . However, for people with high anthropomorphic tendencies, the two-way GMC Daily Effortful Tasks X GMC Non-Human Entities interaction was marginally significant,  $OR = 1.11$ ,  $95\% CI = [0.98, 1.25]$ ,  $p = .092$ .

Among people who generally engaged with non-human entities to a lesser extent than the rest of the sample, those who typically enacted more effortful tasks were less likely to participate in risky sexual behavior,  $OR = 0.50$ ,  $95\% CI = [0.23, 1.07]$ ,  $p = .076$ . However, among people who generally engaged with non-human entities to a greater extent than the rest of the sample, those who typically enacted more effortful tasks were less likely to participate in risky sexual behavior,  $OR = 0.21$ ,  $95\% CI = [0.04, 1.13]$ ,  $p = .069$ . Therefore, among people with high anthropomorphic tendencies, those who engaged with non-human entities to a greater extent and typically enacted more effortful tasks were less likely to engage in risky sexual behavior.

### ***Exploratory Analyses***

Given that the worship question (i.e., “Since my last report, I prayed, worshipped, or meditated”) may not accurately tap anthropomorphized interaction with religious deities, I ran separate analyses for connection with pet and worship to examine the influence of each of those behaviors on the association between effortful tasks and risky sexual behavior. First, I examined the three-way Daily Effortful Tasks X Worship X Anthropomorphism interaction predicting risky sexual behavior. This three-way interaction failed to reach significance,  $OR = 1.01$ ,  $95\% CI = [0.99, 1.03]$ ,  $p = .169$ . Given the exploratory nature of the analyses, I still proceeded to examine the interaction (see Figure 9). I broke down this interaction by examining the Daily Effortful Tasks X Worship interaction for people with low and high general tendency to anthropomorphize. For people with low general tendency to anthropomorphize, the two-way Daily Effortful Tasks X Worship interaction was not significant,  $OR = 0.64$ ,  $95\% CI = [0.20, 2.10]$ ,  $p = .451$ . For people with high general

tendency to anthropomorphize, the two-way Daily Effortful Tasks X Worship interaction was also not significant,  $OR = 1.16$ ,  $95\% CI = [0.62, 2.17]$ ,  $p = .637$ .

Second, I examined the three-way Daily Effortful Tasks X Pet X Anthropomorphism interaction predicting risky sexual behavior. This three-way interaction was marginally significant,  $OR = 1.02$ ,  $95\% CI = [0.99, 1.05]$ ,  $p = .082$ . I broke down this interaction by examining the Daily Effortful Tasks X Pet interaction for people with a low and a high general tendency to anthropomorphize (see Figure 10). For people with low general tendency to anthropomorphize, the two-way Daily Effortful Tasks X Pet interaction was not significant,  $OR = 1.07$ ,  $95\% CI = [0.39, 2.97]$ ,  $p = .887$ . For people with high general tendency to anthropomorphize, the two-way Daily Effortful Tasks X Pet interaction also failed to reach significance,  $OR = 2.80$ ,  $95\% CI = [0.49, 15.78]$ ,  $p = .244$ . When people with a high general tendency to anthropomorphize did *not* have contact with pets, enacting a greater number of effortful tasks was associated with a lower likelihood of engaging in risky sexual behavior, although this effect was not significant,  $OR = 0.35$ ,  $95\% CI = [0.08, 1.56]$ ,  $p = .169$ . However, when they had contact with pets, this association was not significant,  $OR = 0.97$ ,  $95\% CI = [0.69, 1.37]$ ,  $p = .870$ . In examining Figure 10, it is apparent that on days when people in anthropomorphism had contact with pets, they tended to have consistently low levels of risky sexual behavior. In other words, the marginally significant interaction for non-human entities in the planned analyses was driven by the effect for pets, and not for worship.

Furthermore, I examined the moderating role of gender and relationship status. I ran separate analyses replacing anthropomorphism with each of these variables in three-way

Daily Effortful Tasks X Non-Human Entities X Exploratory Moderator interactions. Neither of those interactions were significant.

**Table 6**

*Results of the Three-way Daily Effortful Tasks X Non-Human Entities X General Anthropomorphic Tendencies Interaction Predicting Risky Sexual Behavior*

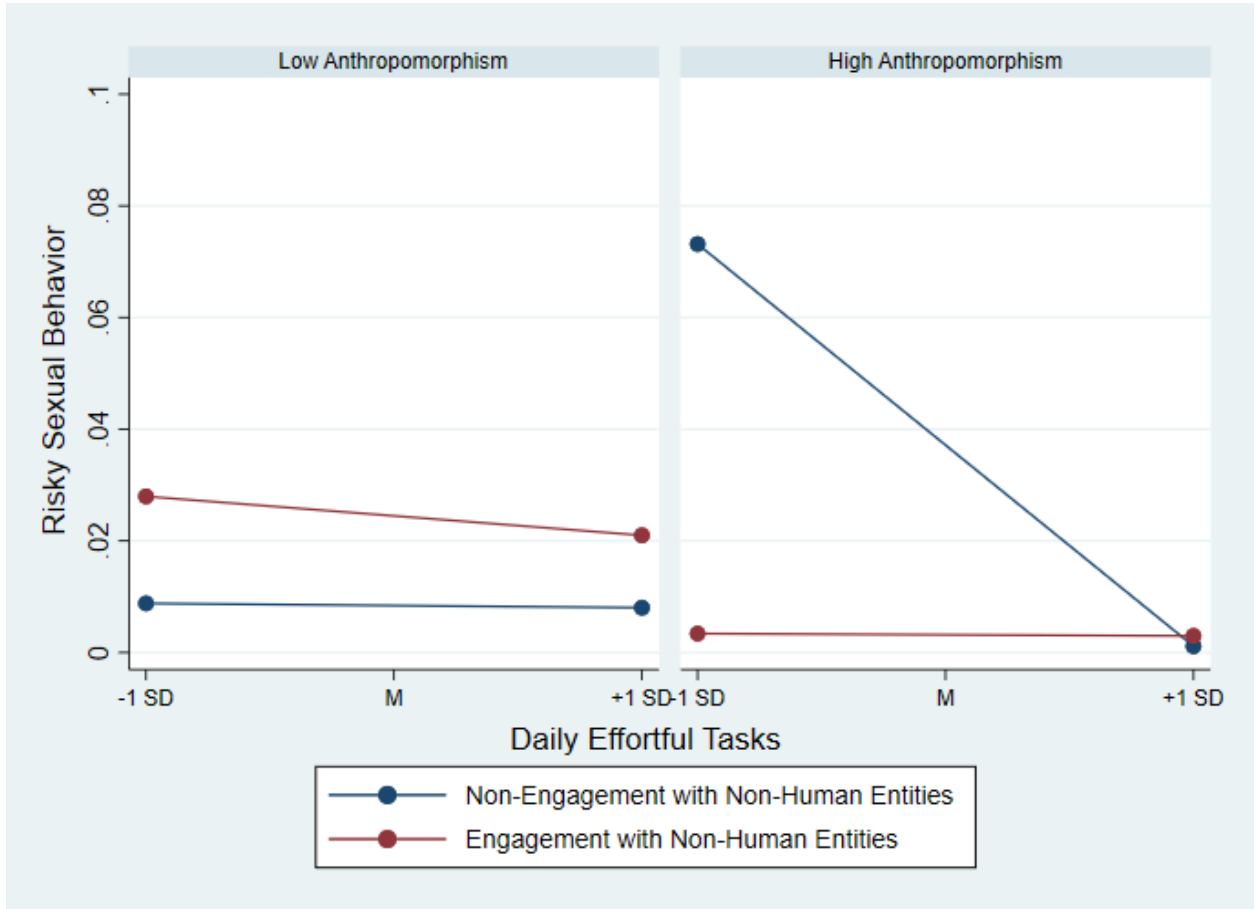
Fixed Effects	<i>OR</i>	<i>p</i>	<i>95% CI</i>	
Intercept	0.01	.000	[0.00	0.09]
Study day	0.87	.037	[0.77	0.99]
Gender	0.56	.282	[0.19	1.62]
Age	0.87	.501	[0.59	1.30]
Relationship Status	2.48	.094	[0.86	7.20]
Race				
Biracial or Multicultural	12.25	.023	[1.41	106.15]
Latino	9.01	.030	[1.23	65.74]
Other	1.50	.760	[0.11	20.75]
White	3.94	.216	[0.45	34.50]
Lagged Risky Sexual Behavior	8.39	.001	[2.38	29.62]
Religious Affiliation	1.34	.640	[0.39	4.56]
PMC Irritable Mood	0.99	.958	[0.61	1.61]
PMC Alcohol Intoxication	1.50	.437	[0.54	4.19]
GMC Daily Effortful Tasks	0.54	.039	[0.30	0.97]
GMC Non-Human Entities	1.14	.130	[0.96	1.34]
GMC Anthropomorphism	1.00	.882	[0.96	1.05]
GMC Daily Effortful Tasks X GMC Non-Human Entities	1.01	.770	[0.94	1.09]
GMC Daily Effortful Tasks X GMC Anthropomorphism	0.98	.143	[0.95	1.01]
GMC Non-Human Entities X GMC Anthropomorphism	1.01	.065	[1.00	1.01]
GMC Daily Effortful Tasks X GMC Non-Human Entities X GMC Anthropomorphism	1.00	.051	[1.00	1.01]
PMC Daily Effortful Tasks	0.54	.198	[0.22	1.37]
TV Non-Human Entities	0.99	.986	[0.42	2.34]
PMC Daily Effortful Tasks X TV Non-Human Entities	1.73	.399	[0.48	6.20]
PMC Daily Effortful Tasks X GMC Anthropomorphism	0.97	.112	[0.94	1.01]
TV Non-Human Entities X GMC Anthropomorphism	0.95	.035	[0.91	1.00]
PMC Daily Effortful Tasks X TV Non-Human Entities X GMC Anthropomorphism	1.03	.074	[1.00	1.06]
Random Effects				
Intercept Variance	0.00		[0.00	0.00]

*Note.* The reference group for race was Asian or Asian American. *95% CI* = 95% confidence interval. GMC = grand-mean centered; PMC = person-mean centered; TV = uncentered time-varying; *OR* = Odds ratio.



**Figure 6**

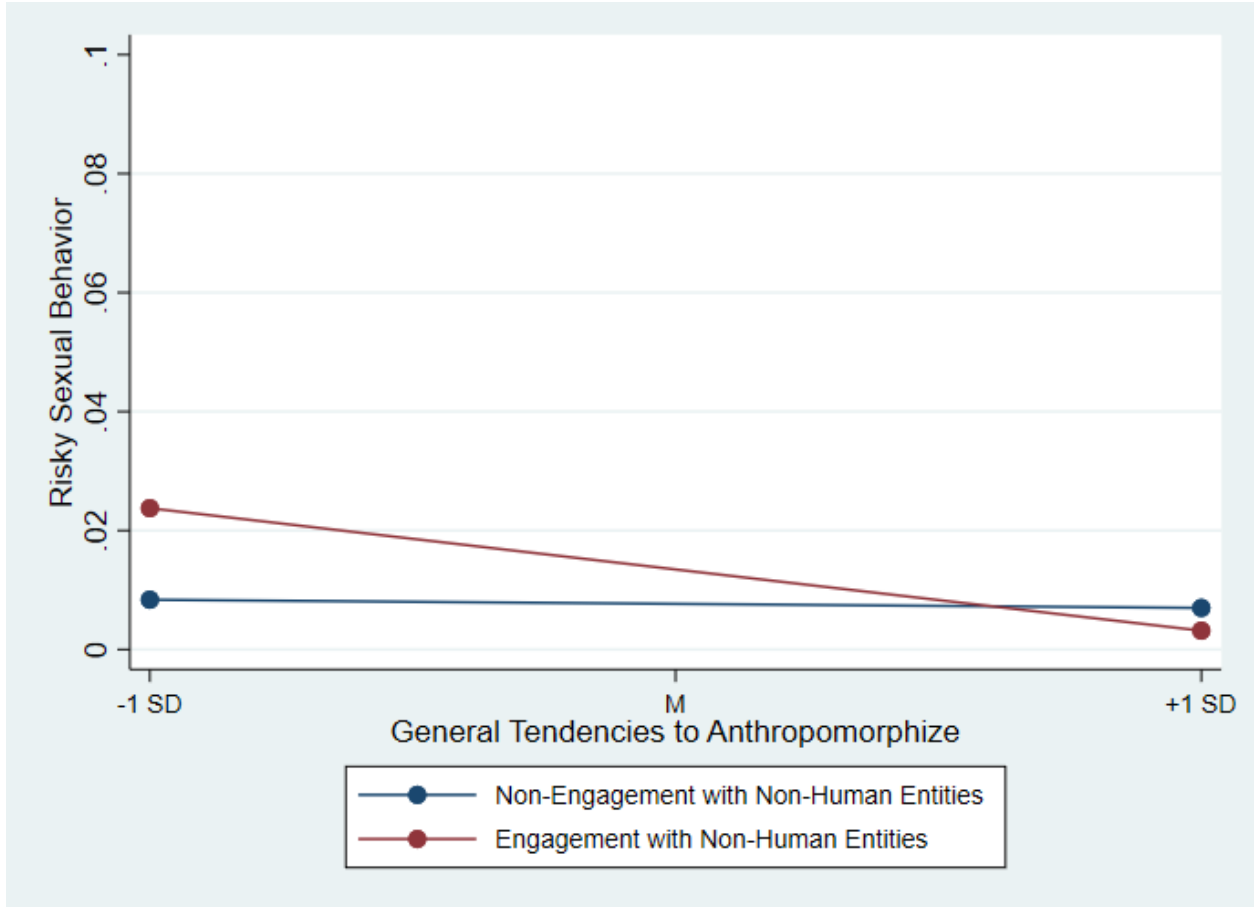
*The three-way Daily Effortful Tasks X Non-Human Entities X Anthropomorphism Interaction Predicting Risky Sexual Behavior*



*Note.* Daily Effortful Tasks were graphed at 1 SD below and above the mean.

**Figure 7**

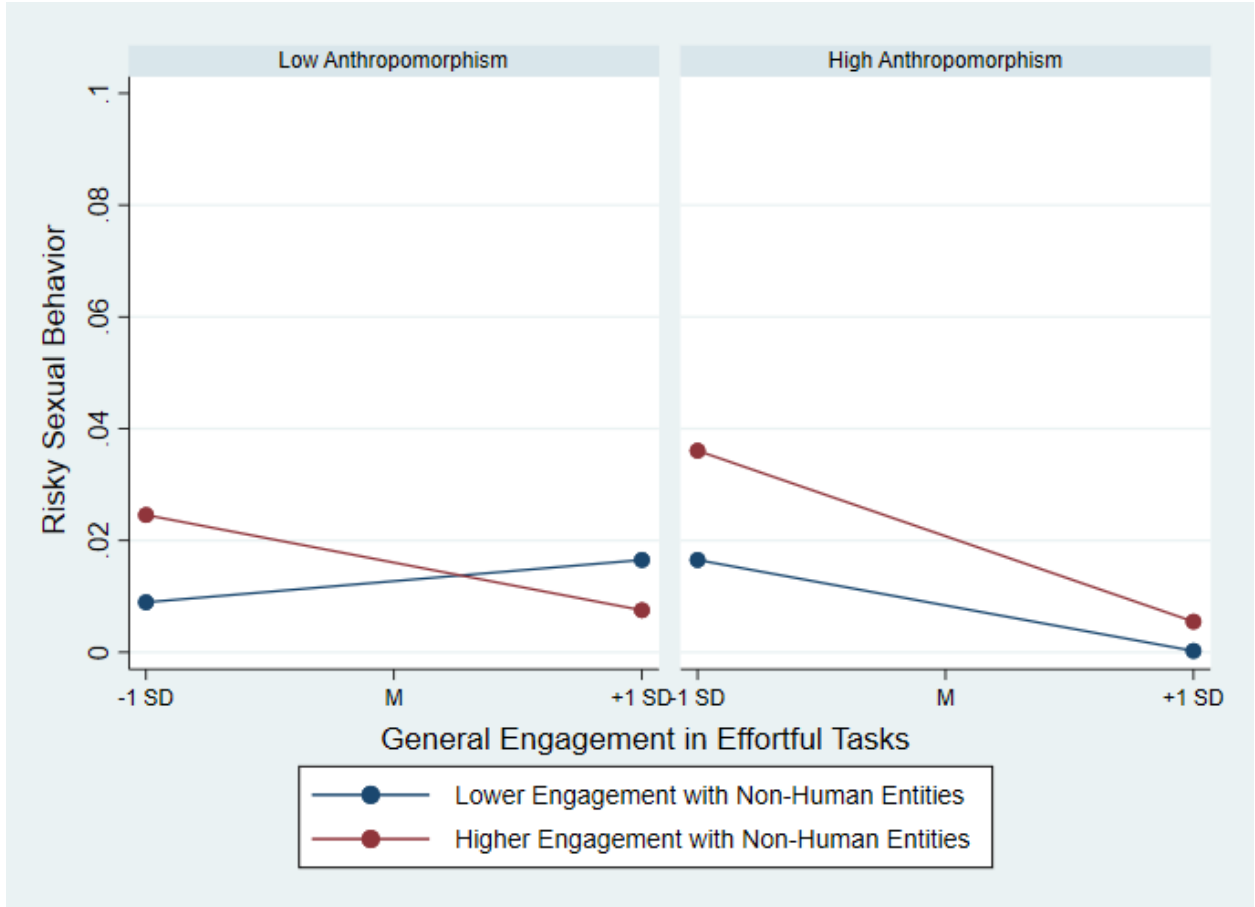
*The Two-way Non-Human Entities X GMC Anthropomorphism Interaction Predicting Risky Sexual Behavior*



*Note.* General Tendency to Anthropomorphize was graphed at 1 SD below and above the mean.

**Figure 8**

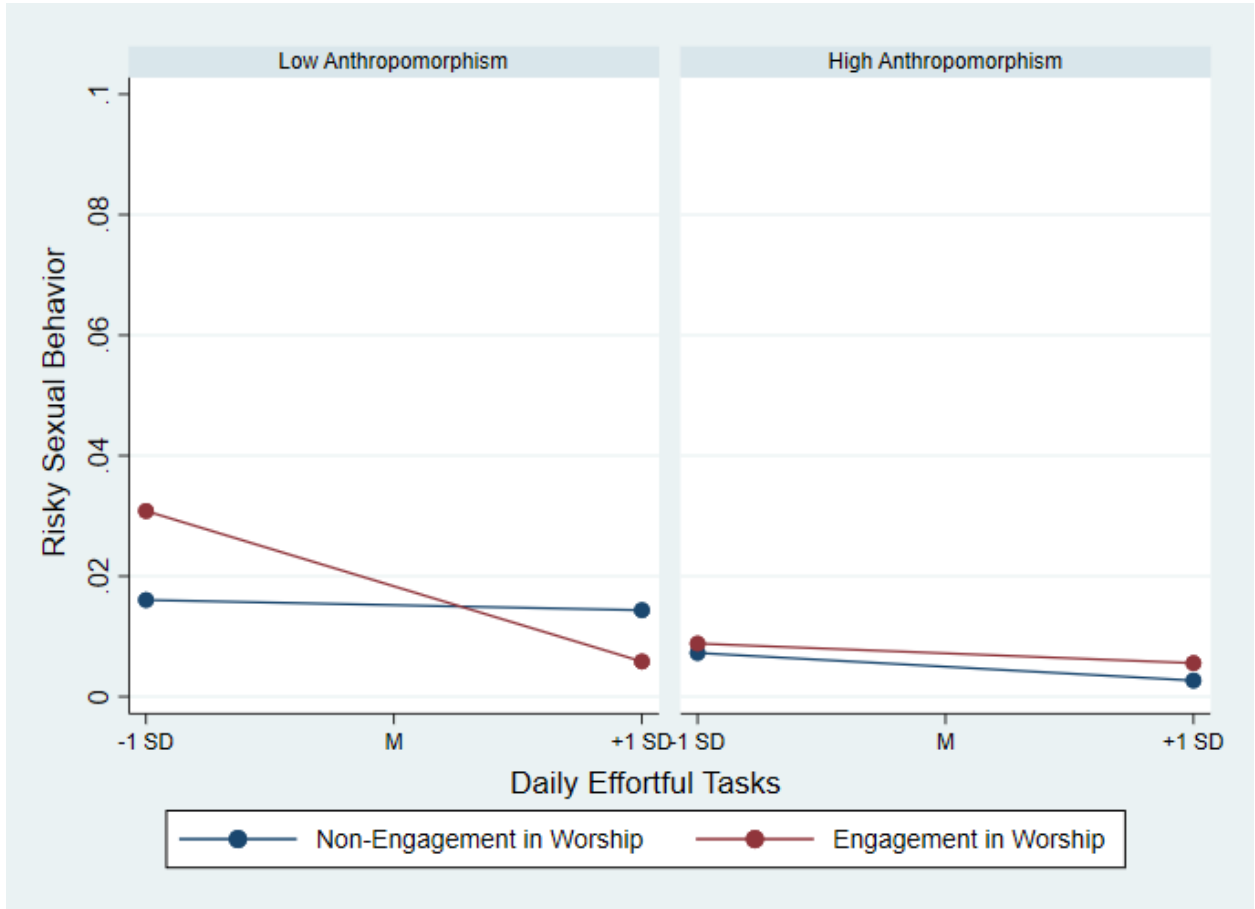
*The three-way GMC Daily Effortful Tasks X GMC Non-Human Entities X GMC Anthropomorphism Interaction Predicting Risky Sexual Behavior*



*Note.* General Engagement in Effortful Tasks was graphed at 1 SD below and above the mean.

**Figure 9**

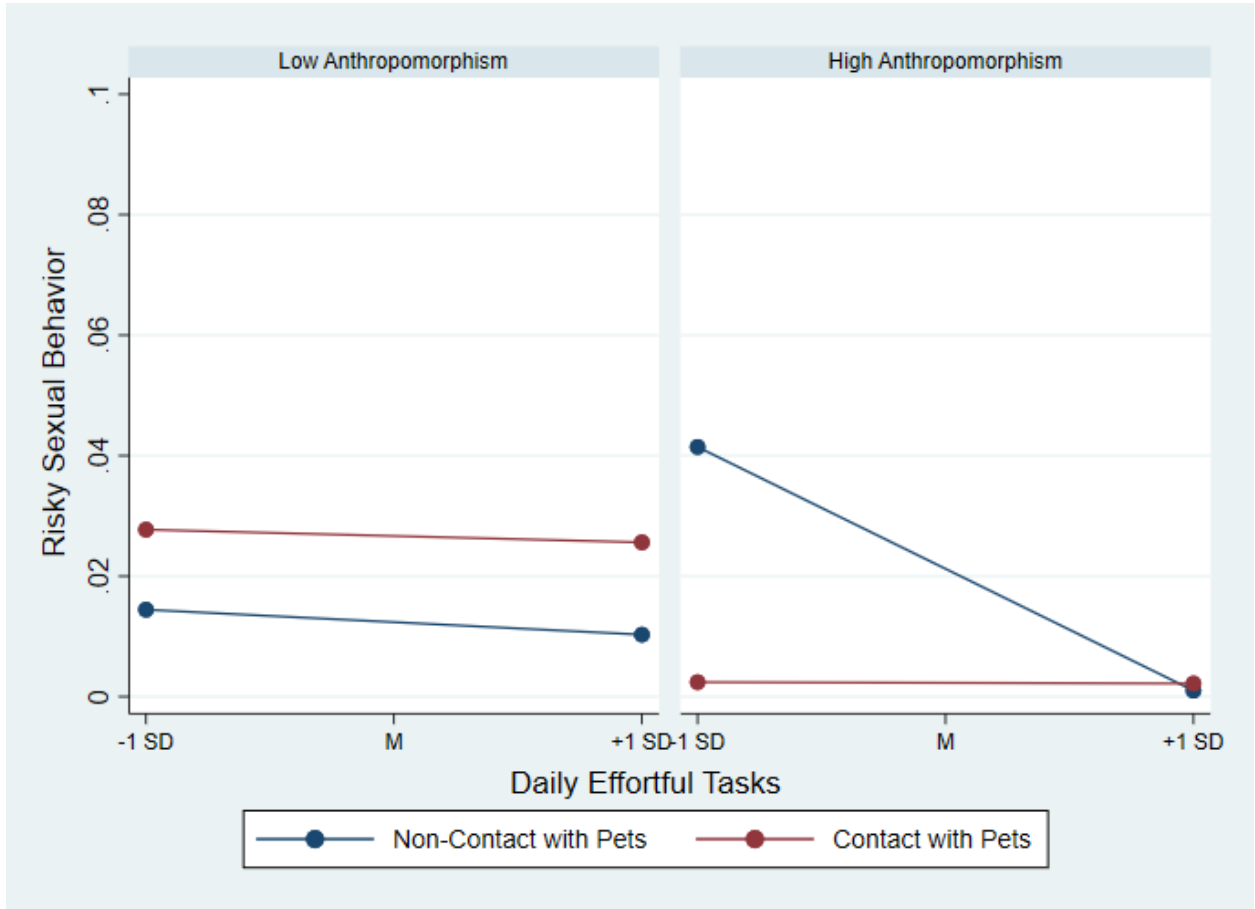
*The three-way Daily Effortful Tasks X Worship X Anthropomorphism Interaction Predicting Risky Sexual Behavior*



*Note.* Daily Effortful Tasks were graphed at 1 SD below and above the mean.

**Figure 10**

*The three-way Daily Effortful Tasks X Pet X Anthropomorphism Interaction Predicting Risky Sexual Behavior*



*Note.* Daily Effortful Tasks were graphed at 1 SD below and above the mean.

## **Discussion**

Interacting with anthropomorphized non-human entities can increase self-control through emotion regulations and inhibition (Chen et al., 2020). Indeed, people should attain positive psychological outcomes through engagement with non-human entities if they anthropomorphize them, rather than just interacting with them (Brown et al., 2016). Accordingly, I expected that for people high in the general tendency to anthropomorphize, interacting with non-human entities would mitigate the negative effects of self-control depletion on risky sexual behavior. The findings of Study 3 did not support this hypothesis. However, it was shown that people high in anthropomorphism tended to have consistently low levels of risky sexual behavior when they engaged with non-human entities after enacting effortful tasks. Therefore, it seems that engaging with non-human entities reduced the likelihood of participation in risky sexual behavior for people high in anthropomorphism, but independent of enacting effortful tasks. Exploratory analyses revealed that these effects were most likely driven by having contact with a pet, rather than engaging in worship.

Furthermore, analyses of the Level 2 effects revealed some interesting results. Among people with high anthropomorphism who generally engaged more with non-human entities than the rest of the sample, those who typically enacted more effortful tasks were less likely to participate in risky sexual behavior. This finding demonstrates that anthropomorphizing non-human entities can be protective against participation in risky sexual behavior at least for some people.

### **Analysis Set 4: Reminders of Others**

Material objects that remind people of the presence of loved ones (e.g., comfort foods, photographs of a romantic partner or close friends) can foster a sense of social

connection (Niemyjska, 2014; Troisi & Gabriel, 2011). In addition, as with narrative social worlds (e.g., Derrick, 2013), reminders of others may restore depleted self-control. However, the extent to which people may utilize the positive psychological outcomes associated with reminders of others should be influenced by their ability to activate representations of safe and loving relationships. People who are securely attached feel comfortable and optimistic about their close relationships, whereas people who are insecurely attached avoid intimacy or fear of being abandoned or hurt in their close relationships (Bartholomew & Horowitz, 1991). Therefore, using comfort foods after a belongingness threat reduces feelings of loneliness for securely attached, but not for insecurely attached, people (Troisi & Gabriel, 2011). Possessing a secure attachment orientation may similarly influence self-control and risky sexual behavior.

In Analysis Set 4, I examined the potential protective effects of using reminders of others. I expected that using reminders of others should restore self-control and, therefore, should decrease the likelihood of engaging in risky sexual behavior. This benefit should be limited to securely attached people (because securely attached people have easily accessible representations of safe and loving relationships). I did not expect to observe this positive consequence for insecurely attached people (who may struggle to access such representations).

## **Method**

### ***Dataset***

I used the same EMA dataset as in the previous analyses (Derrick et al., 2019). At baseline, participants completed several questionnaires, including two measures of attachment: the Relationships Questionnaire (Bartholomew & Horowitz, 1991) and the

Relationship Structures Questionnaire (ECR-RS; Fraley et al., 2011). Troisi and Gabriel (2011) and Troisi and colleagues (2015) used the forced-choice version of the Relationships Questionnaire in their analyses, so I focused on that assessment of attachment here. However, the Relationships Questionnaire has generally fallen out of favor (especially the forced-choice procedure), so I also conducted exploratory analyses using the ECR-RS. I used the EMA measures of “daily effortful tasks” and “risky sexual behavior” described in Analysis Set 1. In addition, I used “reminders of others” as another EMA measure in the current analyses.

### *New Baseline Measures*

**Attachment Orientations: Forced Choice.** To assess attachment security vs. insecurity, I used participants’ responses to the Relationships Questionnaire (Bartholomew & Horowitz, 1991). At baseline, participants completed a paragraph statement of attachment that asked about their relationship style (e.g., “It is easy for me to be emotionally close to others. I am comfortable depending on others and having others depend on me. I don’t worry about being alone or having others not accept me”). The scale included four paragraphs corresponding to the secure, dismissive, preoccupied, and fearful attachment styles. Participants indicated which of the four paragraphs most accurately described their relationship style. Using the Troisi & Gabriel (2011) method (see also Troisi et al., 2015), I categorized participants’ attachment orientations into two groups: secure vs. insecure (i.e., all insecure attachment styles: dismissive, preoccupied, or fearful). The Relationships Questionnaire scale is presented in Appendix C.

**Attachment Orientations: Continuous.** Participants’ attachment anxiety and attachment avoidance were assessed dimensionally using the ECR-RS (Fraley et al., 2011).



Participants responded to six items assessing avoidance (e.g., “I don’t feel comfortable opening up to others”), and three items assessing anxiety (e.g., “I worry that others won’t care about me as much as I care about them) on a 7-point scale (1 = *strongly disagree*, 7= *strongly agree*). I averaged responses to the anxiety items and avoidance items separately, with higher scores indicating higher attachment anxiety ( $M = 3.94$ ,  $SD = 1.81$ ) and attachment avoidance ( $M = 3.31$ ,  $SD = 1.10$ ), respectively. The ECR-RS scale is presented in Appendix D.

### ***New EMA Measures***

**Reminders of Others.** In both randomly prompted and evening reports, participants completed two no/yes questions relevant to reminders of others. First, participants indicated whether they ate food (i.e., “Since my last report, I ate food”). If yes, participants completed a follow-up question to ensure that they used food as a reminder of others (i.e., “I ate something that I consider a comfort food”; e.g., Troisi & Gabriel, 2011; Troisi et al., 2015). Second, participants indicated whether they had reviewed old messages received from others (i.e., “Since my last report, I read old letters, personal emails, or saved online conversations”). I created a dichotomous variable tapping the use of reminders of others, with 0 indicating that the participant did not enact either behavior, and 1 indicating that the participant enacted at least one behavior, thereby engaging with a reminder of others.

### ***Analysis Plan***

Preliminary analyses were conducted as in the previous analyses. As the primary analyses, I again conducted MEGLMs in Stata 15, with days (Level 1) nested within people (Level 2). As in the previous analyses, I used a binomial distribution with a logit link, and the slopes were set as fixed effects. Centering and covariates were also nearly identical to

previous analyses, with the exception that I grand-mean centered the continuous ECR-RS anxiety and avoidance variables, given that they were Level 2 (time invariant) variables in Analysis Set 4.

## **Results**

Descriptive statistics and intercorrelations for the independent, dependent, moderator, and control variables are included in Table 7. Some new bivariate correlations emerged with the examination of new variables. Effortful tasks were positively correlated with attachment anxiety and using reminders of others, and negatively correlated with forced-choice attachment security. Risky sexual behavior was also positively correlated with attachment anxiety. Furthermore, forced-choice attachment security was negatively correlated with using reminders of others, attachment anxiety, attachment avoidance, and the two negative mood scales, and positively correlated with positive mood and alcohol intoxication. Attachment anxiety was positively correlated with using reminders of others and the two negative mood scales, and negatively correlated with positive mood and alcohol intoxication. Attachment avoidance was also negatively correlated with using reminders of others and positive mood, and positively correlated with attachment anxiety, and the two negative mood scales. The ICC demonstrated that for using reminders of others, most of the variation occurred at the within-person level (see Table 7).

**Table 7***Descriptive statistics and intercorrelations for the Study 4 variables.*

	1	2	3	4	5	6	7	8	9	10
1. Effortful tasks	--									
2. Risky sexual behavior	-.05 <sup>+</sup>	--								
3. Reminders of Others	.14 <sup>***</sup>	.02	--							
4. Forced-Choice Attachment	-.08 <sup>**</sup>	-.00	-.07 <sup>**</sup>	--						
5. Attachment Anxiety	.13 <sup>***</sup>	.10 <sup>***</sup>	.07 <sup>**</sup>	-.34 <sup>***</sup>	--					
6. Attachment Avoidance	.01	-.00	-.05 <sup>+</sup>	-.40 <sup>***</sup>	.12 <sup>***</sup>	--				
7. Positive mood	-.19 <sup>***</sup>	.01	-.07 <sup>*</sup>	.14 <sup>***</sup>	-.28 <sup>***</sup>	-.16 <sup>***</sup>	--			
8. Irritable mood	.23 <sup>***</sup>	.00	.04	-.12 <sup>***</sup>	.21 <sup>***</sup>	.09 <sup>**</sup>	-.53 <sup>***</sup>	--		
9. Depressed mood	.17 <sup>***</sup>	.01	.00	-.21 <sup>***</sup>	.26 <sup>***</sup>	.16 <sup>***</sup>	-.38 <sup>***</sup>	.48 <sup>***</sup>	--	
10. Alcohol intoxication	-.03	.11 <sup>***</sup>	-.07 <sup>*</sup>	.06 <sup>*</sup>	-.06 <sup>*</sup>	.02	.08 <sup>**</sup>	-.10 <sup>**</sup>	-.06 <sup>+</sup>	--
<b>Mean</b>	1.35	0.05	0.33	0.31	3.94	3.31	2.90	2.02	1.38	0.18
<b>SD</b>	2.25	0.21	0.47	0.46	1.81	1.10	0.90	0.94	0.55	0.65
<b>Range</b>	0.00-19.00	0.00-1.00	0.00-1.00	0.00-1.00	1.00-7.00	1.00-6.17	1.00-4.00	1.00-4.00	1.00-4.00	0.00-4.00
<b>ICC</b>	0.33	0.20	0.25	--	--	--	0.55	0.48	0.55	0.12

*Note.* Degrees of freedom = 1678; SD = standard deviation; ICC = intraclass correlation coefficient.

+ p &lt; .10, \* p &lt; .05, \*\* p &lt; .01, \*\*\* p &lt; .00

Next, I examined the influence of using reminders of others on the association between effortful tasks and risky sexual behavior for securely attached individuals. I used the forced-choice attachment security variable from the Relationships Questionnaire (Bartholomew & Horowitz, 1991) in my primary analyses because this variable was used to operationalize attachment security vs. insecurity in previous research on comfort foods (Troisi & Gabriel, 2011; Troisi et al., 2015). I examined the three-way Daily Effortful Tasks X Reminders of Others X Attachment Security interaction predicting risky sexual behavior. Unexpectedly, this three-way interaction was not significant ( $p = .296$ ; see Table 8). Thus, the hypothesis that for securely attached people, interacting with reminders of others reduces the likelihood of participating in risky sexual behavior after enacting effortful tasks was not supported.

### ***Exploratory Analyses***

I also examined the four-way Daily Effortful Tasks X Reminders of Others X Attachment Anxiety X Attachment Avoidance interaction using the dimensional assessments of attachment anxiety and avoidance. I examined this interaction because dimensional assessments are the current preferred method of operationalizing attachment, but these analyses are exploratory because dimensional assessments of attachment have not been used in research with comfort food thus far. The four-way interaction was not significant,  $OR = 0.96$ ,  $95\% CI = [0.73, 1.26]$ ,  $p = .761$ . Therefore, I examined the three-way interactions for attachment anxiety and attachment avoidance. The three-way Daily Effortful Tasks X Reminders of Others X Attachment Avoidance interaction was not significant,  $OR = 1.24$ ,  $95\% CI = [0.84, 1.83]$ ,  $p = .269$ . However, the three-way Daily Effortful Tasks X Reminders of Others X Attachment Anxiety interaction was marginally significant (see Table 9).

I then broke down this interaction by examining the Daily Effortful Tasks X Reminders of Others interaction for people with low and high attachment anxiety (see Figure 11). For people with low attachment anxiety, the two-way Daily Effortful Tasks X Reminders of Others interaction failed to reach significance,  $OR = 2.24$ ,  $95\% CI = [0.82, 6.20]$ ,  $p = .117$ . Examining the conditional main effects, when they interacted with reminders of others, the effects of engaging in effortful tasks on risky sexual behavior was not significant,  $OR = 1.24$ ,  $95\% CI = [0.91, 1.71]$ ,  $p = .173$ . This association was also not significant when they did not interact with reminders of others,  $OR = 0.71$ ,  $95\% CI = [0.41, 1.25]$ ,  $p = .236$

For people with high attachment anxiety, the two-way Daily Effortful Tasks X Reminders of Others interaction also failed to reach significance,  $OR = 0.62$ ,  $95\% CI = [0.35, 1.09]$ ,  $p = .102$ . Examining the conditional main effects, when people with high attachment anxiety interacted with reminders of others, engaging in a greater number of effortful tasks was associated with a lower likelihood of engaging in risky sexual behavior,  $OR = 0.56$ ,  $95\% CI = [0.37, 0.85]$ ,  $p = .006$ . This association was not significant when they did not interact with reminders of others,  $OR = 0.89$ ,  $95\% CI = [0.67, 1.20]$ ,  $p = .467$ . Thus, interacting with reminders of others after enacting effortful tasks reduced the likelihood of engaging in risky sexual behavior for people with high attachment anxiety. Overall, these results are not consistent with my hypotheses, but they show that interacting with reminders of others can protect people with high attachment anxiety against risky sexual behavior.

Finally, I examined the moderating role of gender and relationship status. I ran separate analyses replacing attachment security with each of these variables in three-way

Daily Effortful Tasks X Reminders of Others X Exploratory Moderator interaction. Neither of those interactions were significant.

**Table 8**

*Results of the Three-way Daily Effortful Tasks X Reminders of Others X Attachment Security Interaction Predicting Risky Sexual Behavior*

Fixed Effects	<i>OR</i>	<i>p</i>	<i>95% CI</i>	
Intercept	0.02	.000	[0.00	0.13]
Study day	0.95	.390	[0.85	1.07]
Gender	0.64	.425	[0.21	1.94]
Age	1.02	.897	[0.78	1.32]
Relationship Status	3.39	.042	[1.04	11.00]
Race				
Biracial or Multicultural	2.31	.374	[0.37	14.56]
Latino	1.91	.385	[0.44	8.18]
Other	0.34	.356	[0.03	3.36]
White	0.86	.853	[0.18	4.21]
Lagged Risky Sexual Behavior	5.67	.005	[1.70	18.88]
PMC Irritable Mood	1.02	.942	[0.62	1.69]
PMC Alcohol Intoxication	1.27	.532	[0.60	2.66]
Attachment Security	1.03	.971	[0.25	4.17]
GMC Daily Effortful Tasks	0.72	.170	[0.46	1.15]
GMC Reminders of Others	0.98	.845	[0.82	1.17]
GMC Daily Effortful Tasks X GMC Reminders of Others	1.04	.391	[0.95	1.14]
GMC Daily Effortful Tasks X Attachment Security	1.28	.596	[0.51	3.18]
GMC Reminders of Others X Attachment Security	0.97	.873	[0.63	1.49]
GMC Daily Effortful Tasks X GMC Reminders of Others X Attachment Security	0.83	.128	[0.65	1.06]
PMC Daily Effortful Tasks	0.94	.724	[0.68	1.30]
TV Reminders of Others	1.57	.540	[0.37	6.60]
PMC Daily Effortful Tasks X TV Reminders of Others	0.79	.378	[0.47	1.33]
PMC Daily Effortful Tasks X Attachment Security	0.81	.328	[0.54	1.23]
TV Reminders of Others X Attachment Security	0.62	.682	[0.06	6.27]
TV Reminders of Others X Attachment Security X PMC Daily Effortful Tasks	1.65	.296	[0.64	4.24]
Random Effects				
Intercept Variance	1.00		[0.13	7.71]

*Note.* The reference group for race was Asian or Asian American. *95% CI* = 95% confidence interval. GMC = grand-mean centered; PMC = person-mean centered; TV = uncentered time-varying; *OR* = Odds ratio.

**Table 9**

*Results of the Three-way Daily Effortful Tasks X Reminders of Others X Attachment Anxiety Interaction Predicting Risky Sexual Behavior*

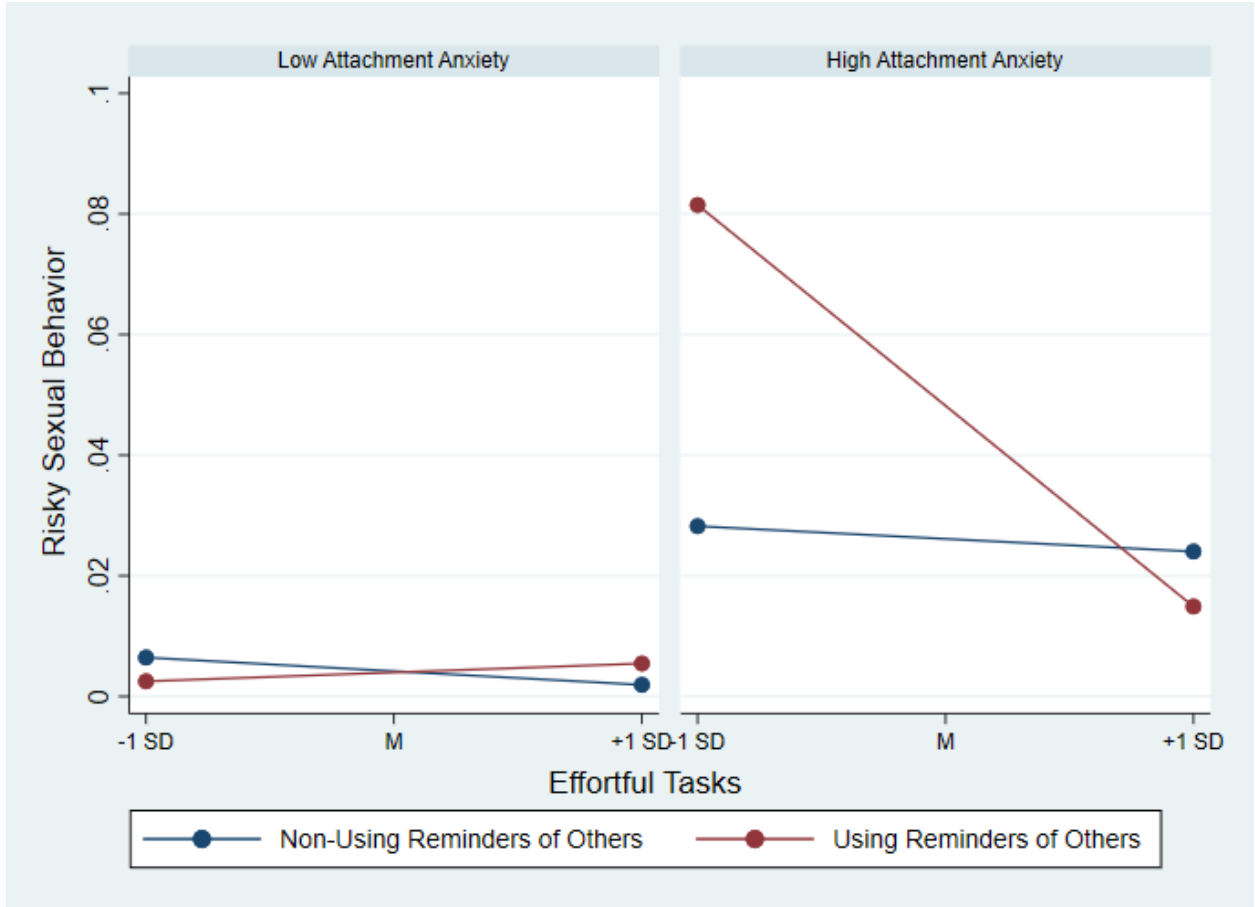
Fixed Effects	<i>OR</i>	<i>p</i>	<i>95% CI</i>	
Intercept	0.00	.000	[0.00	0.05]
Study day	0.94	.351	[0.83	1.06]
Gender	0.68	.517	[0.21	2.14]
Age	1.02	.858	[0.77	1.35]
Relationship Status	13.42	.002	[2.69	66.94]
Race				
Biracial or Multicultural	4.27	.160	[0.56	32.36]
Latino	2.02	.411	[0.37	10.84]
Other	0.69	.759	[0.06	7.06]
White	0.79	.810	[0.12	5.18]
Lagged Risky Sexual Behavior	4.14	.015	[1.31	13.06]
PMC Irritable Mood	0.89	.779	[0.41	1.96]
PMC Alcohol Intoxication	1.23	.561	[0.61	2.52]
GMC Daily Effortful Tasks	0.49	.107	[0.21	1.16]
GMC Reminders of Others	0.93	.498	[0.75	1.15]
GMC Attachment Anxiety	1.94	.012	[1.15	3.28]
GMC Attachment Avoidance	0.54	.042	[0.30	0.97]
GMC Daily Effortful Tasks X GMC Reminders of Others	1.06	.225	[0.97	1.15]
GMC Daily Effortful Tasks X GMC Attachment Anxiety	1.58	.074	[0.95	2.61]
GMC Reminders of Others X GMC Attachment Anxiety	1.03	.443	[0.95	1.12]
GMC Daily Effortful Tasks X GMC Attachment Avoidance	0.34	.007	[0.16	0.74]
GMC Reminders of Others X GMC Attachment Avoidance	1.37	.012	[1.07	1.77]
GMC Daily Effortful Tasks X GMC Reminders of Others X GMC Attachment Anxiety	0.94	.171	[0.87	1.02]
GMC Daily Effortful Tasks X GMC Reminders of Others X GMC Attachment Avoidance	1.46	.027	[1.04	2.04]
PMC Daily Effortful Tasks	0.78	.155	[0.56	1.09]
TV Reminders of Others	1.15	.841	[0.29	4.62]
PMC Daily Effortful Tasks X TV Reminders of Others	1.18	.370	[0.82	1.69]
PMC Daily Effortful Tasks X GMC Attachment Anxiety	1.07	.590	[0.84	1.35]
TV Reminders of Others X GMC Attachment Anxiety	1.10	.672	[0.70	1.74]
PMC Daily Effortful Tasks X GMC Attachment Avoidance	0.85	.226	[0.65	1.10]
TV Reminders of Others X GMC Attachment Avoidance	0.73	.455	[0.32	1.66]
TV Reminders of Others X GMC Attachment Anxiety X PMC Daily Effortful Tasks	0.70	.088	[0.46	1.05]
TV Reminders of Others X GMC Attachment Avoidance X PMC Daily Effortful Tasks	1.24	.269	[0.84	1.82]
Random Effects				
Intercept Variance	0.54		[0.00	51.06]



*Note.* The reference group for race was Asian or Asian American. 95% *CI* = 95% confidence interval. GMC = grand-mean centered; PMC = person-mean centered; TV = uncentered time-varying; *OR* = Odds ratio.

**Figure 11**

*The Three-way Daily Effortful Tasks X Reminders of Others X Attachment Anxiety Interaction Predicting Risky Sexual Behavior*



*Note.* Effortful Tasks were graphed at 1 *SD* below and above the mean.

## **Discussion**

As with narrative social worlds (e.g., Derrick, 2013), I expected that engagement with reminders of others would restore depleted self-control and reduce the likelihood of participating in risky sexual behavior after enacting effortful tasks. However, the extent to which people may benefit the positive psychological outcomes associated with reminders of others should be dependent on their attachment style or their ability to activate representations of safe and loving relationships. For instance, research shows that consuming comfort foods after a relationship threat reduces feelings of loneliness for securely attached, but not for insecurely attached, people (Troisi & Gabriel, 2011). Accordingly, I expected that using reminders of others after enacting effortful tasks would decrease the likelihood of engaging in risky sexual behavior for securely attached people. The findings of Study 4 did not support this hypothesis.

In exploratory analyses, I also examined whether attachment insecurity (i.e., attachment anxiety, attachment avoidance) influenced the effects of using reminders of others on the association between daily effortful tasks and risky sexual behavior. It was shown that for people with high attachment anxiety, using reminders of others after enacting effortful tasks reduced the likelihood of participating in risky sexual behavior. Therefore, interacting with reminders of others can be protective against risky sexual behavior for people with high attachment anxiety, but not for securely attached people.

## **General Discussion**

The main purpose of this paper was to examine the influence of different types of symbolic social bonds on risky sexual behavior after enacting effortful tasks. First, I assessed whether immersion in narrative social worlds for restoration motives would reduce the likelihood of participating in risky sexual behavior after enacting effortful tasks. Second, I

examined whether for low self-esteem people, engaging with parasocial relationships would reduce the likelihood of participating in risky sexual behavior after enacting effortful tasks. Third, I examined whether for people with a high general tendency to anthropomorphize, interacting with non-human entities would mitigate the likelihood of participating in risky sexual behavior after enacting effortful tasks. Finally, I assessed whether for securely attached people, using reminders of others would decrease the likelihood of engaging in risky sexual behavior after enacting effortful tasks.

I did not observe a significant main effect of enacting effortful tasks on a given day predicting greater likelihood of engaging in risky sexual behavior later that day. However, when other variables were included in the model, I observed positive outcomes of symbolic social bonds on risky sexual behavior. Engaging with symbolic social bonds reduced the likelihood of participating in risky sexual behavior. However, each type of symbolic social bond was beneficial for just some people and provided such positive outcomes under different conditions.

Surprisingly, participating in tasks requiring effortful self-control did not predict risky sexual behavior in the current analyses, as the main effect of effortful tasks on risky sexual behavior was not significant. Past research has shown that higher self-control is associated with lower likelihood of participating in risky sexual behavior (Quinn & Fromme, 2010; Wiederman et al., 2004), and that impulsivity and lack of self-control are associated with greater participation in risky sexual behavior (Crockett et al., 2006; Winters et al., 2008). For instance, greater difficulties in emotion regulation (e.g., lack of emotional clarity) are positively associated with having a higher number of sexual partners and are negatively associated with the likelihood of using condoms when having sex (Tull et al., 2012).

Similarly, high school students with poor inhibitory control that participate in impulsive decision-making have more sexual partners, have sex at an earlier age, and are more likely to use alcohol or marijuana before sex (Donohew et al., 2000).

The link between self-control and risky sexual behavior is important to understand because risky sexual behavior can yield adverse consequences on health and well-being (Holmes et al., 2004; Malhotra, 2008; Thomas et al., 1999). For instance, risky sexual behavior can lead to the spread of sexually transmitted diseases such as chlamydia, genital herpes, syphilis, hepatitis, and HIV (Connors et al., 2017; Holmes et al., 2004). Risky sexual behavior is also associated with feelings of loneliness, sleep problems, and impaired ability to create a healthy long-term relationship (Escobar et al., 2020; Malhotra, 2008). In addition, participation in risky sexual behavior is associated with increased psychological distress (e.g., increased anxiety and depression) and decreased psychological well-being including lower self-esteem and reduced life satisfaction (Agardh et al., 2012; Bersamin et al., 2014). Therefore, I had expected that restoring depleted self-control and reducing the likelihood of participating in risky sexual behavior would contribute to improved health and well-being.

Past research has shown that symbolic social bonds may restore depleted self-control (Chen et al., 2020; Derrick, 2013). For instance, engaging with narrative social worlds restores people's mood and energy after participating in tasks requiring attention control or emotion regulation (Derrick, 2013). Accordingly, I hypothesized that engaging with symbolic social bonds would reduce the likelihood of participating in risky sexual behavior after enacting effortful tasks. This hypothesis was supported for narrative social worlds. However, the results of Analysis Sets 2-4 demonstrated that other types of symbolic social bonds may also provide positive outcomes on risky sexual behavior, but only for some

people and possibly through different means. Specifically, reminders of others, parasocial relationships, and anthropomorphized non-human entities may also reduce at least some people's participation in risky sexual behavior, but these effects appeared to be mostly independent of self-control restoration processes. Research shows that a higher sense of belonging and social connectedness may prevent risky sexual behavior (de Voux et al., 2016; Peterson et al., 2020). Accordingly, the positive outcomes of other types of symbolic social bonds on risky sexual behavior may be due to their contribution to the satisfaction of belongingness needs. Therefore, although performing in different ways, each type of symbolic social bond may diminish risky sexual behavior.

### **Limitations and Strengths**

The current analyses had a few limitations. First, there was a limited number of risky sexual behavior demonstrations in the dataset used for the current analyses. Only 3.39% ( $n = 57$ ) of participants' sexual behavior was categorized as demonstration of risky sexual behavior. However, even with this limited number of risky sexual behavior, I observed significant results for the effects of symbolic social bonds on risky sexual behavior. Although the main effect of enacting effortful tasks on risky sexual behavior was not significant, the positive outcomes of symbolic social bonds on reducing risky sexual behavior was largely supported. Second, the current dataset did not include some types of behavior tapping engagement with symbolic social bonds. For example, in addition to consuming comfort foods and reviewing old messages, another example of using reminders of others is looking at the photos of loved ones (e.g., romantic partners, close friends), a behavior that was not included in the current dataset. However, the current research used secondary data analyses, and thus I was necessarily limited to the variables included in the dataset. The dataset

included various questions about engaging with multiple different types of symbolic social bonds. Such a broad range of items allowed me to assess the effects of each type of symbolic social bond in the present analyses. Third, the current dataset did not include questions about participants' risk appraisal. However, there were various questions about participants' sexual behavior in the current dataset that were categorized by CDC as demonstrations of risky sexual behavior. I used those items to examine how engaging with symbolic social bonds may reduce risky sexual behavior.

Despite these limitations, the current study had several strengths. It was the first study that examined how engaging with symbolic social bonds may influence people's sexual health through reducing the likelihood of participation in risky sexual behavior. Indeed, this study extended the research on symbolic social bonds to the domain of sexual health. In addition, this study demonstrated how a wide range of individual characteristics (e.g., self-esteem, attachment orientations, individual differences in anthropomorphism) may influence the positive outcomes of engagement with symbolic social bonds on risky sexual behavior. Furthermore, the dataset that I used in the current analyses consisted of EMA data, allowing me to examine multiple, immediate reports of people's behaviors in a natural environment and examine the association of those behaviors within a given period of time. Using this data allowed me to show how the naturally occurring use of different types of symbolic social bonds influenced people's participation in risky sexual behavior.

### **Implications and Future Directions**

The current project provides some implications for the domain of sexual health. Risky sexual behavior can lead to poor physical health outcomes (Malhotra, 2008; Thomas et al., 1999), such as getting HIV and other sexually transmitted diseases (Connors et al., 2017;

Holmes et al., 2004; Malhotra, 2008). Risky sexual behavior can also reduce mental health and psychological well-being through increasing anxiety and depression and decreasing life satisfaction (Agardh et al., 2012; Bersamin et al., 2014). Therefore, employing strategies that reduce participation in risky sexual behavior may improve people's physical and mental health. The findings of this research demonstrated that engaging with symbolic social bonds may provide such positive outcomes. Immersion in narrative social worlds reduced participation in risky sexual behavior after enacting effortful tasks. Other types of symbolic social bonds were also beneficial for some people and reduced their participation in risky sexual behavior, but mostly independent of self-control restoration processes. They may do so through other processes such as fulfilling belongingness needs. Overall, the results of the current study demonstrate that each type of symbolic social bond may help different people to improve their sexual health through reducing the likelihood of participating in risky sexual behavior.

The current study supported the efficacy of symbolic social bonds on reducing risky sexual behavior. However, symbolic social bonds may provide similar beneficial outcomes on other types of risky health behaviors. For instance, future research may address whether engaging with symbolic social bonds buffers against binge drinking alcohol, using marijuana and non-prescribed drugs, or consuming unhealthy foods. They can also address how different types of symbolic social bonds may influence risky health behaviors; whether they reduce participation in such behaviors through self-control restoration processes or through other processes such as supporting belongingness needs.

## **Conclusion**



Risky sexual behavior can lead to poor physical and mental health outcomes. Therefore, using strategies to inhibit risky sexual behavior should contribute to people's health and well-being. The current study demonstrated that engaging with symbolic social bonds may diminish risky sexual behavior, although each type of symbolic social bond may provide its benefits via different pathways. Therefore, in addition to supporting belongingness needs and some other positive psychological outcomes (e.g., improving interpersonal interactions; increasing relationship quality), symbolic social bonds offer useful means to improve people's sexual health. Given that symbolic social bonds reduced the likelihood of participation in risky sexual behavior, they may also be able to contribute to other domains of physical and mental health.

## References

- Agardh, A., Elizabeth, C. G., & Östergren, P. O. (2012). Youth, sexual risk-taking behavior, and mental health: A study of university students in Uganda. *International Journal of Behavioral Medicine, 19*(2), 208–216. <https://doi.org/10.1007/s12529-011-9159-4>.
- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: Sage.
- Bartholomew, K., & Horowitz, L. M. (1991). Attachment styles among young adults: A test of a four-category model. *Journal of Personality and Social Psychology, 61*(2), 226–244. <https://doi.org/10.1037/0022-3514.61.2.226>.
- Bartholomew, K. & Shaver, P. (1998). Methods of assessing adult attachment: Do they converge? In J. A. Simpson, & W. S. Rholes, (Eds.), *Attachment theory and close relationships*, (pp. 25–45). New York: Guilford.
- Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology, 74*(5), 1252–1265. <https://doi.org/10.1037/0022-3514.74.5.1252>.
- Bersamin, M. M., Zamboanga, B. L., Schwartz, S. J., Donnellan, M. B., Hudson, M., Weisskirch, R. S., Kim, S. Y., Agocha, V. B., Whitbourne, S. K., & Caraway, S. J. (2014). Risky business: Is there an association between casual sex and mental health among emerging adults? *Journal of sex research, 51*(1), 43-51. <https://doi.org/10.1080/00224499.2013.772088>
- Blackhart, G. C., Nelson, B. C., Winter, A., & Rockney, A. (2011). Self-control in relation to feelings of belonging and acceptance. *Self and Identity, 10*(2), 152-165. <https://doi.org/10.1080/15298861003696410>.

- Bond, B. J., & Calvert, S. L. (2014). A model and measure of U.S. parents' perceptions of young children's parasocial relationships. *Journal of Children and Media*, 8(3), 286–304. <https://doi.org/10.1080/17482798.2014.890948>.
- Brown, W. J. (2015). Examining four processes of audience involvement with media personae: Transportation, parasocial interaction, identification, and worship. *Communication Theory*, 25(3), 259–283. <https://doi.org/10.1111/comt.12053>.
- Brown, W. J. (2021). Involvement with media personae and entertainment experiences. In P. Vorderer & Ch. Klimmt (Eds.), *The Oxford Handbook of Entertainment Theory* (pp. 285–304). New York, NY: Oxford University Press.
- Brown, W. J., & Basil, M. D. (1995). Media celebrities and public health: Responses to “Magic” Johnson’s HIV disclosure and its impact on AIDS risk and high-risk behaviors. *Health Communication*, 7(4), 345–370. [https://doi.org/10.1207/s15327027hc0704\\_4](https://doi.org/10.1207/s15327027hc0704_4).
- Brown, W. J., & Basil, M. D. (2010). Parasocial interaction and identification: Social change processes for effective health interventions. *Health Communication*, 25(6-7), 601–602. <https://doi.org/10.1080/10410236.2010.496830>.
- Brown, W. J., & deMatviuk, M. (2010). Sports celebrities and public health: Diego Maradona’s influence on drug use prevention. *Journal of Health Communication*, 15(4), 358–373. <https://doi.org/10.1080/10810730903460575>.

- Brown, C. M., Hengy, S. M., & McConnell, A. R. (2016). Thinking about cats and dogs provides relief from social rejection. *Anthrozoös*, 29, 47–58.  
<https://doi.org/10.1080/20414005.2015.1067958>.
- Carter, E. C., Kofler, L. M., Forster, D. E., & McCullough, M. E. (2015). A series of meta-analytic tests of the depletion effect: Self-control does not seem to rely on a limited resource. *Journal of Experimental Psychology: General*, 144(4), 796–815.  
<https://doi.org/10.1037/xge0000083>.
- Centers for Disease Control and Prevention. (2020). *Youth risk behavior surveillance data summary & trends report: 2009-2019*. U.S. Department of Health and Human Services. [https://www.cdc.gov/nchhstp/dear\\_colleague/2020/dcl-102320-YRBS-2009-2019-report.html](https://www.cdc.gov/nchhstp/dear_colleague/2020/dcl-102320-YRBS-2009-2019-report.html).
- Chattaraman, V., Kwon, W. S., & Gilbert, J. E. (2012). Virtual agents in retail web sites: Benefits of simulated social interaction for older users. *Computers in Human Behavior*, 28(6), 2055–2066. <https://doi.org/10.1016/j.chb.2012.06.009>.
- Chen, F., Chen, R. P., & Yang, L. (2020). When sadness comes alive, will it be less painful? The effects of anthropomorphic thinking on sadness regulation and consumption. *Journal of Consumer Psychology*, 30(2), 277–295. <https://doi.org/10.1002/jcpy.1137>.
- Chung, A. H., & Slater, M. D. (2013). Reducing stigma and out-group distinctions Through perspective-taking in narratives, *Journal of Communication*, 63(5), 894–911.  
<https://doi.org/10.1111/jcom.12050>.
- Ciarocco, N., Twenge, J., Muraven, M., & Tice, D. (2007). Measuring state self-control: Reliability, validity, and correlations with physical and psychological stress. Unpublished manuscript.

- Cohen, J. (2003). Parasocial breakups: Measuring individual differences in responses to the dissolution of parasocial relationships. *Mass Communication & Society*, 6(2), 191–202. [https://doi.org/10.1207/S15327825MCS0602\\_5](https://doi.org/10.1207/S15327825MCS0602_5).
- Cohen, J. (2004). Parasocial break-up from favorite television characters: The role of attachment styles and relationship intensity. *Journal of Social and Personal Relationships*, 21(2), 187–202. <https://doi.org/10.1177/0265407504041374>.
- Cohen, J. (2006). Audience identification with media characters. In J. Bryant & P. Vorderer (Eds.), *Psychology of entertainment* (pp. 183–198). Mahwah, NJ: Erlbaum.
- Cohen, J., & Holbert, R. L. (2021). Assessing the predictive value of parasocial relationship intensity in a political context. *Communication Research*, 48(4) 501–526. <https://doi.org/10.1177/0093650218759446>.
- Cole, T., & Leets, L. (1999). Attachment styles and intimate television viewing: Insecurely forming relationships in a parasocial way. *Journal of Social and Personal Relationships*, 16(4), 495–511. <https://doi.org/10.1177/0265407599164005>.
- Connors, E. E., Swanson, K., Morales-Miranda, S., Fernández Casanueva, C., Mercer, V. J., & Brouwer, K. C. (2017). HIV risk behaviors and correlates of inconsistent condom use among substance using migrants at the Mexico/Guatemala border. *AIDS and Behavior*, 21(7), 2033–2045. <https://doi.org/10.1007/s10461-017-1726-5>.
- Crisp, R. J., & Turner, R. N. (2009). Can imagined interactions produce positive perceptions?: Reducing prejudice through simulated social contact. *American Psychologist*, 64(4), 231–240. <https://doi.org/10.1037/a0014718>.
- Crockett, L. J., Raffaelli, M., & Shen, Y. L. (2006). Linking self-regulation and risk proneness to risky sexual behavior: Pathways through peer pressure and early

- substance use. *Journal of Research on Adolescence*, 16(4), 503–525.  
<https://doi.org/10.1111/j.1532-7795.2006.00505.x>.
- Dang, J., Barker, P., Baumert, A., Bentvelzen, M., Berkman, E., Buchholz, N., Buczny, J., Chen, Z., De Cristofaro, V., de Vries, L., Dewitte, S., Giacomantonio, M., Gong, R., Homan, M., Imhoff, R., Ismail, I., Jia, L., Kubiak, T., Lange, F., ... Zinkernagel, A. (2021). A multilab replication of the ego depletion effect. *Social Psychological and Personality Science*, 12(1), 14–24. <https://doi.org/10.1177/1948550619887702>.
- de Voux, A., Baral, S. D., Bekker, L. G., Beyrer, C., Phaswana-Mafuya, N., Siegler, A. J., Sullivan, P. S., Winskell, K., & Stephenson, R. (2016). A social network typology and sexual risk-taking among men who have sex with men in Cape Town and Port Elizabeth, South Africa. *Culture, health & sexuality*, 18(5), 509-523.  
<https://doi.org/10.1016/j.adolescence.2020.10.004>.
- Deckman, T., & Nathan DeWall, C. (2011). Negative urgency and risky sexual behaviors: A clarification of the relationship between impulsivity and risky sexual behavior. *Personality and Individual Differences*, 51(5), 674–678.  
<https://doi.org/10.1016/j.paid.2011.06.004>.
- Derrick, J. L. (2013). Energized by television: Familiar fictional worlds restore self-control. *Social Psychological and Personality Science*, 4(3), 299–307.  
<https://doi.org/10.1177/1948550612454889>.
- Derrick, J. L., Gabriel, S., & Hugenberg, K. (2009). Social surrogacy: How favored television programs provide the experience of belonging. *Journal of Experimental Social Psychology*, 45(2), 352–362. <https://doi.org/10.1016/j.jesp.2008.12.003>.

- Derrick, J. L., Gabriel, S., & Tippin, B. (2008). Parasocial relationships and self-discrepancies: Faux relationships have benefits for low self-esteem individuals. *Personal Relationships, 15*(2), 261–280. <https://doi.org/10.1111/j.1475-6811.2008.00197.x>.
- Derrick, J. L., Keefer, L. A., Troisi, J. D. (2019). Who needs friends? Personality as a predictor of social surrogate use. *Personality and Individual Differences, 138*, 349–354. <https://doi.org/10.1016/j.paid.2018.10.028>.
- Derrick, J. L., Leonard, K. E., Houston, R. J., Lucke, J. F., & Muraven, M. (2015). Relationship behaviors unrelated to smoking influence relapse independent of partner support for quitting. Rapid Response poster presented at the annual meeting of the Society for Research on Nicotine and Tobacco, Philadelphia, PA.
- Dibble, J. L., Hartmann, T., & Rosaen, S. F. (2016). Parasocial interaction and parasocial relationship: Conceptual clarification and a critical assessment of measures, *Human Communication Research, 42*(1), 21–44. <https://doi.org/10.1111/hcre.12063>.
- Donohew, L., Zimmerman, R., Cupp, P. S., Novak, S., Colon, S., & Abell, R. (2000). Sensation seeking, impulsive decision-making, and risky sex: Implications for risk-taking and design of interventions. *Personality and Individual Differences, 28*(6), 1079–1091. [https://doi.org/10.1016/S0191-8869\(99\)00158-0](https://doi.org/10.1016/S0191-8869(99)00158-0).
- Epley, N., Akalis, S., Waytz, A., & Cacioppo, J. T. (2008). Creating social connection through inferential reproduction. *Psychological Science, 19*(2), 114–120. <https://doi.org/10.1111/j.1467-9280.2008.02056.x>.

- Epley, N., Waytz, A., & Cacioppo, J. T. (2007). On seeing human: A three-factor theory of anthropomorphism. *Psychological Review*, *114*(4), 864–886.  
<https://doi.org/10.1037/0033-295X.114.4.864>.
- Epley, N., Waytz, A., Akalis, S., & Cacioppo, J. T. (2008). When we need a human: Motivational determinants of anthropomorphism. *Social Cognition*, *26*(2), 143–155.  
<https://doi.org/10.1521/soco.2008.26.2.143>.
- Escobar, D. F. S. S., Noll, P. R. E. S., Jesus, T. F. D., & Noll, M. (2020). Assessing the mental health of Brazilian students involved in risky behaviors. *International journal of environmental research and public health*, *17*(10), 3647.  
<https://doi.org/10.3390/ijerph17103647>.
- Fraley, R. C., Heffernan, M. E., Vicary, A. M., & Brumbaugh, C. C. (2011). The experiences in close relationships—Relationship Structures Questionnaire: A method for assessing attachment orientations across relationships. *Psychological Assessment*, *23*, 615–625. <https://doi.org/10.1037/a0022898>.
- Gabriel, S., Paravati, E., Green, M. C., & Flomsbee, J. (2018). From apprentice to president: The role of parasocial connection in the election of Donald Trump. *Social Psychology and Personality Science*, *9*(3), 299–307. <https://doi.org/10.1177/1948550617722835>.
- Gabriel, S., & Young, A. F. (2011). Becoming a vampire without being bitten: The narrative collective-assimilation hypothesis. *Psychological Science*, *22*(8), 990–994.  
<https://doi.org/10.1177/0956797611415541>.
- Gabriel, S., Valenti, J., & Young, A. F. (2016). Social surrogates, social motivations, and everyday activities: The case for a strong, subtle, and sneaky social self. In J. M. Olson & M. P. Zanna, (Eds.), *Advances in experimental social psychology*, *53*, (pp.



- 189–243). San Diego, CA: Elsevier Academic Press.
- Gargurevich Espinoza, A., & Vahedi, M. (2020). Can Familiar Fictional Worlds Promote Health Through Buffering Belongingness Threats?. *Summer Undergraduate Research Fellowship*. <https://hdl.handle.net/10657/7459>.
- Gomillion, S., Gabriel, S., Kawakami, K., & Young, A. F. (2017). Let's stay home and watch TV: The benefits of shared media use for close relationships. *Journal of Social and Personal Relationships*, *34*(6), 855–874. <https://doi.org/10.1177/0265407516660388>.
- Green, M. C. (2004). Transportation into narrative worlds: The role of prior knowledge and perceived realism. *Discourse Processes*, *38*(2), 247–266. [https://doi.org/10.1207/s15326950dp3802\\_5](https://doi.org/10.1207/s15326950dp3802_5).
- Green, M. C., & Brock, T. C. (2000). The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology*, *79*(5), 701–721. <https://doi.org/10.1037//0022-3514.79.5.701>.
- Griffin, K. W., Scheier, L. M., Acevedo, B., Grenard, J. L., & Botvin, G. J. (2012). Long-term effects of self-control on alcohol use and sexual behavior among urban minority young women. *International Journal of Environmental Research and Public Health*, *9*(1), 1–23. <https://doi.org/10.3390/ijerph9010001>.
- Hagger, M. S., Chatzisarantis, N. L. D., Alberts, H., Anggono, C. O., Batailler, C., Birt, A. R., Brand, R., Brandt, M. J., Brewer, G., Bruyneel, S., Calvillo, D. P., Campbell, W. K., Cannon, P. R., Carlucci, M., Carruth, N. P., Cheung, T., Crowell, A., De Ridder, D. T. D., Dewitte, S., ... Zwieneberg, M. (2016). A multilab preregistered replication of the ego-depletion effect. *Perspectives on Psychological Science*, *11*(4), 546–573. <https://doi.org/10.1177/1745691616652873>.

- Hall, C. & Coles, M. (1999). *Children's reading choices*. London: Routledge.
- Hartmann, T. (2016). Parasocial interaction, parasocial relationships, and well-being. In L. Reinecke & M. B. Oliver (Eds.), *The Routledge handbook of media use and well-being: International perspectives on theory and research on positive media effects* (pp. 131–144). New York, NY: Routledge.
- Hartmann, T., & Goldhoorn, C. (2011). Horton and Wohl revisited: Exploring viewers' experience of parasocial interaction. *Journal of communication*, *61*(6), 1104–1121. <https://doi.org/10.1111/j.1460-2466.2011.01595.x>.
- Hartmann, T., Stuke, D., & Daschmann, G. (2008). Positive parasocial relationships with drivers affect suspense in racing sport spectators. *Journal of Media Psychology*, *20*(1), 24–34. <https://doi.org/10.1027/1864-1105.20.1.24>.
- Holmes, K. K., Levine, R., & Weaver, M. (2004). Effectiveness of condoms in preventing sexually transmitted infections. *Bulletin of the World Health Organization*, *82*(6), 454–461. <https://doi.org/10.1590/S0042-96862004000600012>.
- Horton, D., & Wohl, R. R. (1956). Mass communication and para-social interaction: Observations on intimacy at a distance. *Psychiatry: Journal for the Study of Interpersonal Processes*, *19*(3), 215–229. <https://doi.org/10.1080/00332747.1956.11023049>.
- Inzlicht, M., & Friese, M. (2019). The past, present, and future of ego depletion. *Social Psychology*, *50*, 370–378. <https://doi.org/10.1027/1864-9335/a000398>.
- Johnson, B. K., Ewoldsen, D. R., & Slater, M. D. (2015). Self-control depletion and narrative: Testing a prediction of the TEBOTS model. *Media Psychology*, *18*(2), 196–220. <https://doi.org/10.1080/15213269.2014.978872>.

- Knowles, M. L., Haycock, N., Shaikh, I. (2015). Does Facebook magnify or mitigate threats to belonging? *Social Psychology*, 46(6), 313–324.  
<https://doi.org/10.1027/1864-9335/a000246>.
- Lakey, B., Cooper, C., Cronin, A., & Whitaker, T. (2014). Symbolic providers help people regulate affect relationally: Implications for perceived support. *Personal Relationships*, 21(3), 404–419. <https://doi.org/10.1111/pere.12038>.
- Lawson, D. V. (1972). Children's reasons and motivation for the selection of favorite books. Doctoral dissertation, University of Arkansas. *Dissertation Abstracts International*, 32(9), 4840. University Microfilms No. AAT8900468.
- Lejuez, C. W., Bornovalova, M. A., Daughters, S. B., Curtin, J. J. (2005). Differences in impulsivity and sexual risk behavior among inner-city crack/cocaine users and heroin users. *Drug and Alcohol Dependence*, 77(2), 169–175.  
<https://doi.org/10.1016/j.drugalcdep.2004.08.013>.
- Levy, M. R. (1979). Watching TV news as para-social interaction. *Journal of Broadcasting*, 23(1), 69–80. <https://doi.org/10.1080/08838157909363919>.
- Malhotra, S. (2008). Impact of the sexual revolution: consequences of risky sexual behaviors. *Journal of American Physicians and Surgeons*, 13(3), 88–90.
- Mar, R. A., & Oatley, K. (2008). The function of fiction is the abstraction and simulation of social experience. *Perspectives on Psychological Science*, 3(3), 173–192.  
<https://doi.org/10.1111/j.1745-6924.2008.00073.x>.
- Masicampo, E. J., Martin, S. R., & Anderson, R. A. (2014). Understanding and overcoming self-control depletion. *Social and Personality Psychology Compass*, 8(11), 638–649.  
<https://doi.org/10.1111/spc3.1213911>, 638–649.

- Mikulincer, M., Gillath, O., & Shaver, P. R. (2002). Activation of the attachment system in adulthood: Threat-related primes increase the accessibility of mental representations of attachment figures. *Journal of Personality and Social Psychology*, *83*(4), 881–895. <https://doi.org/10.1037/0022-3514.83.4.881>.
- Mourey, J. A., Olson, J. G., & Yoon, C. (2017). Products as pals: Engaging with anthropomorphic products mitigates the effects of social exclusion. *Journal of Consumer Research*, *44*(2), 414–431. <https://doi.org/10.1093/jcr/ucx038>.
- Muraven, M., & Baumeister, R. F. (2000). Self-Regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, *126*(2), 247–259. <https://doi.org/10.1037/0033-2909.126.2.247>.
- Muraven, M., Collins, R. L., Shiffman, S., & Paty, J. A. (2005). Daily fluctuations in self-control demands and alcohol intake. *Psychology of Addictive Behaviors*, *19*, 140–147. <https://doi.org/10.1037/0893-164x.19.2.140>.
- Muraven, M., Slessareva, E. (2003). Mechanisms of self-control failure: Motivation and limited resources. *Personality and Social Psychology Bulletin*, *29*(7), 894–906. <https://doi.org/10.1177/0146167203029007008>.
- Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-Control as limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology*, *74*(3), 774–789. <https://doi.org/10.1037/0022-3514.74.3.774>.
- Murray, S. L., Holmes, J. G., & Griffin, D. W. (2000). Self-esteem and the quest for felt security: How perceived regard regulates attachment processes. *Journal of Personality and Social Psychology*, *78*(3), 478–498. <https://doi.org/10.1037/0022-3514.78.3.478>.

- Murray, S. L., Rose, P., Bellavia, G. M., Holmes, J. G., & Kusche, A. G. (2002). When rejection stings: How self-esteem constrains relationship-enhancement processes. *Journal of Personality and Social Psychology, 83*(3), 556–573.  
<https://doi.org/10.1037/0022-3514.83.3.556>.
- Niemyjska, A. (2014). How does love magic work? The regulation of closeness and affect by magical thinking. *Journal of Social and Personal Relationships, 32*(1), 57–77.  
<http://doi.org/10.1177/0265407514523552>.
- Paravati, E., Naidu, E., & Gabriel, S. (2020). From “love actually” to love, actually: The sociometer takes every kind of fuel. *Self and Identity, 20*(1), 6–24.  
<http://doi.org/10.1080/15298868.2020.1743750>.
- Peterson, A. J., Allen, E., Viner, R., & Bonell, C. (2020). Effects of the school environment on early sexual risk behavior: A longitudinal analysis of students in English secondary schools. *Journal of adolescence, 85*, 106-114.  
<https://doi.org/10.1016/j.adolescence.2020.10.004>.
- Pettigrew, T. F., & Tropp, L. R. (2006). A meta-analytic test of intergroup contact theory. *Journal of Personality and Social Psychology, 90*(5), 751–783. <https://doi.org/10.1037/0022-3514.90.5.751>.
- Quinn, P. D., & Fromme, K. (2010). Self-Regulation as a protective factor against risky drinking and sexual behavior. *Psychology of Addictive Behaviors, 24*(3), 376–385.  
<https://doi.org/10.1037/a0018547>.
- Raffaelli, M., & Crockett, L. J. (2003). Sexual risk taking in adolescence: The role of self-regulation and attraction to risk. *Developmental Psychology, 39*(6), 1036–1046. <https://doi.org/10.1037/0012-1649.39.6.1036>.

- Rosaen, S. F., & Dibble, J. L. (2016). Clarifying the role of attachment and social compensation on parasocial relationships with television characters. *Communication Studies, 67*(2), 147–162. <https://doi.org/10.1080/10510974.2015.1121898>.
- Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.
- Rozin, P., Markwith, M., & McCauley, C. (1994). Sensitivity to indirect contact with other persons: AIDS aversion as a composite of aversion to strangers, infection, moral taint, and misfortune. *Journal of Abnormal Psychology, 103*(3), 495–504. <https://doi.org/10.1037/0021-843X.103.3.495>.
- Rozin, P., Millman, L., & Nemeroff, C. (1986). Operation of the laws of sympathetic magic in disgust and other domains. *Journal of Personality and Social Psychology, 50*(4), 703–712. <https://doi.org/10.1037/0022-3514.50.4.703>.
- Rubin, A. M., Perse, E. M., & Powell, R. A. (1985). Loneliness, parasocial interaction, and local television news viewing. *Human Communication Research, 12*(2), 155–180. <https://doi.org/10.1111/j.1468-2958.1985.tb00071.x>.
- Schiappa, E., Gregg, P. B., & Hewes, D. E. (2005). The parasocial contact hypothesis. *Communication Monographs, 72*(1), 92–115. <https://doi.org/10.1080/0363775052000342544>.
- Schiappa, E., Gregg, P. B., & Hewes, D. E. (2006). Can one TV show make a difference? Will & Grace and the parasocial contact hypothesis. *Journal of Homosexuality, 51*(4), 15–37. [https://doi.org/10.1300/J082v51n04\\_02](https://doi.org/10.1300/J082v51n04_02).

- Schmeichel, B. J., & Vohs, K. D. (2009). Self-Affirmation and self-control: Affirming core values counteracts ego depletion. *Journal of Personality and Social Psychology*, 96(4), 770–782. <https://doi.org/10.1037/a0014635>.
- Schuster, R. M., Crane, N. A., Mermelstein, R., & Gonzalez, R. (2012). The influence of inhibitory control and episodic memory on the risky sexual behavior of young adult cannabis users. *Journal of the International Neuropsychological Society*, 18(5), 827-833. <https://doi.org/10.1017/S1355617712000586>.
- Seeley, E. A., & Gardner, W. L. (2003). The “selfless” and self-regulation: The role of chronic other-orientation in averting self-regulatory depletion. *Self and Identity*, 2(2), 103-117. <https://doi.org/10.1080/15298860309034>.
- Shiffman S., Stone A. A., Hufford, M. R. (2008) Ecological momentary assessment. *Annual Review of Clinical Psychology*, 4, 1–32. <https://doi.org/10.1146/annurev.clinpsy.3.022806.091415>.
- Slater, M. D. (2002). Entertainment education and the persuasive impact of narratives. In M. C. Green, J. J. Strange, & T. C. Brock (Eds.), *Narrative impact: Social and cognitive foundations* (pp.157–181). Mahwah, NJ: Erlbaum.
- Slater, M. D., Ewoldsen, D. R., Woods, K. W. (2018). Extending conceptualization and measurement of narrative engagement after-the-fact: Parasocial relationship and retrospective imaginative involvement. *Media Psychology*, 21(3), 329–351. <https://doi.org/10.1080/15213269.2017.1328313>.
- Slater, M. D., & Rouner, D. (2002). Entertainment-education and elaboration likelihood: Understanding the processing of narrative persuasion. *Communication Theory*, 12(2), 173–191. <https://doi.org/10.1111/j.1468-2885.2002.tb00265.x>.

- Stone, A. A., Shiffman, S. S., & DeVries, M. W. (1999). Ecological momentary assessment. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: The foundations of hedonic psychology* (pp. 26–39). New York: Russell-Sage.
- Thomas, J. C., Lansky, A., Weiner, D. H., Earp, J. A., & Schoenbach, V. J. (1999). Behaviors that facilitate sexual transmission of HIV and STDs in a rural community. *AIDS and Behavior*, *3*(4), 257–267. <https://doi.org/10.1023/A:1025416932388>.
- Tice, D. M., Baumeister, R. F., Shmueli, D., & Muraven, M. (2007). Restoring the self: Positive affect helps improve self-regulation following ego depletion. *Journal of Experimental Social Psychology*, *43*(3), 379–384. <https://doi.org/10.1016/j.jesp.2006.05.007>.
- Timeo, S., Riva, P., Paladino, M. P. (2020). Being liked or not being liked: A study on social-media exclusion in a preadolescent population. *Journal of Adolescence*, *80*, 173–181. <https://doi.org/10.1016/j.adolescence.2020.02.010>.
- Troisi, J. D., & Gabriel, S. (2011). Chicken soup really is good for the soul: “Comfort food” fulfills the need to belong. *Psychological Science*, *22*(6), 747–753. <https://doi.org/10.1177/0956797611407931>.
- Troisi, J. D., Gabriel, S., Derrick, J. L., & Geisler, A. (2015). Threatened belonging and preference for comfort food among the securely attached. *Appetite*, *90*, 58–64. <https://doi.org/10.1016/j.appet.2015.02.029>.
- Tukachinsky, R., & Sangalang, A. (2016). The effect of relational and interactive aspects of parasocial experiences on attitudes and message resistance. *Communication Reports*, *29*(3), 175–188. <https://doi.org/10.1080/08934215.2016.1148750>.



- Tull, M. T., Weiss, N. H., Adams, C. E., & Gratz, K. L. (2012). The contribution of emotion regulation difficulties to risky sexual behavior within a sample of patients in residential substance abuse treatment. *Addictive Behaviors, 37*(10), 1084–1092. <https://doi.org/10.1016/j.addbeh.2012.05.001>.
- Twenge, J. M., Zhang, L., Catanese, K. R., Dolan-Pascoe, B., Lyche, L. F., & Baumeister, R. F. (2007). Replenishing connectedness: Reminders of social activity reduce aggression after social exclusion. *British Journal of Social Psychology, 46*(1), 205–224. <https://doi.org/10.1348/014466605X90793>.
- Vahedi, M. (2019). *Prayer Objects Provide the Experience of Belonging* (Doctoral dissertation). <https://hdl.handle.net/10657/5350>.
- Vohs, K. D., Schmeichel, B. J., Lohmann, S., Gronau, Q. F., Finley, A. J., Ainsworth, S. E., Alquist, J. L., Baker, M. D., Brizi, A., Bunyi, A., Butschek, G. J., Campbell, C., Capaldi, J., Cau, Ch., Chambers, H., Chatzisarantis, N. L. D., Christensen, W. J., Clay, S. L., Curtis, J., ... Albarracín, D. (2021). A Multisite preregistered paradigmatic test of the ego-depletion effect. *Psychological Science, 32*(10), 1566–1581. <https://doi.org/10.1177/0956797621989733>.
- Wang, W. (2017). Smartphones as social actors? Social dispositional factors in assessing anthropomorphism. *Computers in Human Behavior, 68*, 334–344. <https://doi.org/10.1016/j.chb.2016.11.022>.
- Waytz, A., Epley, N., & Cacioppo, J. T. (2010). Social cognition unbound: Insights into anthropomorphism and dehumanization. *Current Directions in Psychological Science, 19*(1), 58–62. <https://doi.org/10.1177/0963721409359302>.

- Wiederman, M. W., Baumeister, R. F., & Vohs, K. D. (2004). Self-control and sexual behavior. In *Handbook of self-regulation: Research, theory, and applications*. (pp. 525–536). New York: Guilford Press.
- Winters, K. C., Botzet, A. M., Fahnhorst, T., Baumel, L., & Lee, S. (2008). Impulsivity and its relationship to risky sexual behaviors and drug abuse. *Journal of Child & Adolescent Substance Abuse, 18*(1), 43–56.  
<https://doi.org/10.1080/15470650802541095>.
- Young, A. F., Gabriel, S., & Hollar, J. L. (2013). Batman to the rescue! The protective effects of parasocial relationships with muscular superheroes on men’s body image. *Journal of Experimental Social Psychology, 49*(1), 173–177.  
<https://doi.org/10.1016/j.jesp.2012.08.003>.
- Young, A. F., Gabriel, S., & Sechrist, G. B. (2012). The skinny on celebrities: Parasocial relationships moderate the effects of thin media figures on women’s body image. *Social Psychological and Personality Science, 3*(6), 659–666.  
<https://doi.org/10.1177/1948550611434785>.

## Appendix A

### Self-Esteem Scale (Rosenberg, 1965)

Instructions: On the items below, indicate the degree to which each statement represents your personal reactions or feelings. Marking 5 would indicate that the statement is definitely true of your personal reactions. Marking 1 would indicate that the statement is definitely untrue of your reactions

1	2	3	4	5
Not at all		Neutral		Very much
Like me				Like me

1. I feel that I am a person of worth, at least on an equal basis with others.
2. I feel that I have a number of good qualities.
3. All in all, I am inclined to feel that I am a failure. (R)
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of. (R)
6. I take on a positive attitude toward myself.
7. On the whole, I am satisfied with myself.
8. I wish I could have more respect for myself. (R)
9. I certainly feel useless at times. (R)
10. At times I think I am no good at all. (R)

## Appendix B

### IDAQ Scale (Waytz et al., 2010)

Instructions: The following questions are designed to give us a sense of how you think about the world. There are no right or wrong answers, we are only interested in learning about your personality. To get an accurate assessment, it is important that you try not to spend too much time thinking about each item and respond with your first, gut-level response.

Not at all

Very Much

0            1    2    3    4    5    6    7    8            9    10

1. To what extent does technology – devices and machines for manufacturing, entertainment, and productive processes (e.g., cars, computers, television sets) – have intentions?
2. To what extent does the average fish have free will?
3. To what extent does the average mountain have free will?
4. To what extent does a television set experience emotions?
5. To what extent does the average robot have consciousness?
6. To what extent do cows have intentions?
7. To what extent does a car have free will?
8. To what extent does the ocean have consciousness?
9. To what extent does the average computer have a mind of its own?
10. To what extent does a cheetah experience emotions?
11. To what extent does the environment experience emotions?
12. To what extent does the average insect have a mind of its own?

13. To what extent does a tree have a mind of its own?

14. To what extent does the wind have intentions?

15. To what extent does the average reptile have consciousness?

## Appendix C

Relationships Questionnaire Scale (Bartholomew & Horowitz, 1991)

Instructions: Below is a series of statements that correspond to your GENERAL RELATIONSHIP STYLE. Using the scale provided, please rate how much each Relationship Style is characteristic of you.

1 = Not At All Like Me

2

3

4 = Somewhat Like Me

5

6

7 = Very Much Like Me

Relationship Style # 1: It is easy for me to be emotionally close to others. I am comfortable depending on others and having others depend on me. I don't worry about being alone or having others not accept me.

Relationship Style # 2: I am comfortable without close emotional relationships. It is very important to me to feel independent and self-sufficient, and I prefer not to depend on others or have others depend on me.

Relationship Style # 3: I want to be completely emotionally intimate with others, but I often find that others are reluctant to get as close as I would like. I am uncomfortable being without close relationships, but I sometimes worry that others don't value me as much as I value them.

Relationship Style # 4: I am uncomfortable getting close to others. I want emotionally close relationships, but I find it difficult to trust others completely, or to depend on them. I worry that I will be hurt if I allow myself to become too close to others.

Next, please indicate the ONE relationship style above that BEST describes you or is closest to the way you are.

Relationship Style # 1

Relationship Style # 2

Relationship Style # 3

Relationship Style # 4

## Appendix D

### ECR-RS Attachment Scale (Fraley et al., 2011)

Instructions: Please read each of the following statements and rate the extent to which you believe each statement best describes your feelings about close relationships in general.

	Strongly Disagree						Strongly Agree
1. It helps to turn to people in times of need. (R)	1	2	3	4	5	6	7
2. I usually discuss my problems and concerns with others. (R)	1	2	3	4	5	6	7
3. I talk things over with people. (R)	1	2	3	4	5	6	7
4. I find it easy to depend on others. (R)	1	2	3	4	5	6	7
5. I don't feel comfortable opening up to others.	1	2	3	4	5	6	7
6. I prefer not to show others how I feel deep down.	1	2	3	4	5	6	7
7. I often worry that other people don't really care for me.	1	2	3	4	5	6	7
8. I'm afraid that other people may abandon me.	1	2	3	4	5	6	7
9. I worry that others won't care about me as much as I care about them.	1	2	3	4	5	6	7