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Interpersonal Processes And Consequences Of "technoference" In Romantic Couples

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INTERPERSONAL PROCESSES AND CONSEQUENCES OF "TECHNOFERENCE" IN ROMANTIC COUPLES

by

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CHAPTER 1 INTRODUCTION

Background

Smartphone use is ubiquitous in modern society. One recent Marketing Charts survey (2013) reported that people between the ages of 18 and 34 send and receive over 2,000 text messages per month, and research shows that text messaging has continued to increase considerably in recent years (Pew Research Center, 2011; 2015). There are over two hundred million smartphone users in the United States alone (Pew Research Center, 2016), and a recent survey showed that 36% of younger adults (aged 18-29) reported going online “almost constantly” (Pew Research Center, 2015). Research has also shown that people tend to prefer their smartphones over desktop computers as a means for going online, and more than one in ten people in the United States use their smartphones as their primary source of internet connection (Ofcom, 2015; Pew Research Center, 2016).

People often use their smartphones to communicate with others, even when they are in the physical presence of colleagues, friends, and/or a romantic partner with whom they could easily interact. It has become commonplace to see romantic couples on dates with one or both members of the couple completely absorbed by their smartphones, and research has shown that instances of technology interfering with face to face interactions in everyday life—termed “technoference”—leads to reduced well-being and relationship satisfaction (McDaniel & Coyne, 2016). Other new terminology specific to smartphone use has emerged in the literature to account for this phenomenon: “phubbing,” short for “phone snubbing,” refers to the action of being snubbed or snubbing others during face to face interactions by attending to one’s phone

instead of attending to the person (or people) who are physically present (Chotpitayasunondh & Douglas, 2016; Haigh, 2015). Being phubbed and experiencing technoference are accompanied by feelings of depression, lower subjective well-being, and reduced relationship satisfaction (McDaniel & Coyne, 2016; Roberts & David, 2016), and Chotpitayasunondh and Douglas (2016) found that "being phubbed" and "phubbing" are highly correlated (indicated by a Spearman correlation of .60); thus, it appears that the reciprocal effects of phubbing have contributed to smartphone-specific technoference becoming both normative and pervasive, yet the evidence suggests that this behavior can be damaging to one's close relationships and psychological health (Halpern & Katz, 2017).

A recent survey of 3,217 adults found that 89% of people used their phones at their most recent social event (Pew Research Center, 2015), and 46% of smartphone owners reported that they "couldn't live" without their phones. Without question, there are many benefits to mobile technology; however, the notion of being "unable to live" without one's phone reflects language that is typically reserved for one's most basic needs (or one's closest relationship), suggesting that smartphones have reached an extreme level of importance in people's lives. Given the extraordinary psychological value placed on smartphones, and the overall pattern and degree of smartphone use, the potential for interference from smartphones in close relationships is both unsurprising and unsettling.

While research has begun to examine the potential negative consequences of technoference and phubbing in close relationships (Halpern & Katz, 2017; McDaniel & Coyne, 2016; McDaniel, 2017; Przybylski & Weinstein, 2013; Roberts & David, 2016; Vanden Abeele, Antheunis, & Schouten; 2016), research investigating the processes by

which technoference influences relationship outcomes is still in its infancy. Of the research that proposes explanatory process models, most are based on cross-sectional and/or correlational data (cf. Halpern & Katz, 2017). Thus, while technoference is clearly associated with negative psychological and relationship consequences, the question of *how* technoference exerts its effects on close relationships has largely remained unanswered in the literature. This dissertation seeks to address this gap.

Purpose

The purpose of this dissertation is to take a social psychological approach to technoference in romantic relationships, with the following aims: 1) Provide a theoretical framework to explain and understand how technoference influences romantic relationships, and 2) Empirically test the question of how technoference influences romantic relationships. The primary goals of the studies proposed in this dissertation are threefold: 1) Test if there is something unique about technoference (specifically smartphone use), that influences romantic relationship processes, above and beyond other types of common distracting activities (e.g., being immersed in reading a book) that may interfere with relationship functioning, 2) Explore the mechanisms by which technoference influences consequential relationship outcomes (both experimentally and in everyday life), and 3) Identify the conditions under which technoference may be especially damaging to one's romantic relationship.

Proposal Overview

This dissertation will first review literature that provides a theoretical backdrop for how technoference influences close relationships. Subsequently, this dissertation argues that from the actor's perspective (the technoference "perpetrator"), technoference

impedes one's ability to be responsive to one's partner, and appropriates one's limited attentional resources, which reduces one's ability to be a supportive, high quality partner; this ultimately leads to more negative relationship outcomes. From the partner's perspective (i.e., the person who is experiencing but is not engaging in technoference), technoference leads to both negative emotional responses (i.e., feelings of uncertainty, rejection, loneliness, and reduced self-esteem) and reduced perceived partner responsiveness, which ultimately lead to more negative relationship outcomes (i.e., reduced feelings of closeness and relationship satisfaction). Four studies were conducted to begin empirically testing key components of the theoretical arguments advanced herein; study results are discussed, and future directions are proposed.

A Theoretical Account of Technoference and Romantic Relationship Functioning

People are fundamentally motivated to form meaningful relationships with others (Baumeister & Leary, 1995), and one critical component of relationship functioning is intimacy (Reis & Shaver, 1988). Intimacy is fostered by the dynamic process of disclosing thoughts, feelings, and information (self-disclosure), receiving a partner's response, and perceiving the partner's response as understanding, validating, and caring (Laurenceau, Barrett, & Pietromonaco, 1998; Reis & Shaver, 1988). In the context of an in-person interaction with one's romantic partner, technoference may disrupt this process by decreasing opportunities for self-disclosure for both members of a dyad, as well as decreasing perceived partner responsiveness and/or the ability to *be* responsive to a partner (for the partner and actor respectively) (Reis & Shaver, 1988). While the term "technoference" refers to interruptions from any technology device during face to face interactions, the vast majority of these interruptions in everyday life are posited to come

from smartphones, which constitute the only truly widely used mobile devices that can accompany people everywhere they go (Miller-Ott, Kelly, & Duran, 2012; Campbell, Ling, & Bayer, 2014).

Smartphone use and communication: A bridge, a barrier, or both? It is important to acknowledge that smartphones can sometimes *facilitate* intimacy and feelings of closeness to others who are not physically present. According to a Pew Research Center survey, 21% of couples reported increased closeness to their romantic partner due to texting and/or online interactions with their partner (Lenhart & Duggan, 2014), and research shows that phone use is generally considered important for facilitating and maintaining close relationships (Tulane & Beckert, 2013). Communications research has shown that the purpose of approximately one half to two thirds of all text messaging is specifically for facilitating and maintaining romantic relationships, friendships, and other important social relationships (Faulkner & Culwin, 2005; Thurlow, 2003).

The utility of smartphones for facilitating communication with one's romantic partner is clear, yet smartphones are also used to maintain social relationships with *other people*, as well as for many other important tasks (i.e., work email, entertainment, information seeking, etc.) (Andreassen & Pallesen, 2014). Indeed, the multifaceted utility of smartphones may be *exactly* what makes smartphone use in the context of in-person interactions uniquely aversive experiences: If a partner engages with his or her smartphone during an in-person interaction, the reasons for its use and the goals that it serves are endless and unknown (unless, of course, the smartphone user explains what they are doing on their phone and why). Being ignored by a romantic partner during face

to face conversations, especially during conflict (i.e., stonewalling), is damaging to the relationship (Giles-Sims & Gottman, 1994). However, being ignored in favor of an activity that has a clear, certain, and unambiguous function (i.e., reading a book) is qualitatively different from being ignored in favor of some activity that is ambiguous (i.e., engagement with one's smartphone, or even simply remaining silent during an interaction). Research has shown that the "silent treatment" derives its power over the sufferer because of its strategic ambiguity (Williams, 2001; Wright & Roloff, 2009), which purposefully makes the sufferer feel ostracized without providing a reason for the ostracism. Receiving the silent treatment has been shown to induce feelings of rejection, reduced self-esteem, and a threatened need to belong (Williams, Shore, & Grahe, 1998), and these feelings arise *because* one does not know why their partner is being silent or unresponsive (Williams, 2001).

Actor smartphone use and the "state of silent uncertainty." Although smartphone use during an in-person interaction may not in and of itself be equivalent to delivering the "silent treatment" (especially in the absence of conflict), the key distinguishing factor is that, presumably, the smartphone user does not have the intention of making his or her partner feel ostracized, rejected, and unloved. According to Williams' (1997) model of ostracism, "oblivious ostracism" is ostracism perceived as conveying the message that one's partner is unworthy of attention; despite the lack of intention to *punish* one's partner, oblivious ostracism is still damaging to the partner's self-esteem and emotional well-being (Williams, 1997; Williams et al., 1998), and smartphone-related technoference is argued to be a particularly effective and detrimental instrument of oblivious ostracism due to the smartphone's pervasive use and functional ambiguity.

The ambiguity of the smartphone's function and the uncertainty that it creates during an in-person interaction is arguably similar to experiencing the "silent treatment," correspondingly unpleasant, and therefore likely to evoke similar negative emotions. While it may always be somewhat unpleasant to be ignored by a partner during an in-person discussion (i.e., if Jack starts reading the newspaper while Jill is telling him about her upcoming day), in line with the analysis presented above (Williams, 2001), the severity of Jill's negative emotional response to being ignored depends upon the ambiguity and the uncertainty (or lack thereof) that accompanies being ignored. Assuming that Jack and Jill are not discussing a conflict (Jill is merely disclosing to Jack about her day), if Jack begins reading a newspaper, Jill *knows* what Jack is doing—Jack is clearly and unambiguously *reading a newspaper*, and he is clearly not talking to someone else, browsing dating sites for potential hookups, or posting on social media. Jill may be irked that Jack is no longer providing his undivided attention, but she is unlikely feeling uncertain about Jack's activity, and therefore, is less likely to feel severely rejected, worthless, etc.

However, in line with the idea that silence (or lack of responsiveness) coupled with ambiguity (uncertainty over why a partner is being silent or unresponsive; Wright & Roloff, 2009; Williams, 2001) is particularly uncomfortable, if Jack starts using his smartphone while Jill is telling him about her day, Jill is unable to be certain about *what* Jack is doing on his smartphone, and she is therefore more likely to feel rejected and less valuable, with increased severity (relative to when Jack is reading the newspaper). Thus, one important principle for how technoference influences close relationships is as follows: In the context of an in-person interaction with a romantic partner, *smartphone use creates*

states of "silent uncertainty" akin to giving one's partner "mini silent treatments" for the duration of the smartphone use.

The experience of silent uncertainty induces feelings of rejection and reduced self-esteem, and may spark feelings of irritation or anger that lead to smartphone-related conflict, and, eventually, reduced feelings of closeness and relationship satisfaction, as well as broader feelings of increased loneliness and reduced well-being. Research has shown that the presence of smartphones during an in-person interaction undermines trust in one's interaction partner (Przybylski & Weinstein, 2013), and reduces perceived relationship quality (Roberts & David, 2016), providing support for the idea that smartphone use during an in-person interaction uniquely facilitates negative emotional responses in interaction partners.

Actor smartphone use, its unique nonverbal messages, and the partner's emotional responses. The idea that smartphone use creates states of "silent uncertainty" speaks to what makes smartphone use during an in-person interaction unique from being ignored in favor of an unambiguous activity. Essentially, smartphone use is a form of oblivious ostracism, coupled with engagement in an activity that enhances feelings of uncertainty. Another unique aspect of smartphone use during in-person interactions is the idea that smartphone engagement can be brief, and checking one's smartphone is considered relatively normative behavior (Chotpitayasunondh & Douglas, 2016). It would be less normative, for instance, for someone to take out a book in semi-regular intervals during a conversation, look at a page for two or three seconds, and re-engage in the conversation. Regardless of how brief smartphone engagement is, smartphone use during in-person interactions communicates important nonverbal

messages to interaction partners. For example, communications researchers have theorized that smartphone use conveys the message "my smartphone is more important/interesting/engaging than you," (McDaniel & Coyne, 2016; Roberts & David, 2016) while others have theorized that smartphone use during face to face interaction conveys indifference towards one's partner more generally (Aagaard, 2015), or indicates that a partner should "hold" their thoughts until the phone-related task is complete (Nakamura, 2015).

Conveying any one of these messages is likely to generate a negative emotional response from a partner who has the goal of interpersonal closeness, and in line with Williams' concept of oblivious ostracism (1997; 2001), conveying these messages may also be damaging to the recipient's self-esteem. Furthermore, the process models of technoference posit that conveying these messages (i.e., "my phone is more important than you") sparks technology-related relationship conflict, which mediates the negative relationship between technoference and relationship satisfaction/quality (Roberts & David, 2016; Halpern & Katz, 2017).

Undermined understanding: How smartphones disrupt responsiveness. One key sub-component of responsiveness is the degree to which one perceives that a partner *understands* one's self-disclosure (Reis & Patrick, 1996), and research has shown that feeling understood buffers the negative effect of relationship conflict on relationship satisfaction. In a series of experimental studies, Gordon and Chen (2016) showed that the negative effect of conflict on relationship satisfaction only held for members of a romantic couple who did not feel *understood* by their partners during a conflict discussion.

They argue that this buffering effect of “feeling understood” occurred because conveyed understanding signals that one’s partner is highly invested in the relationship.

Feeling understood by one’s partner is essential for fostering closeness, and conveying understanding to a partner while using one’s smartphone is difficult at best, and impossible at worst. For example, one small but qualitatively rich communications study of 25 college students (Aagaard, 2015), suggested that engagement with phones during face to face interactions resulted in perceived delays of responses, mechanical verbal communication, and a lack of appropriate expressiveness (i.e., reduced eye contact, lack of facial expression, head nodding, etc.), which contributed to perceptions of interaction partners as uninterested and lacking empathy. Muted expressions and inappropriate or mistimed expressive behaviors that result from smartphone use uniquely tie to a decreased ability to convey understanding. Thus, this decreased ability to convey understanding may signal a lack of investment in the relationship (or at the very least, a lack of investment in the interaction), which may evoke negative emotional responses in one’s partner, spark conflict, and contribute to decreased feelings of closeness and relationship satisfaction. A number of empirical studies have shown that the presence of smartphones reduces perceived empathy (Przybylski & Weinstein, 2013) and perceived empathetic concern (Misra, Cheng, Genevie, & Yuan, 2014) in an interaction partner.

Recall that intimacy, a key component of relationship functioning, is facilitated by the dyadic process of self-disclosure and partner responsiveness, and smartphone use is posited to disrupt this process by creating a barrier for both self-disclosure and responsiveness (Reis & Shaver, 1988). In addition to smartphones acting as a barrier to relationship processes that facilitate intimacy, smartphone engagement usurps one’s

limited attentional resources (Basil, 1994; Lang, 2000), which likely undermines the ability to optimally navigate one's romantic relationship, particularly when conflict arises. Research has shown that the mere presence of a smartphone reduces one's cognitive capacity (indexed by performance on an O-span task and Raven's Standard Progressive Matrices; Unsworth et al., 2005; Raven, Raven, & Court, 1998), even when the phone is turned off (Ward, Duke, Gneezy, & Bos, 2017). Unfortunately, engagement with smartphones may consume cognitive resources that are required to handle conflict that smartphone use itself sparks. Thus, the effects of smartphone use may deliver a double blow to one's romantic relationship by 1) creating conflict in the first place, while 2) simultaneously leaving one less able to contend with conflict by depleting cognitive resources and reducing the ability to understand (and appropriately respond to) the emotional responses of one's partner (Gordon & Chen, 2016; Aagaard, 2015).

Responsiveness: A mediator or a moderator for smartphone use and relationship outcomes? In line with the ideas presented above, the key relationship process that smartphone use disrupts is responsiveness. Specifically, the ability of the actor to understand the partner is undermined as the actor engages with a smartphone. Additionally, and perhaps most critically, the unique aspect of smartphone use (compared to unambiguous activities such as reading a book or newspaper) is the element of *uncertainty* that accompanies its use. Thus, while the actor's responsiveness may not *actually* differ between the instances of reading a book versus engaging with a smartphone (i.e., the actor is equally silent and the actor's attention is just as clearly focused on something that is not the partner), the responsiveness that the partner *perceives* may differ due to the uncertainty and ambiguity that accompanies smartphone

use, but not book reading. By extension, in both instances, the emotional responses that result from the lack of responsiveness may be negative, but these negative emotional reactions may be more extreme when a partner is engaged with a smartphone versus an unambiguous activity, *because* of the uncertainty that is associated with smartphone use. As argued earlier, ambiguous actions of the partner may be more likely to lead to feelings of isolation, rejection, and reduced self-esteem (Williams, 2001; Przybylski & Weinstein, 2013). It follows that when an actor engages in technoference, the partner may perceive less responsiveness and experience more negative emotions than when the actor engages in an unambiguous activity that also interferes with in-person interactions.

In line with Williams' (1997) model of ostracism, and assuming that an absence (or reduction) of perceived partner responsiveness during an in-person interaction constitutes oblivious ostracism, the link between perceived partner responsiveness and negative emotional reactions may occur through the attribution of a partner's behavior. In other words, the psychological process that unfolds when a partner engages in a distracting activity (i.e., smartphone use or an unambiguous activity) is likely to involve an evaluation of *why* one's partner is engaging in some other activity during a conversation. In the instance of smartphone use (versus an unambiguous activity), one must also wonder *what* the partner is doing, and in line with the idea that ambiguity fosters feelings of rejection and reduced self-esteem (Williams, 2001), it follows that smartphone use (versus book reading) may represent a more substantial blow to one's self-esteem. For example, if Jack engages with his smartphone during a conversation with Jill, she may attribute his behavior to his personal character flaw (i.e., "Jack is using his phone right now because he is a rude person"). Alternatively, Jill may attribute Jack's behavior to a

self-relevant character flaw (i.e., “Jack is using his phone right now because I am not good/interesting/important enough to warrant his full attention”). The argument is that the latter case is more likely in the instance of smartphone use (versus an unambiguous activity), because of the uncertainty uniquely fostered by smartphone use, compounded by the possibility that one’s partner is more interested in communicating with *others* who are not physically present.

While the argument advanced above has portrayed smartphone use as leading to decreased responsiveness, which in turn leads to negative personal outcomes and emotional reactions from the partner, it is also plausible that the link between an actor’s smartphone use and a partner’s personal outcomes/emotional responses depends upon the level of the actor’s responsiveness (or the partner’s perception of the actor as responsive). Thus, it may appear that an actor’s smartphone use only leads to a partner’s negative personal outcomes/emotional responses when the actor’s responsiveness (perceived partner responsiveness) is low, which conceptualizes responsiveness as a moderator.

However, in line with the theoretical analysis that conceptualizes smartphone use as mini “silent treatments,” this dissertation advances the argument that actor smartphone use directly *causes* a reduction in perceived partner responsiveness, which in turn causes negative emotional responses/personal outcomes, and subsequently leads to more negative relationship outcomes (see Figure 1 below).

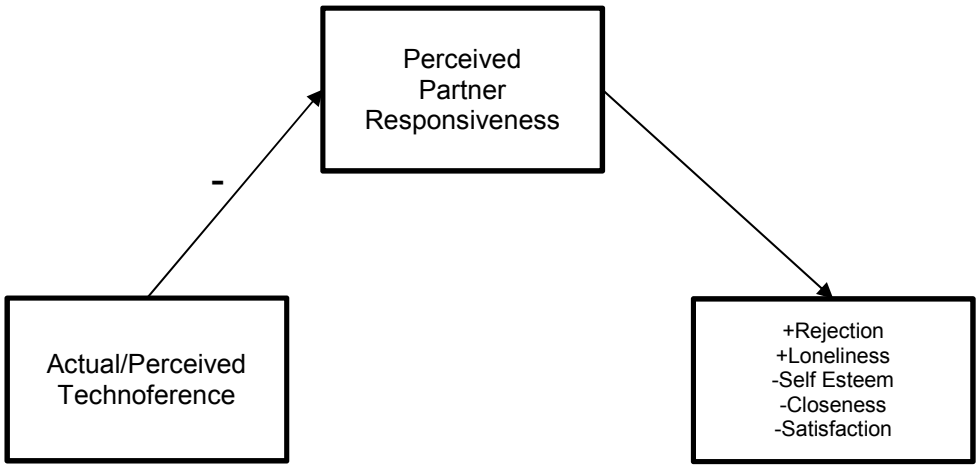


Figure 1. The proposed theoretical model for technoference, personal, and relationship outcomes, with perceived partner responsiveness as a key mediator.

It is not possible for the same variable to act as both a mediator and a moderator in the same statistical model, and theoretical analysis should guide the conceptualization of variable as a moderator or mediator (Wu & Zumbo, 2008). In the proposed set of studies, when responsiveness was measured, it was tested as a mediator; when responsiveness was manipulated, it was tested as a moderator. In line with the theoretical argument outlined above, responsiveness is expected to mediate the link between technoference and negative personal and relationship outcomes.

The Present Studies: A Correlational, Experimental, and Daily Diary Approach

The aims of the proposed set of studies are to 1) Test the links between "technoference," and perceived partner responsiveness, personal outcomes (self-esteem, feelings of rejection and loneliness), and relationship outcomes (i.e., closeness), 2) Test if smartphone-related technoference uniquely influences perceived partner responsiveness, emotional reactions, and relationship outcomes, beyond the effect of being spurned for a non-smartphone related activity, 3) Directly test the idea that the

effects of smartphone-related technoference occur because of a reduction in perceived partner responsiveness, and 4) Examine the effects of smartphone-related technoference in everyday life to see how daily experiences of technoference may influence perceived partner responsiveness, emotions, and feelings of closeness.

First, a correlational study was proposed to 1) Test the links between "technoference," perceived partner responsiveness, personal outcomes, technology related conflict, and relationship outcomes, and 2) Preliminarily test process-oriented models that explain how technoference influences romantic relationships. Second, a simple experimental study was proposed to test if smartphone-related technoference uniquely influences perceived partner responsiveness and emotional responses to a greater degree than being spurned for a non-smartphone related activity. Third, an additional experimental study was proposed to test the idea that smartphone-related technoference negatively influences emotional responses/personal outcomes and feelings of closeness to one's partner to a greater degree than other interfering activities (i.e., reading a book), and that this effect is reduced (or disappears) when perceived partner responsiveness is experimentally enhanced. Finally, a daily diary study was proposed to examine the effects of smartphone-related technoference in everyday life across a two-week period, to test the idea that daily experiences of technoference influence perceived partner responsiveness, feelings of rejection/isolation, and feelings of closeness to one's partner.

Summary of Hypotheses

The theoretical analysis and empirical evidence outlined above gave rise to the following hypotheses:

Hypothesis 1 (H1). In Study 1, we expected that greater technoference, operationalized in multiple ways that target self-relevant behavior and perceptions (i.e., number of hours the self spends on technology, perceived amount of time that the self spends on technology while with one's partner, problematic technology use of the self) would be associated with lower perceived partner responsiveness, more negative feelings and emotions (i.e., rejection, loneliness, and self-esteem), and reduced feelings of closeness and satisfaction.

Hypothesis 2 (H2). In Study 1, we expected that greater technoference, operationalized in multiple ways that target self-reported perceptions of a *partner's* behavior (i.e., how much time participants report that their *partners* spend and/or are perceived to spend on technology, problematic technology use of one's *partner*) would be more strongly associated with lower perceived partner responsiveness, more negative personal outcomes (i.e., rejection, loneliness, and self-esteem), and reduced feelings of closeness and satisfaction than the self-relevant technology use measures. In other words, perceptions of a partner's technoference were expected to be more strongly associated with negative personal and relationship outcomes than perceptions of self-perpetrated technoference.

Hypothesis 3 (H3). In Study 1, we expected that greater self-reported partner-perpetrated technoference (time that the *partner* spends on technology) would be negatively related to both personal outcomes (i.e., reduced self-esteem, increased rejection and loneliness) and relationship outcomes (i.e., feelings of closeness and relationship satisfaction); We expected that these relationships would be mediated by perceived partner responsiveness.

Hypothesis 4 (H4). In Study 2, we expected that participants who were prompted to think of a scenario in which their partner was on their smartphone (versus those who were instructed to think of having a meaningful conversation with one's partner—as a neutral condition—versus those who were instructed to think of an instance in which their partner was reading a book) would report more negative personal outcomes (i.e., increased rejection and loneliness); again, these relationships were expected to be mediated by perceived partner responsiveness.

Hypothesis 5 (H5). In Study 3, the nearly identical hypothesis to H4 was proposed, but we hypothesized that H4 would *only* hold in Study 3 when participants were instructed to consider a scenario in which their partner was also being particularly unresponsive (versus responsive). These differences in personal outcomes between groups were hypothesized to be reduced or non-existent for those with experimentally enhanced perceived partner responsiveness.

Hypothesis 6 (H6). In Study 4, during a two-week daily diary study, we expected that participants with partners who spent more time on their phones in daily life would report reduced perceived partner responsiveness, increased feelings of rejection, and decreased closeness to one's partner over the course of two weeks. Specifically, we hypothesized that an actor's technoference that occurred on a specific day (i.e., day t-1) would negatively affect the partner's perceived partner responsiveness, feelings of rejection, and feelings of closeness on that same day (i.e., on day t-1). In other words, we hypothesized that there would be a partner effect of technoference on perceived partner responsiveness, as well as actor effects of perceived partner responsiveness on feelings of rejection and closeness. We expected that actor effects of smartphone use

(technoference) on perceived partner responsiveness would be present but weaker than partner effects of smartphone use on perceived partner responsiveness (see Figure 2 below).

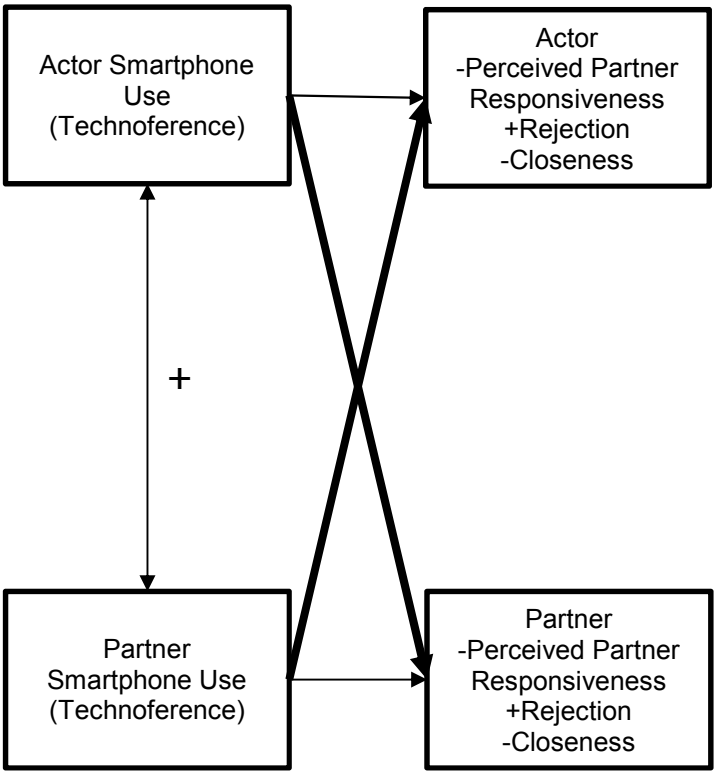


Figure 2. Visual representation of H6. Weights of paths depict the relative hypothesized strength of effects.

Hypothesis 7 (H7). In Study 4, we expected that people who *perceived* that their partners spent more time on their phones (and perceived more partner-perpetrated technoference) would report reduced perceived partner responsiveness, increased feelings of rejection and reduced feelings of closeness to one's partner over the course of two weeks. In other words, we hypothesized actor effects of perceived partner-perpetrated technoference on perceived partner responsiveness, feelings of rejection, and feelings of closeness. Similar to H6, we expected that an actor's perception of partner-perpetrated technoference on a particular day (i.e., day t-1) would affect the

actor's perceived partner responsiveness, feelings of rejection, and feelings of closeness to one's partner on that same day (i.e., day t-1), as well as the actor's feelings of rejection and closeness on the following day (i.e., day t) (see Figure 3 below).

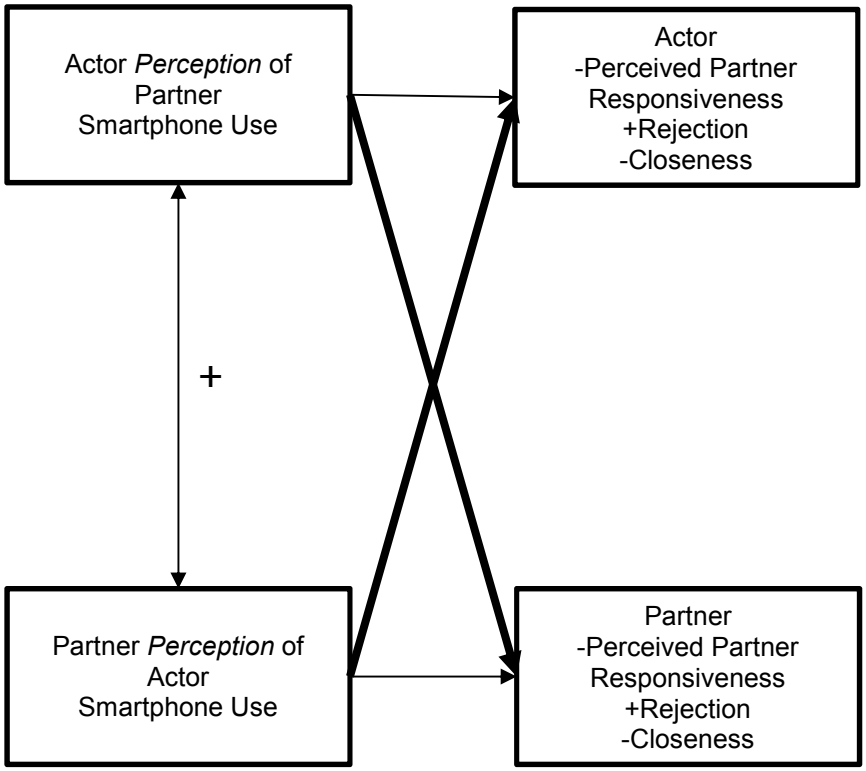


Figure 3. Visual representation of H7. Weights of paths depict the relative hypothesized strength of effects.

CHAPTER 2: THE EFFECT OF TECHNOFERENCE ON PERSONAL AND RELATIONSHIP OUTCOMES (STUDY 1)

Study 1 Method

Participants were deemed eligible for Study 1 if they were in long-term, committed romantic relationships (for a minimum of 4 months), were over the age of 18, were not in long distance relationships, and had smartphones with data plans.

Study 1 was designed as a preliminary step for establishing a comprehensive operationalization of "technoference," and testing the question of how technoference may be associated with perceived partner responsiveness, personal outcomes such as self-esteem and emotional responses (i.e., rejection and loneliness), as well as relationship outcomes (i.e., closeness to partner and relationship satisfaction). Furthermore, we sought to preliminarily test perceived partner responsiveness as a mechanism through which technoference leads to negative personal and relationship outcomes.

We predicted that technoference, operationalized as any of the following: 1) Time that the partner spends on technology devices when together, 2) Time that the self spends on technology devices when together, 3) Perceptions of time that the self and/or partner spends on technology devices when together, 4) Self-reported "technology device interference" and/or 5) Self-reported "technology interference in life examples" would be positively associated with negative emotions and negative personal outcomes (i.e., feelings of rejection, loneliness, and reduced self-esteem), and negatively associated with relationship outcomes (i.e., closeness to one's partner and relationship satisfaction). Furthermore, we predicted that the influence of technoference on personal outcomes would be mediated by perceived partner responsiveness, such that technoference would

directly lead to a reduction in perceived partner responsiveness, which in turn would lead to feelings of reduced self-esteem, satisfaction, and closeness, and increased feelings of rejection and loneliness.

Study 1 participants. As noted above, participants were deemed eligible if they were in long-term, committed romantic relationships (for a minimum of 4 months), were over the age of 18, were not in long distance relationships, and had smartphones with data plans. Data from 352 participants were collected.

Study 1 procedure. Participants were recruited through Amazon's Mechanical Turk (MTurk) to take part in an online study. MTurk participants were directed to an online survey on Qualtrics, via an advertisement and link on MTurk. To ensure eligibility of the participants, pre-screening questions were administered. If eligible, participants completed a collection of measures, filled out demographic information, and had a chance to add anything they wished to document at the end of the survey. Upon completion of the online survey, participants were thanked and compensated for their time and effort with $3.50 to $5.00. Data collection took place from December 1st, 2016 through January 10th, 2017.

Study 1 measures. (See Appendix A for full measures).

Technology device interference scale*; *(TDIS; McDaniel & Coyne, 2016). This scale was designed to tap into how technology devices get in the way of interacting with a partner. Example items included "In general, how frequently do cell phones/smartphones get in the way of (or even interrupt) interacting with your romantic partner?" and "In general, how frequently do computers get in the way of (or even

interrupt) interacting with your romantic partner?" Responses were on a 6-point scale (0 = Never to 6 = All the time).

Technology interference in life examples scale (TILES; McDaniel & Coyne, 2016). This scale was designed to tap into more specific instances of technology interference in daily life. Example items included "During a typical mealtime that my partner and I spend together, my partner pulls out and checks his/her phone or mobile device" and "When my partner's phone or mobile device rings or beeps, he/she pulls it out even if we are in the middle of a conversation." Responses were on an 8-point scale (0 = Never to 8 = Ten or more times a day).

Intrusiveness of technology use. These items were designed to get at the perception of how intrusive technology is in one's romantic relationship. Example items included "In general, how intrusive (to your relationship) is your PARTNER'S use of technology?" and "In general, how intrusive (to your relationship) is YOUR use of technology?" Responses were on a 7-point scale (1 = Not at all to 7 = An extreme amount).

Conflict over technology use. These items were designed to get at how much conflict occurs in the relationship due to technology. Example items included "In general, how problematic to your relationship is your PARTNER'S use of technology?" and "In general, how problematic to your relationship is YOUR use of technology?" Responses were on a 7-point scale (1 = Not at all to 7 = An extreme amount).

Average time that the self and partner spends on technology devices. These questions specifically inquired about the estimated amount of time that the self and partner spend on the collective use of phones, laptops, and tablets while in the presence

of each other. Example items included “In general, while you and your partner are together, how much time do YOU spend on your technology device(s) (tablet, cell phone, computer)?” and “In general, while you and your partner are together, how much time does your PARTNER spend on technology device(s) (tablet, cell phone, computer)?” Responses were typed into a text box and were labeled in both hours and minutes.

Self-disclosure. These items were designed to tap into how much one discloses thoughts, feelings, and information to one’s partner. Example items included “I talk about my thoughts,” and “I talk about my feelings.” Responses are on a 5-point scale (1 = Not at all to 5 = Extremely).

Perceived partner responsiveness (Reis, Clark, & Holmes, 2004). These items were designed to get at how validated, cared for, and understood one felt by their partner. Example items included “In my relationship, in general, my partner makes me feel like he/she values my abilities and opinions” and “In my relationship, in general, my partner understands me.” Responses were on a 6-point scale (1 = Not at all to 6 = Very much).

Self-esteem (Rosenberg, 1965). This scale was designed to tap into feelings of personal value and self-esteem. Example items included “I feel that I have a number of good qualities,” and “I take a positive attitude towards myself.” Responses were on a 4-point scale (1 = Strongly agree to 4 = Strongly disagree).

Feelings of rejection. These items were designed to tap into feelings of social rejection. An example item included “In general, I feel socially rejected.” Responses were on a 7-point scale (1 = Strongly disagree to 7 = Strongly agree).

Feelings of loneliness. These items were designed to tap into feelings of loneliness or isolation. An example item included "In general, I feel lonely." Responses were on a 7-point scale (1 = Strongly disagree to 7 = Strongly agree).

Relationship satisfaction (Investment Model; Rusbult, Martz, & Agnew, 1998). These items were designed to tap into multiple components of relationship functioning. Example items of the satisfaction, commitment, quality of alternatives, and investment components respectively included "I feel satisfied with our relationship," "I am committed to maintaining my relationship with my partner," "The people other than my partner with whom I might become involved are very appealing," and "I have put a great deal into our relationship that I would lose if the relationship were to end." Responses were on an 8-point scale (0 = Do not agree at all to 8 = Agree completely).

Inclusion of other in self scale (closeness; Aron, Aron, & Smollan, 1992). This single-item scale displayed two circles (one labeled the "self," and one labeled the "other,") with varying degrees of overlap. Participants were instructed to select the picture that best described their relationship with their romantic partner. A score of 1 represented circles with no overlap and a score of 5 represented circles that almost entirely overlapped, with greater scores indicating greater feelings of closeness to one's romantic partner.

Study 1 Results

A Priori Power Analysis. For Study 1, based on the calculations using G*Power software for F-Tests, "Linear Multiple Regression: Fixed Model, R^2 Increase," with an estimated effect size of $f^2 = .05$, the number of tested predictors = 10, power of .80 and alpha of .05, the minimum total participants needed was 335 (see Appendix G).

Data Screening for Study 1. Three hundred and fifty two participants completed the online survey. Participants were excluded from analysis if they failed more than one attention check; 33 participants were removed from the data set prior to analysis for failing more than one attention check, leaving 319 eligible participants (M_{age} = 38.05, *SD* = 10.82; 58.9% female, 77.1% White, 7.2% Black/African American, 5.3% Asian/East Asian/Pacific Islander, 0.3% Middle Eastern, 4.7% Hispanic, 0.6% Native American, 4.1% multiracial, 0.6% other; 87.5% had at least some college education).

Hypothesis Testing Study 1. For Study 1, correlations were computed, and regression analyses were conducted to test the effect of different operationalizations of technoference on emotional responses, perceived partner responsiveness, and relationship outcomes (closeness and satisfaction). Models using the PROCESS macro (Model 4; Hayes, 2013) were used to preliminarily test the hypothesis that technoference would lead to a reduction in perceived partner responsiveness, which in turn would predict more negative emotional responses and relationship outcomes.

Self-relevant technoference analyses (H1). Correlational results and descriptive statistics for Study 1 variables are presented in Table 1. In line with H1, the number of hours that participants reported spending on technology (themselves) was significantly negatively associated with self-esteem (r = -.15, p < .01). However, contrary to expectations, the reported number of hours that the self spends on technology was unrelated to perceived partner responsiveness, rejection, loneliness, relationship satisfaction, and closeness. Additionally, an alternative operationalization of self-relevant technoference (perceptions of frequency of technology use) was unrelated to perceived partner responsiveness, rejection, loneliness, and relationship satisfaction, and was

significantly positively related to closeness (r = .13, p < .05; possibly because frequent technology use may indicate communication with one's romantic partner). These results suggest that the number of hours that the self spends on technology devices is unrelated to personal and relationship outcomes, with the exception that time spent on technology may suggest increased communication with one's partner (as indicated by a significant positive correlation of time spent on technology with feelings of closeness to one's partner).

In line with expectations, perceptions of problematic technology use for the self were significantly negatively correlated with perceived partner responsiveness (r = -.19, p < .01), relationship satisfaction (r = -.17, p < .01), closeness (r = -.13, p < .05), and self-esteem (r = -.23, p < .01), and significantly positively correlated with loneliness (r = .22, p < .01) and rejection (r = .18, p < .01). Similarly, scores on the TILES and the TIDES showed identical patterns of significant positive and negative associations as perceptions of problematic technology use for the self (as well as similar magnitudes of effect sizes), with the exception of a nonsignificant association with closeness to one's partner (see Table 1). These results suggest that problematic technology use of the self is negatively associated with personal and relationship outcomes, which lends support to H1.

Partner-relevant technoference analyses (H2). In line with H2, technoference relevant to the partner was more strongly associated with more negative personal and relationship outcomes (relative to self-relevant technoference). The number of hours that participants reported their *partners* spent on technology was significantly negatively associated with perceived partner responsiveness (r = -.14, p < .05), relationship satisfaction (r = -.19, p < .01), and self-esteem (r = -.26, p < .01), and significantly

positively associated with loneliness (r = .20, p < .01) and rejection (r = .16, p < .01). Perceptions of problematic partner technology use had the strongest associations with personal and relationship outcomes, and was significantly negatively associated with perceived partner responsiveness (r = -.40, p < .01), relationship satisfaction (r = -.35, p < .01), closeness (r = -.21, p < .01), and self-esteem (r = -.19, p < .01), and significantly positively associated with loneliness (r = .27, p < .01) and rejection (r = .22, p < .01). Similarly, scores on the TILES and the TIDES showed identical patterns of significant positive and negative associations as perceptions of problematic technology use for the partner (though associations were smaller in magnitude), with the exception of a nonsignificant association with closeness to one's partner (see Table 1). These results suggest that not only problematic technology use, but technology use more generally (indicated by the time a partner spends on technology) is negatively associated with personal and relationship outcomes, lending support to H2.

Mediation analyses of technoference via perceived partner responsiveness (H3). The PROCESS macro (Model 4) with 5000 bootstrapped samples was used to test the hypothesis that the effect of partner-perpetrated technoference (hours a partner spends on technology) on rejection, loneliness, self-esteem, relationship satisfaction, and closeness would be mediated by perceived partner responsiveness. This hypothesis was tested in separate models, and results were in line with predictions. As the number of hours increased for partner technology use, this led to significant reductions in perceived partner responsiveness (b = -.11, SE = .04, t(317) = -2.45, p = .015); in turn, this led to significant increases in feelings of rejection (b = -.15, R^2 = .06, F(2,316) = 10.02, p < .001, t(316) = -3.45, p < .001, 95% CI [-.23, -.06]). The standardized indirect effect of hours a

partner spent on technology on rejection via perceived partner responsiveness was .03 (*SE* = .008, 95% CI [.0006, .0266]) (see Figure 4).

Similarly, reductions in perceived partner responsiveness led to significant increases in feelings of loneliness (*b* = -.15, R^2 = .02, *F*(2,316) = 14.42, *p* < .001, *t*(316) = -3.90, *p* < .001, 95% CI [-.22, -.07]). The standardized indirect effect of hours a partner spent on technology on loneliness via perceived partner responsiveness was .03 (*SE* = .02, 95% CI [.003, .065]) (see Figure 5).

Reductions in perceived partner responsiveness also led to significant decreases in feelings of self-esteem (*b* = .07, R^2 = .09, *F*(2,316) = 16.55, *p* < .001, *t*(316) = 3.07, *p* = .002, 95% CI [.02, .11]). The standardized indirect effect of hours a partner spent on technology on self-esteem via perceived partner responsiveness was -.02 (*SE* = .01, 95% CI [-.056, -.002]) (see Figure 6).

Reductions in perceived partner responsiveness also led to significant decreases in relationship satisfaction (*b* = .31, R^2 = .19, *F*(2,316) = 37.72, *p* < .001, *t*(316) = 7.81, *p* < .001, 95% CI [.23, .38]). The standardized indirect effect of hours a partner spent on technology on relationship satisfaction via perceived partner responsiveness was -.05 (*SE* = .03, 95% CI [-.101, -.002]) (see Figure 7).

Reductions in perceived partner responsiveness also led to significant reductions in feelings of closeness (*b* = .19, R^2 = .10, *F*(2,316) = 17.17, *p* < .001, *t*(316) = 5.66, *p* < .001, 95% CI [.12, .25]). The standardized indirect effect of hours a partner spent on technology on closeness via perceived partner responsiveness was -.04 (*SE* = .02, 95% CI [-.085, -.004]) (see Figure 8).

With the exception of closeness as the outcome variable, in all models, the direct effect of the number of hours that the partner spends on technology remained significant, even when accounting for the significant indirect effect of technoference via perceived partner responsiveness. As the number of hours a partner spent on technology increased, reports of rejection (b = .08, SE = .03, t(317) = 2.35, p = .019, 95% CI [.01, .14]) and loneliness (b = .09, SE = .03, t(317) = 3.13, p = .002, 95% CI [.03, .15]) also significantly increased. As the number of hours a partner spent on technology increased, reports of self-esteem (b = -.07, SE = .02, t(317) = -4.40, p < .001, 95% CI [-.11, -.04]) and relationship satisfaction (b = -.08, SE = .03, t(317) = -2.69, p = .007, 95% CI [-.14, .02]) significantly decreased. While the effect of partner hours on closeness was in the same direction as self-esteem and relationship satisfaction, the direct effect was no longer significant with perceived partner responsiveness included in the model (b = -.02, SE = .03, t(317) = -0.75, p = .45, 95% CI [-.07, .03]). These results suggest that the effect of technoference on personal and relationship outcomes is partially mediated by perceived partner responsiveness, lending support to H3.

Study 1 Discussion

Correlational results from Study 1 were mostly in line with predictions and with prior work; specifically, the preliminary correlational study showed that perceptions of problematic technology use in one's partner was significantly positively associated with feelings of rejection and loneliness, and significantly negatively associated with feelings of self-esteem, relationship satisfaction, and closeness to one's partner. These effects were present, but weaker, for self-perpetrated problematic technology use. This suggests that it may be the perception of a partner's behavior that is especially important for

predicting negative personal and interpersonal outcomes. The correlational study also provided preliminary evidence that technoference exerts its effect on personal and interpersonal outcomes via perceived partner responsiveness.

Preliminary mediational analyses from Study 1 suggested that greater technoference, particularly when conceptualized as the time that a partner spends on technology, was significantly positively associated with feelings of loneliness and rejection, and significantly negatively associated with self-esteem, relationship satisfaction, and closeness. Interestingly, all of these effects were partially mediated by perceived partner responsiveness. Above and beyond the significant indirect effects of technoference via perceived partner responsiveness, the number of hours that a partner was perceived to spend on technology devices exerted significant direct effects on feelings of rejection, loneliness, self-esteem, and relationship satisfaction. These results suggest that when people perceive that their partners spend a lot of time on technology, they also perceive less responsiveness from their partners, and subsequently feel more rejected, lonelier, and less satisfied/close to their relationship partners.

Study 1 provided preliminary evidence that technoference may exert negative effects on personal and relationship outcomes. However, the question of how technoference may be unique from being ignored in favor of other activities (i.e., reading a book or newspaper) has not yet been addressed. Answering this question was the primary aim of Study 2.

CHAPTER 3: A TEST OF TECHNOFERENCE UNIQUENESS (STUDY 2)

Study 2 Method

Study 2 was designed to answer the question of whether technoference was related to decreases in perceived partner responsiveness and increases in negative emotional reactions/negative personal outcomes to a greater degree than interference from activities unrelated to technology. In other words, is there something uniquely aversive about being spurned in favor of one's phone, and if so, why is this the case? In line with the idea that uncertainty and ambiguity increase feelings of isolation and rejection and decrease feelings of self-esteem (Williams, 2001), we hypothesized that smartphones have the unique quality of being ambiguous when used (compared to an activity such as reading a book), and are therefore more likely to elicit feelings of decreased perceived partner responsiveness, and increased rejection and loneliness. To test these predictions, we employed a simple experimental design with partner activity (technoference vs. book-reading vs. neutral control) as the between-subjects factor, and perceived partner responsiveness, feelings of rejection, and feelings of loneliness as the dependent variables in separate models.

Study 2 participants. Participants were deemed eligible if they were in long-term, committed romantic relationships (for a minimum of 4 months), were over the age of 18, were not in long distance relationships, and had smartphones with data plans. The total number of participants collected for Study 2 was 453.

Study 2 procedure. Participants were recruited through a Qualtrics Panel to take part in an online study. Participants were directed to an online survey on Qualtrics, via a Qualtrics advertisement. To ensure eligibility of the participants, pre-screening questions

were administered. If eligible, participants were randomly assigned to one of three conditions (technoference condition, book-reading condition, or neutral control condition) and underwent a manipulation of "partner activity." Participants read a vignette that asked them to recall and re-experience a situation in which they were attempting to interact with their partner while their partner was either 1) On his or her smartphone (technoference condition), 2) Reading a book/newspaper/magazine (referred to as the "book-reading" condition hereafter), or 3) While having a meaningful conversation with one's partner. Specifically, participants read the following vignette, adapted from Gordon and Chen's (2016, p. 245) experiments:

> "In every relationship people experience times when their partner wants to multitask while having a conversation. We would now like you to recall a situation in which you and your partner were having a meaningful discussion, and your partner was [on their smartphone vs. reading a book/newspaper/magazine] at the same time. Please take a moment to remember one specific situation in which your partner was simultaneously [on their smartphone vs. reading a book/newspaper/magazine] while you were discussing something meaningful. Picture where you were, what you were saying, and how you were feeling."

At this point, a single question was asked: "Were you able to think of a situation?" and participants only continued with the survey if they answered "yes." This mid-survey question was intended to reduce the amount of unusable data, and reduce the amount of money spent on participant payment for unusable data. If participants were eligible to continue, they read the following prompt:

"Once you have recalled a situation, please take three minutes to write about it in detail. Try to immerse yourself in the experience and relive the situation, focusing on what was said and how it made you feel."

For the control condition:

"In every relationship, people have conversations with their partners. We would now like you to recall a situation in which you were having a meaningful conversation with your partner (in person). Please take a moment to remember one specific situation in which you and your partner were discussing something meaningful. Picture where you were, what you were saying, and how you were feeling." [Eligibility check question].

"Once you have recalled a situation, please take three minutes to write about it in detail. Try to immerse yourself in the experience and relive the situation, focusing on what was said and how it made you feel."

Subsequently, participants were asked to report on perceived partner responsiveness, rejection, and loneliness at the time of the event that they recalled. Participants filled out demographic information, and had a chance to add anything they wished to document at the end of the survey. Upon completion of the online survey, participants were thanked and compensated for their time and effort with $2.00 to $3.00 (see Appendix B for Study 2 manipulation).

Study 2 measures. (See Appendix C for complete Study 2 measures).

Technoference manipulation check. To be certain that the manipulation of technoference was successful, participants reported on the degree to which technology seemed to interfere with the ability to have a conversation on a 7-point scale (1 = Not at

all to 7 = Extremely). It was expected that higher scores would be reported in the technoference condition relative to the other two conditions.

Manipulation check: Successful recall. To be certain that participants were able to recall the situation outlined in the manipulation, participants reported on the degree to which they were 1) successful at remembering the situation, and 2) had difficulty remembering the situation, on a 7-point scale (1 = Not at all to 7 = Extremely). Additionally, they reported on how recently the event occurred and how often they experience events like the one they had described.

Perceived partner responsiveness (adapted; Reis, Clark, & Holmes, 2004). These items were designed to get at how validated, cared for, and understood one felt by their partner during and/or immediately after the recalled event had transpired. Example items for "understanding" included "During your conversation, how much was your partner able to understand what you were thinking?" and "During your conversation, how much was your partner able to understand how you were feeling?" Example items for "validation" included "During your conversation, how much did your partner make you feel like they valued your opinion?" and "During your conversation, how much did your partner make you feel like they valued your beliefs?" Example items for "caring" included "During your conversation, to what extent did you feel like your partner really cared about your thoughts?" and "During your conversation, to what extent did you feel like your partner really cared about your feelings?" Responses were on a 6-point scale (1 = Not at all to 6 = Very Much).

Uncertainty about partner's activity. These items were meant to tap into the degree to which participants felt uncertain about what their partner was doing during the

recalled situation. Example items included “During your conversation, how certain were you of what your partner was doing?” and “During the conversation that I brought to mind, I knew exactly what my partner was doing.” Responses were on a 7-point scale (1 = Not at all to 7 = Extremely).

Feelings of rejection. These items were designed to tap into feelings of social rejection experienced during the recalled event. Example items included, “During the situation that I just recalled, I felt rejected by my partner,” and “During the situation that I just recalled, I felt like I was cast aside by my partner.” Responses were on a 7-point scale (1 = Strongly disagree to 7 = Strongly agree).

Feelings of loneliness. These items were designed to tap into feelings of loneliness or isolation experienced during the recalled event. Example items included “During the situation that I just recalled, I felt lonely,” and “During the situation that I just recalled, I felt isolated.” Responses were on a 7-point scale (1 = Strongly disagree to 7 = Strongly agree).

Study 2 Results

A Priori Power Analysis. For Study 2, based on the calculations using G*Power software for F-Tests, “ANOVAS Fixed Effects, Omnibus, One-Way,” with an estimated effect size of $f = .18$, and the number of groups = 3, the estimated total participants needed to achieve 80% power was 303 (see Appendix H).

Study 2 Data Screening. Four hundred and fifty three participants completed the survey. Eighty three participants failed the key attention check and were excluded from analysis; additionally, 31 participants did not follow instructions for the manipulation (i.e., they wrote about a time their partner was on their smartphone when they were assigned

to write about a time their partner was reading a book/newspaper/magazine). The final sample included 339 participants (M_{age} = 53.69, *SD* = 14.65; 54.0% female, 87.3% White, 5.0% Black/African American, 3.2% Asian/East Asian/Pacific Islander, 2.1% Hispanic, 0.9% Native American, 0.9% multiracial, 0.6% other; 79.0% had at least some college education).

Study 2 Hypothesis Testing. For Study 2, a one-way ANOVA was conducted to test the hypothesis that technoference (vs. reading a book vs. neutral control) would lead to a reduction in perceived partner responsiveness. Additional ANOVAs tested the hypotheses that partner activity (i.e., technoference) would lead to more negative emotional responses (i.e., rejection and loneliness), relative to the other two conditions (book-reading and neutral control). Mediation analyses were conducted to test the effect of condition on perceived partner responsiveness, in turn predicting negative emotions (i.e., rejection and loneliness; PROCESS Model 4; Hayes, 2013).

Technoference and perceived partner responsiveness (H4). A one-way Analysis of Variance (ANOVA) was conducted to test the effect of partner activity (technoference vs. book reading vs. control) on perceived partner responsiveness. Results showed that there was a significant main effect of condition on perceived partner responsiveness $F(2, 336) = 30.57$, $p < .001$, $\eta_p^2 = .154$. Participants in the technoference condition (*M* = 3.91, *SD* = 1.92, 95% CI [3.51, 4.30]) and the book-reading condition (*M* = 4.23, *SD* = 1.86, 95% CI [3.90, 4.56]) reported significantly lower perceived partner responsiveness compared to those in the control condition (*M* = 5.64, *SD* = 1.49, 95% CI [5.37, 5.91]) (see Figure 9). Planned comparisons revealed that those in the technoference condition and those in the book-reading condition reported significantly

less perceived partner responsiveness than those in the control condition $t(336) = 7.79$, $p < .001$, however, participants in the technoference condition and the book-reading condition did not significantly differ from each other $t(336) = 1.33$, $p = .186$ for perceived partner responsiveness. This suggests that a partner's activity does affect perceived partner responsiveness, but that the effect of being ignored more generally (i.e., smartphone use OR book-reading) drives a reduction in perceived partner responsiveness.

Technoference and emotional responses (H4). Additional one-way analysis of variance tests were conducted to test the effect of partner activity (technoference vs. book reading vs. control) on emotional responses (rejection and loneliness). Results showed that there was a significant main effect of condition (partner activity) on feelings of rejection $F(2, 336) = 4.29$, $p < .001$, $\eta_p^2 = .20$. Participants in the technoference condition ($M = 3.30$, $SD = 1.78$, 95% CI [2.93, 3.66]) and the book-reading condition ($M = 3.20$, $SD = 1.67$, 95% CI [2.91, 3.50]) reported significantly greater feelings of rejection compared to those in the control condition ($M = 1.62$, $SD = 1.17$, 95% CI [1.41, 1.83]) (see Figure 10). Planned comparisons revealed that those in the technoference condition and those in the book-reading condition reported significantly higher feelings of rejection than those in the control condition $t(336) = -9.19$, $p < .001$, however, participants in the technoference condition and the book-reading condition did not significantly differ from each other $t(336) = -0.461$, $p = .681$ for reported feelings of rejection. This suggests that a partner's activity does affect feelings of rejection, but that the effect of being ignored more generally (i.e., smartphone use OR book-reading) drives the increase in feelings of rejection, rather than smartphone use specifically.

An additional one-way Analysis of Variance revealed a significant main effect of partner activity on reported feelings of loneliness $F(2, 336) = 25.44$, $p < .001$, $\eta_p^2 = .13$. Participants in the technoference condition ($M = 3.28$, $SD = 1.80$, 95% CI [2.91, 3.64]) and the book-reading condition ($M = 2.77$, $SD = 1.55$, 95% CI [2.49, 3.04]) reported significantly higher feelings of loneliness compared to those in the control condition ($M = 1.81$, $SD = 1.30$, 95% CI [1.57, 2.04]) (see Figure 11). Planned comparisons revealed that those in the technoference condition and those in the book-reading condition reported significantly higher levels of loneliness compared to those in the control condition $t(336) = -6.89$, $p < .001$. Additionally, participants in the technoference condition reported significantly higher levels of loneliness compared to those in the book-reading condition $t(336) = -2.43$, $p = .016$. This suggests that there may be something unique about smartphone use that leads to an increase in loneliness, relative to being ignored in favor of a book (or not being ignored at all; neutral control). This finding represents preliminary evidence that there could be something uniquely aversive about smartphones, and that being spurned in favor of a smartphone can make people feel particularly lonely.

Mediation analyses of technoference via perceived partner responsiveness (H4). A mediation analysis with 5000 bootstrapped samples using PROCESS model 4 was conducted to test if the effect of experimental condition on personal outcomes/emotions (i.e., rejection and loneliness) was mediated by reductions in perceived partner responsiveness. Condition was coded such that the neutral control condition = 1, the book-reading condition = 2, and the technoference condition = 3, so that conceptually, the degree of interference from technology increased with experimental condition. Results showed that as technological interference increased, both rejection and

loneliness increased, and this effect was partially mediated by perceived partner responsiveness. Specifically, experimental condition led to significant reductions in perceived partner responsiveness b = -.885, R^2 = .13, $F(1,337) = 52.52$, $p < .001$, $t(337) = -7.25$, $p < .001$, 95% CI [-1.13, -.645], which in turn led to significant increases in feelings of rejection b = -.55, R^2 = .48, $F(2,336) = 155.03$, $p < .001$, $t(336) = -14.42$, $p < .001$, 95% CI [-.63, -.48]. The standardized indirect effect of condition on rejection via perceived partner responsiveness was .22 (*SE* = .03, 95% CI [.16, .29]) (see Figure 12). This suggests that interference from technology leads to increases in rejection via perceived partner responsiveness, lending support to H4.

Similarly, experimental condition led to significant reductions in perceived partner responsiveness b = -.885, R^2 = .13, $F(1,337) = 52.52$, $p < .001$, $t(337) = -7.25$, $p < .001$, 95% CI [-1.13, -.645], which in turn led to significant increases in feelings of loneliness, b = -.47, R^2 = .38, $F(2,336) = 104.21$, $p < .001$, $t(336) = -11.80$, $p < .001$, 95% CI [-.55, -.39]. The standardized indirect effect of condition on loneliness via perceived partner responsiveness was .20 (*SE* = .03, 95% CI [.14, .26]) (see Figure 13). This suggests that interference from technology leads to increases in loneliness via perceived partner responsiveness, lending support to H4.

Study 2 Discussion

While some Study 2 findings were in line with predictions, some hypotheses were not supported. Participants who thought of instances in which their partners were either reading a book or on their smartphone reported significantly less perceived partner responsiveness compared to those in the control condition; however, participants in the book-reading and technoference conditions did not significantly differ from each other.

This same pattern of effects emerged for the outcome of rejection. This suggests that being ignored for any activity (i.e., book-reading or a smartphone) may be equally effective at reducing perceived partner responsiveness and increasing feelings of rejection, suggesting that smartphones may not be *uniquely* aversive.

However, results also showed that smartphone-related technoference uniquely influenced feelings of loneliness, above and beyond the negative effect of being spurned for a non-smartphone related activity (i.e., book-reading). It should be noted that this was the only instance in which smartphone use was uniquely aversive for any personal or relationship outcome. It appears that smartphone use may be uniquely aversive by enhancing feelings of loneliness, however, results did not show a robust difference between the book-reading and technoference conditions for negative emotional responses or perceived partner responsiveness. This suggests, contrary to expectations, that smartphone use may not be uniquely aversive compared to being spurned for other distracting activities.

Mediation analyses showed that experimental condition led to significant reductions in perceived partner responsiveness (i.e., as technological interference increased, perceived partner responsiveness decreased), which in turn led to significant increases in reported feelings of rejection and loneliness. In line with findings from Study 1, Study 2 results showed that the effect of technoference on negative personal outcomes was partially mediated by perceived partner responsiveness. These results collectively suggest that while there *may* be something unique about smartphone use for influencing feelings of loneliness, it seems to be the case that being spurned for any distracting activity negatively affects perceived partner responsiveness and other personal outcomes

(i.e., rejection and loneliness). Results thus far showed a robust negative effect of distracting partner activity on perceived partner responsiveness and personal outcomes; however, relationship-specific outcomes (i.e., closeness) have not yet been tested. Furthermore, it may be the case that the effect of distracting partner activities depends upon the *degree* of perceived partner responsiveness —it is possible that the negative effects of distraction may be mitigated by high levels of perceived partner responsiveness. The primary aim of Study 3 was to test this possibility.

CHAPTER 4: TESTING THE MODERATING ROLE OF PERCEIVED PARTNER RESPONSIVENESS (STUDY 3)

Study 3 Method

Study 3 was designed to directly test the idea that technoference leads to more negative personal outcomes, as well as more negative relationship outcomes, directly due to a reduction in perceived partner responsiveness. If this is the case, then when perceived partner responsiveness is experimentally manipulated, the negative effect of technoference on personal outcomes/emotional responses should reduce or disappear. Study 3 employed a 3 × 2 design with partner activity (technoference vs. book reading vs. neutral control) and perceived partner responsiveness (responsive vs. unresponsive) as between subjects factors. Feelings of rejection, loneliness, and closeness served as the dependent variables (in separate models).

Study 3 participants. Participants were deemed eligible if they were in long-term, committed romantic relationships (for a minimum of 4 months), were over the age of 18, were not in long distance relationships, and had smartphones with data plans. Additionally, as in Study 2, participants responded to a mid-study eligibility question to reduce the amount of unusable data. For Study 3, complete data were collected from 379 participants.

Study 3 procedure. Participants were recruited through Amazon's Mechanical Turk (MTurk) to take part in an online study. MTurk participants were directed to an online survey on Qualtrics, via an advertisement and link on MTurk. To ensure eligibility of the participants, pre-screening questions were administered. If eligible, participants were randomly assigned to one of six conditions (technoference responsive condition, book-

reading responsive condition, control responsive condition, technoference unresponsive condition, book-reading unresponsive condition, control unresponsive condition) and underwent manipulations of "partner activity" and perceived partner responsiveness. Specifically, participants read a vignette that asked them to recall a situation in which they were attempting to have a meaningful conversation with their partner while their partner was either 1) On his or her smartphone (technoference condition), 2) Reading a book/newspaper/magazine/kindle, or 3) No additional instruction (i.e., just having a meaningful conversation). Participants additionally recalled a specific instance in which their partner was either 1) Being responsive or 2) Not being responsive during their conversation. Specifically, participants read the following prompt, adapted from Gordon and Chen's (2016, p. 245) set of experiments (see Appendix D for Study 3 manipulation):

> "Sometimes when we interact with another person, the other person wants to multitask by [being on a smartphone vs. reading a book/newspaper/magazine or kindle] at the same time, and it feels like the other person doesn't respond to our desire to have a meaningful conversation. Other times, when the other person is [on a smartphone vs. reading a book/newspaper/magazine or kindle], we feel that the person is still able to be responsive to our conversation.
>
> For this next task, we would like you to recall a time that you and your romantic partner were having a conversation about a topic that was personally meaningful to you. Specifically, we would like you to think of an instance in which your partner was [using a smartphone vs. reading a book/newspaper/magazine or kindle], and they were [still vs. not] being responsive to what you were saying throughout the conversation. That is, recall a time that your partner was [still vs.

not] being responsive to your thoughts and feelings as they tried to multitask during your conversation. Please take a moment to recall one particular instance. Picture where you were, what you and your partner were saying, and how you were feeling."

For the control condition:

"Sometimes when we interact with another person, it feels like the other person doesn't respond to our desire to have a meaningful conversation. Other times, we feel that the person is responsive to our desire to have a meaningful conversation.

For this next task, we would like you to recall a time that you and your romantic partner were having a conversation about a topic that was personally meaningful to you. Specifically, we would like you to think of an instance in which your partner was being responsive [vs. not being responsive] to what you were saying throughout the conversation. That is, recall a time that your partner was being [not being] responsive to your thoughts and feelings as you had your conversation. Please take a moment to recall one particular instance. Picture where you were, what you and your partner were saying, and how you were feeling."

[Continued eligibility question: "Were you able to think of a situation?"]

"Once you have recalled a specific situation, please take three minutes to write about it in detail. Try to immerse yourself in the experience and relive the situation, focusing on what was said and how it made you feel."

Subsequently, the procedure of Study 3 was identical to Study 2. Participants were asked to report on perceived partner responsiveness, rejection, loneliness, and closeness at the time of the event that they recalled. Participants filled out demographic information and had a chance to add anything they wished to document at the end of the survey. Upon completion of the online survey, participants were thanked and compensated for their time and effort with $2.00 to $3.00.

Study 3 measures. (See Appendix E for complete Study 3 measures).

Technoference manipulation check. To be certain that the manipulation of technoference was successful, participants reported on the degree to which technology seemed to interfere with the ability to have a conversation on a 7-point scale (1 = Not at all to 7 = Extremely). It was expected that higher scores would be reported in the technoference conditions relative to the book reading conditions, regardless of responsiveness.

Responsiveness manipulation check. To be certain that the manipulation of perceived partner responsiveness was successful, participants reported on the degree to which their partner was responsive to their desire to interact on a 7-point scale (1 = Not at all to 7 = Extremely). It was expected that higher scores would be reported in the responsive conditions relative to the unresponsive conditions, regardless of the "partner activity" condition.

Manipulation check: Successful recall. To be certain that participants were able to recall the situation outlined in the manipulation, participants reported on the degree to which they were 1) successful at remembering the situation, and 2) had difficulty remembering the situation, on a 7-point scale (1 = Not at all to 7 = Extremely). Additionally,

participants reported on how recently the event occurred and how often they experience events like the one they had described.

Perceived partner responsiveness (adapted; Reis, Clark, & Holmes, 2004). These items were designed to get at how validated, cared for, and understood one felt by their partner immediately after the recalled event had transpired. Example items for understanding included "During your conversation, how much was your partner able to understand what you were thinking?" and "During your conversation, how much was your partner able to understand how you were feeling?" Example items for validation included "During your conversation, how much did your partner make you feel like they valued your opinion?" and "During your conversation, how much did your partner make you feel like they valued your beliefs?" Example items for caring included "During your conversation, to what extent did you feel like your partner really cared about your thoughts?" and "During your conversation, to what extent did you feel like your partner really cared about your feelings?" Responses were on a 6-point scale (1 = Not at all to 6 = Very Much).

Uncertainty about partner's activity. These items were meant to tap into the degree to which participants felt uncertain about what their partner was doing during the recalled situation. Example items included "During the event that you recalled, how certain were you of what your partner was doing?" and "During the event that I recalled, I knew exactly what my partner was doing." Responses were on a 7-point scale (1 = Not at all to 7 = Extremely).

Feelings of rejection. These items were designed to tap into feelings of social rejection experienced during the recalled event. Example items included, "During the situation that I just recalled, I felt rejected by my partner," and "During the situation that I

just recalled, I felt like I was cast aside by my partner." Responses were on a 7-point scale (1 = Strongly disagree to 7 = Strongly agree).

Feelings of loneliness. These items were designed to tap into feelings of loneliness or isolation experienced during the recalled event. Example items included "During the situation that I just recalled, I felt lonely," and "During the situation that I just recalled, I felt isolated." Responses were on a 7-point scale (1 = Strongly disagree to 7 = Strongly agree).

Closeness; Inclusion of other in self scale (Aron, et al., 1992) and single item intimacy scale. This item displayed two circles (one labeled the "self," and one labeled the "other,") with varying degrees of overlap. Participants were instructed to select the picture that best described their relationship with their romantic partner during the event that they just recalled. A score of 1 represented circles with no overlap and a score of 5 represented circles that almost entirely overlap, with greater scores indicating greater feelings of closeness to one's romantic partner. In addition, participants responded to the following single item intimacy scale: "During your conversation, I felt close to my partner." Responses were on a 7-point scale (1 = Disagree completely to 7 = Agree completely).

Study 3 Results

A Priori Power Analysis. For Study 3, based on the calculations using G*Power software for F-Tests, "ANOVA: fixed effects, special, main effects and interactions" with an estimated effect size of f = .20, numerator degrees of freedom = 5, and the number of groups = 6, the total participants needed to achieve 80% power was 327 (see Appendix I).

Study 3 Data Screening. Three hundred and seventy nine eligible participants completed the survey. Seven participants failed the key attention check and were excluded from analysis. The final sample included 372 participants (M_{age} = 36.49, *SD* = 10.35; 50.3% female, 78.0% White, 5.4% Black/African American, 5.9% Asian/East Asian/Pacific Islander, 0.8% Middle Eastern, 5.9% Hispanic, 1.6% Native American, 1.9% multiracial, 0.5% other; 90.3% had at least some college education).

Study 3 Hypothesis Testing. For Study 3, a two-way ANOVA was conducted with partner activity (technoference vs. reading a book vs. neutral control) and perceived partner responsiveness (responsive vs. unresponsive) as between subjects factors, with emotional responses (i.e., rejection and loneliness) and feelings of closeness as the dependent variables (in separate models). Follow up simple slopes analyses were conducted to test the hypothesis that technoference led to more negative emotional responses and decreased feelings of closeness only when the partner was unresponsive.

Technoference and emotional responses (H5). A two-way analysis of variance was conducted with partner activity (technoference, book-reading, or control) and responsiveness (responsive versus not responsive) as the independent variables, and rejection as the dependent variable. There was a significant main effect of partner activity on feelings of rejection, $F(2, 360) = 5.46$, $p = .005$, $\eta_p^2 = .029$, as well as a significant main effect of responsiveness on feelings of rejection $F(1, 360) = 78.63$, $p < .001$, $\eta_p^2 = .18$. Similar to results from Study 2, participants in the technoference condition (*M* = 3.38, *SD* = 1.63, 95% CI [3.09, 3.67]) and the book-reading condition (*M* = 3.21, *SD* = 1.58, 95% CI [3.93, 3.50]) reported significantly higher feelings of rejection compared to those in the control condition (*M* = 2.74, *SD* = 1.72, 95% CI [2.44, 3.05]) (see Figure 14). Results also

showed that those in the unresponsive condition reported significantly higher feelings of rejection (*M* = 3.81, *SD* = 1.49, 95% CI [3.59, 4.03]) compared to those in the responsive condition (*M* = 2.44, *SD* = 1.54, 95% CI [2.21, 2.66]).

Planned comparisons revealed that those in the technoference condition and those in the book-reading condition reported significantly higher levels of rejection compared to those in the control condition $t(363) = -3.02$, $p = .003$, however, participants in the technoference condition and the book-reading condition did not significantly differ from each other $t(363) = -0.77$, $p = .443$ for reported feelings of rejection. This replicates findings from Study 2 and suggests that a partner's activity does affect feelings of rejection, but that the effect of being ignored more generally (i.e., smartphone use OR book-reading) leads to increased feelings of rejection, rather than smartphone use specifically.

Importantly, there was a significant interaction of partner activity and responsiveness for feelings of rejection $F(2, 360) = 6.84$, $p = .001$, $\eta_p^2 = .04$, such that partner activity only significantly affected feelings of rejection in the *responsive* condition. Specifically, when partners were responsive, there were statistically significant differences in reported feelings of rejection as a function of a partner's activity, such that those in the technoference condition and the book-reading condition reported significantly higher feelings of rejection relative to those in the control condition (technoference *M* = 2.88, *SE* = 0.19, 95% CI [2.51, 3.25]; book-reading *M* = 2.75, *SE* = 0.19, 95% CI [2.38, 3.13]); control *M* = 1.69, *SE* = 0.19, 95% CI [1.33, 2.06]). This is in line with predictions, replicates findings from Study 2, and suggests that a partner's activity can lead to increases in feelings of rejection.

Simple effects analysis revealed that participants in the technoference condition and the book-reading condition reported significantly higher levels of rejection compared to the control condition (p's < .001), but were not significantly different from each other (p = .631). This replicates findings from Study 2 and suggests that there may not be anything unique about the smartphone that leads to increases in feelings of rejection—rather, when a partner is distracted more generally (i.e., by a smartphone OR by physical reading material), this leads to increased feelings of rejection. When partners were unresponsive, there were no statistically significant differences in reported feelings of rejection as a function of a partner's activity (F < 1; technoference M = 3.88, SE = 0.20, 95% CI [3.51, 4.25]; book-reading M = 3.68, SE = 0.19, 95% CI [3.31, 4.06]; control M = 3.86, SE = 0.19, 95% CI [3.49, 4.24]). This suggests that when partners are being unresponsive, perceived distractions of the partner (i.e., partner activity) do not affect feelings of rejection—if someone feels that their partner is being unresponsive, reported feelings of rejection are high, regardless of the activity that the partner engages in while being unresponsive. This is conceptually in line with H5, which posited that a partner's activity may only influence personal outcomes under specific circumstances (i.e., when responsiveness comes into play), however, the nature of the interaction was not in line with expectations. Only when people perceive some degree of responsiveness does a partner's distracting activity influence feelings of rejection; otherwise, when partners are unresponsive, feelings of rejection are high regardless of the activity in which partners are engaging.

Another two-way analysis of variance was conducted with partner activity (technoference, book-reading, or control) and responsiveness (responsive versus not

responsive) as the independent variables, and loneliness as the dependent variable. There was no main effect of partner activity on feelings of loneliness, $F(2, 363) = 2.05$, $p = .130$, $\eta_p^2 = .01$. In other words, there were no significant differences for reported levels of loneliness as a function of a partner's activity (technoference $M = 3.29$, $SD = 1.63$, 95% CI [3.00, 3.57]; book-reading condition $M = 3.23$, $SD = 1.73$, 95% CI [2.92, 3.54]; control condition $M = 2.89$, $SD = 1.71$, 95% CI [2.59, 3.20]) (see Figure 15). Thus, the finding for loneliness did not replicate from Study 2, suggesting that a partner's activity may not influence feelings of loneliness.

There was a significant main effect of responsiveness on feelings of loneliness, $F(1, 363) = 50.79$, $p < .001$, $\eta_p^2 = .12$. Similar to Study 2, and similar to the Study 3 findings on rejection, those in the unresponsive condition reported significantly higher feelings of loneliness ($M = 3.73$, $SD = 1.61$, 95% CI [3.50, 3.97]) compared to those in the responsive condition ($M = 2.55$, $SD = 1.57$, 95% CI [2.33, 2.78]). Again, this suggests that when partners are being unresponsive, perceived distractions of the partner (i.e., partner activity) do not affect personal outcomes (in this instance, loneliness)—if someone feels that their partner is being unresponsive, reported feelings of loneliness are high, regardless of the activity that the partner engages in while being unresponsive. The interaction between partner activity and responsiveness for predicting feelings of loneliness was not significant $F(2, 363) = 1.19$, $p = .306$, $\eta_p^2 = .01$. Contrary to expectations, responsiveness does not appear to mitigate the effect of technoference, likely because (at least in the instance of loneliness), the partner's activity does not appear to influence feelings of loneliness at all.

Technoference and closeness (H5). Another two-way analysis of variance was conducted with partner activity (technoference, book-reading, or control) and responsiveness (responsive versus not responsive) as the independent variables, and closeness (IOS) as the dependent variable. There was a significant main effect of partner activity on feelings of closeness, ($F(2, 363) = 9.60$, $p < .001$, $\eta_p^2 = .05$), as well as a significant main effect of responsiveness ($F(1, 363) = 29.53$, $p < .001$, $\eta_p^2 = .08$) on reported feelings of closeness. However, there was no significant interaction of responsiveness and partner activity on feelings of closeness $F(2, 363) = 2.19$, $p = .114$, $\eta_p^2 = .012$.

Participants in the technoference condition ($M = 2.50$, $SD = 1.25$, 95% CI [2.27, 2.72]) and the book-reading condition ($M = 2.64$, $SD = 1.19$, 95% CI [2.43, 2.85]) reported significantly lower feelings of closeness compared to those in the control condition ($M = 3.18$, $SD = 1.47$, 95% CI [2.92, 3.44]). This suggests that when partners are distracted, this leads to reductions in feelings of closeness. Results also showed that those in the unresponsive condition reported significantly lower feelings of closeness ($M = 2.41$, $SD = 1.24$, 95% CI [2.23, 2.59]) compared to those in the responsive condition ($M = 3.12$, $SD = 1.34$, 95% CI [2.93, 3.32]). Unsurprisingly, when partners are responsive, people report greater feelings of closeness to their partners.

Planned comparisons revealed that those in the technoference condition and those in the book-reading condition reported significantly lower levels of closeness compared to those in the control condition $t(366) = 4.23$, $p < .001$, however, participants in the technoference condition and the book-reading condition did not significantly differ from each other ($t(366) = 0.86$, $p = .390$) for reported feelings of closeness (see Figure 16).

This suggests that a partner's activity does affect feelings of closeness, but that the effect of being ignored more generally (i.e., smartphone use OR book-reading) drives the decreases in feelings of closeness, rather than smartphone use specifically. The collective findings from Study 3 do not lend support to H5.

Study 3 Discussion

Study 3 tested the idea that smartphone-related technoference negatively influences emotional responses/personal outcomes and feelings of closeness to one's partner to a greater degree than other interfering activities (i.e., reading a book), and that this effect is reduced (or disappears) when perceived partner responsiveness is experimentally enhanced. The results did not support these ideas. We originally thought that the negative effect of technoference on personal and relationship outcomes would only hold for those who had unresponsive partners, however, the only significant interaction that emerged showed that participants differed in reported feelings of rejection only within the *responsive* condition. Results showed that when participants had unresponsive partners, feelings of rejection, loneliness, and closeness were approximately equal. However, when participants had responsive partners, participants with partners who were either on their phone or reading a book reported significantly lower levels of closeness and higher levels of rejection. These results suggest that a certain degree of responsiveness is necessary for a partner's distracting activity (or lack thereof) to matter for influencing feelings of rejection, loneliness, and closeness.

The main effect of partner activity on loneliness that emerged in Study 2 did not replicate in Study 3, and there were no significant differences between the technoference and book-reading conditions for any personal or relationship outcomes in Study 3. These

findings suggest that partners must be responsive (at least to some degree) for their distracting activity (or lack thereof) to matter for influencing personal and/or relationship outcomes. Furthermore, Study 3 findings partially replicate findings from Study 2, and suggest that overall, technoference may not be uniquely aversive to people. Rather, being spurned for any distracting activity may increase feelings of rejection and loneliness, and decrease feelings of closeness. Furthermore, even when partners are engaging in distracting activities, they must be at least partially responsive for their distraction (or lack thereof) to influence personal and relationship outcomes.

Unsurprisingly, when partners were perceived as unresponsive, people reported feeling significantly more rejected and lonely, as well as significantly less close to their partners. This effect was robust in Studies 2 and 3. In Study 3, there was a strong main effect of responsiveness on feelings of rejection, loneliness, and closeness, such that those in the unresponsive condition felt significantly lonelier and more rejected, and significantly less close to their partners compared to those in the responsive condition. This is in line with a large body of research that suggests that perceived partner responsiveness plays a key role in having happy, healthy relationships.

Thus far, results have suggested that technoference exerts a negative effect on personal and relationship outcomes, and this effect is mediated by perceived partner responsiveness. In line with the theoretical analysis outlined in the Introduction section, technoference (and distracting activities more broadly) appear to lead to reductions in perceived partner responsiveness, which in turn leads to more negative personal and relationship outcomes. While these effects have emerged in a correlational study (Study 1) and two experimental studies (Studies 2 and 3), the question of how technoference is

related to personal and relationship outcomes in daily life remains to be answered. The primary aim of Study 4 was to address how technoference influences perceived partner responsiveness, feelings of rejection, and feelings of closeness over a fourteen day period.

CHAPTER 5: TESTING THE EFFECTS OF TECHNOFERENCE IN DAILY LIFE (STUDY 4)

Study 4 Method

Study 4 was designed to explore how daily experiences of technoference influence perceived partner responsiveness, negative personal outcomes (i.e., rejection), and feelings of closeness to one's partner over a two-week period. We hypothesized that participants with partners who engaged in more technoference would perceive less responsiveness and would report more negative personal and more negative relationship outcomes than participants with partners who engaged in less technoference. In other words, we predicted significant partner effects of technoference on perceived partner responsiveness, and significant actor effects of perceived partner responsiveness on subsequent personal and relationship outcomes. These effects were proposed to be present on the same day (i.e., partner technoference on day t-1 leading to a reduction in the actor's perceived partner responsiveness on day t-1, as well as greater feelings of rejection and a reduction in closeness on day t-1), and the actor effects (perceived partner responsiveness on rejection and closeness) were proposed to be present the following day as well (day t).

Additionally, the perception of partner-perpetrated technoference was hypothesized to lead to a direct reduction in perceived partner responsiveness as well as reductions in personal and relationship outcomes for the actor. In other words, we expected only significant actor effects to emerge when the perception of partner-perpetrated technoference was the primary independent variable of interest.

To test these predictions, dyadic data were represented using a standard actor partner interdependence model (APIM; Kashy & Kenny, 2000; Kenny, Kashy, & Cook, 2006), with the same-day technoference predicting same-day perceived partner responsiveness, rejection, and closeness (in separate models). In addition, a lagged actor partner interdependence model (APIM), was analyzed, with perceived partner responsiveness on day t-1 predicting day t's feelings of rejection and closeness.

Study 4 participants. Participants were eligible for the proposed studies if they were in long-term, committed romantic relationships (for a minimum of 4 months), were over the age of 18, were not in long distance relationships, had smartphones with data plans, and had a romantic partner who was willing to participate in the study with them. In addition, participants must have either been living with their romantic partners or spending most nights with their romantic partners. The total number of couples recruited was 110 (N = 220).

Study 4 procedure. Participants were recruited through Wayne State University's participant subject pool. Interested couples emailed the research team, answered eligibility questions via email, and corresponded with research assistants to arrange a time to come into the lab to complete baseline measures and be trained for the daily diary study (lab session length was approximately 1.5 hours). During the in-lab session, couples were led to a room with comfortable chairs to sit and read the informed consent documents. Couples were subsequently led to individual, private cubicles (adjacent to one another) and completed online baseline measures that asked about technology use, perceived partner responsiveness, self-disclosure, emotions, and closeness. Upon completion of the survey, couples were led back to the room in which they completed the

informed consent, and downloaded the application called “Checky” onto their phones. Alternatively, participants were instructed on how to access their battery use (under “settings” on most smartphones) or the iPhone application “screen time” as an objective measure of time spent on their smartphones when asked to report daily technology use for the daily diaries. Participants then received instructions about the daily diary portion of the study; participants were told that they would be texted or emailed (depending on one’s preference) links to complete a morning diary (within three hours of waking) and an evening diary (within one hour of going to bed). Participants were asked what time they would like to receive the surveys given the time constraints, which was recorded for each participant. Subsequently, emails or email-to-text messages were set up using Gmail’s Boomerang application, and surveys were sent to each member of the dyad at their specified preferred times.

Following the in-lab session, participants responded to daily diaries twice per day for two weeks that inquired about technology use, partner responsiveness, emotions, and feelings of closeness (essentially, shortened versions of measures from Study 1). Upon completion of the daily diary portion of the study, participants received their compensation through SONA. Participants were granted 5 credit hours toward their requirement for an introductory psychology course.

Study 4 measures. (See Appendix F for complete Study 4 measures).

Baseline measures. The baseline survey included all measures that were reported in Study 1; these included the TIDES and TILES (McDaniel & Coyne, 2016), intrusiveness of technology, conflict over technology, average time spent on technology per day (both for self and partner), self-disclosure and perceived partner responsiveness

(Reis, Clark, & Holmes, 2004), self-esteem (Rosenberg, 1965), feelings of rejection, loneliness, relationship satisfaction (Rusbult et al., 1998), and inclusion of other in self (closeness; Aron et al., 1992).

Morning daily diary measures. Within three hours of waking, participants reported on whether or not they and/or their partner used a technology device within 30 minutes of going to sleep the previous night (with "yes," "no," or "N/A" as responses), closeness to one's partner that morning (i.e., "how close did you feel to your partner this morning?" on a 0 = not close at all to 5 = extremely close scale), relationship satisfaction (i.e., "In general, how satisfied were you with your relationship this morning?" on a 0 = not at all to 5 = extremely scale), emotions felt that morning (i.e., "how anxious/angry/worried/sad/etc., do you feel this morning?" on a 1 = not at all to 5 = extremely scale), amount of time spent on technology since waking (in minutes), amount of time one's partner spent on technology since waking (in minutes), whether or not the amount of time was estimated using a phone use application (with "yes," "no," or "N/A" as responses), and subjective measures of technoference (i.e., "how bothersome was your partner's use of technology this morning" on a 1 = not at all to 7 = extremely scale). Participants also reported on the quality of last night's sleep (i.e., "how well did you sleep last night" on a 1= terrible to 8 = great scale). It should be noted that the morning diary data and the baseline data were not of principal interest for this dissertation, and they will not be discussed further.

Evening daily diary measures. Evening diary measures included all morning diary measures (excluding sleep-related items), with the addition of measures of perceived partner responsiveness, feelings of rejection, loneliness, and all of the same

relationship measures completed in the baseline survey (i.e., perceptions of partner technology use and closeness).

Study 4 Results

A Priori Power Analysis. There is no agreed upon method to calculate power for dyadic over-time daily diary studies; however, an online dyadic analysis power calculator does exist (Ackerman & Kenny, 2016). Preliminary analysis from Study 1 showed that perceived technoference perpetrated by the partner and perceived partner responsiveness were correlated at r = -.42. Perceived partner responsiveness was correlated with rejection and loneliness at r = -.43 and r = -.45 respectively, and rejection and loneliness were respectively correlated with relationship satisfaction at r = -.37 and r = -.46, thus it appeared that effect sizes were medium to large.

Using an actor-partner interdependence model with desired power of .80, actor effects estimated at r = .37, and partner effects estimated at r = .43 (optimistically), with correlations between actor and partner effects and errors set at .30, the number of (distinguishable) dyads was estimated to be 59 to detect partner effects and 102 to detect actor effects (see https://robert-a-ackerman.shinyapps.io/APIMPowerRdis/ for calculator) (see Appendix J). It should be noted that estimated sample sizes were for data at a single time point; the effective power across fourteen diary days should be substantially greater.

The goal in Study 4 was to collect 120 dyads, to allow for reasonable data screening (i.e., excluding non-compliant participants, participants who provide less than 80% of survey data, etc.), however, analysis was conducted for the purpose of this dissertation in May 2018, and the final number of dyads collected was 110.

Study 4 Data Screening. One hundred and ten couples completed the daily diary study. Dyads were included in analysis if they reported using an objective measure of technology use (i.e., the use of the "screen time," app for iPhones, battery-based screen time use for Androids, or the use of an external phone use tracking app such as "Moment," or "Checky"), if they spent at least some time with their partner on each daily diary day, and if they completed at least 80% of the daily diaries. Fourteen dyads did not complete any daily diaries, and twenty five other dyads completed fewer than 50% of the diaries (each member completed fewer than seven days' worth of diary data). Eight dyads had only one member complete diaries, and therefore did not have analyzable dyadic data. The total number of analyzable dyads was 63 (N = 126 individuals, M_{age} = 22.17, SD = 5.02; 50.0% female, 64.3% White, 9.5% Black/African American, 6.3% Asian/East Asian/Pacific Islander, 9.5 % Middle Eastern, 4.8% Hispanic, 4.8% multiracial, 0.8% other).

The data was structured so that diary days were nested within individuals, and individuals were nested within couples. This structure accounts for the interdependence of daily diary reports for each individual (i.e., the similarity between any given individual's diary days over the 14-day period), as well as the interdependence within dyads (i.e., the similarity between actor reports and partner reports within each dyad). All independent variables were centered around the person mean prior to analysis.

Study 4 Hypothesis Testing. For Study 4, actor-partner interdependence models (APIM) were constructed, and analysis was conducted with the reported number of minutes that one's self spends on technology as the independent variable, and self-reported perceived partner responsiveness, feelings of rejection, and feelings of

closeness as the dependent variables on the same day. Additionally, an identical analysis was conducted with the perceptions of a partner's technology use frequency as the independent variable, and self-reported perceived partner responsiveness, feelings of rejection, and feelings of closeness as the dependent variables on the same day. Finally, models were tested with a time lag of one day for perceived partner responsiveness on feelings of rejection and closeness; perceived partner responsiveness from the previous day was the independent variable, and feelings of rejection and closeness on the present day were the dependent variables.

Same day analyses (H6 and H7). Multilevel modeling with restricted maximum likelihood (REML) was used to estimate the effect of one's own amount of time spent on technology ("time on technology" in minutes) on one's own reported perceived partner responsiveness (i.e., an actor effect of time on technology on perceived partner responsiveness), as well as the effect of one's own time spent on technology on one's partner's perceived partner responsiveness (i.e., a partner effect) on the same day.

Time on technology predicting perceived partner responsiveness. Contrary to expectations, results showed that there were no significant actor or partner effects of objectively-assessed (via smartphone) time spent on technology on perceived partner responsiveness on the same day (actor estimate = -.0002, *SE* = .0002, *p* = .22, 95% CI [-.0006, .0001], partner estimate = -.0002, *SE* = .0002, *p* = .22, 95% CI [-.0006, .0001]). This suggests that the time that the self spent on technology did not affect one's own perceived partner responsiveness, or the perceived partner responsiveness of one's partner; additionally, the time that partners spent on technology did not appear to affect perceived partner responsiveness.

Time on technology predicting rejection. Additional analyses were conducted with the reported number of minutes spent on technology predicting feelings of rejection on the same day. Contrary to expectations, there were no significant actor or partner effects of time spent on technology on reported feelings of rejection on the same day (actor estimate = .0005, *SE* = .0004, *p* = .19, 95% CI [-.0002, .0012], partner estimate = .00004, *SE* = .0004, *p* = .92, 95% CI [-.0007, .0007]). This suggests that the amount of time that one spent on technology devices did not influence feelings of rejection on the same day.

Time on technology predicting closeness. Identical analyses were conducted with the reported number of minutes spent on technology predicting feelings of closeness on the same day. Contrary to expectations, there were no significant actor or partner effects of time spent on technology on feelings of closeness on the same day (actor estimate = -.0003, *SE* = .0002, *p* = .19, 95% CI [-.0008, .0002], partner estimate = -.00001, *SE* = .0002, *p* = .57, 95% CI [-.0006, .0003]). This suggests that the amount of time that people spent on technology did not affect feelings of closeness on the same day. Collectively, the same day analyses with the number of minutes spent on technology as the IV suggest that the amount of time spent on technology did not influence perceived partner responsiveness, feelings of rejection, or feelings of closeness on the same day.

Perceptions of partner technology use frequency predicting perceived partner responsiveness. A nearly identical analysis was conducted with *perceptions* of partner technology use predicting perceived partner responsiveness; contrary to expectations, there were no significant actor or partner effects of perceived partner technology use on perceived partner responsiveness on the same day (actor estimate = .02, *SE* = .01, *p* = .13, 95% CI [-.01, .05], partner estimate = -.004, *SE* = .01, *p* = .74, 95% CI [-.03, .02]).

This suggests that the perception of partner technology use did not influence perceived partner responsiveness on the same day.

Perceptions of partner technology use frequency predicting rejection. Additional analyses were conducted with *perceptions* of partner technology use predicting feelings of rejection on the same day. Contrary to expectations, there were no significant actor or partner effects of perceived technology use on reported feelings of rejection on the same day (actor estimate = -.04, *SE* = .02, *p* = .07, 95% CI [-.091, .004], partner estimate = .02, *SE* = .02, *p* = .37, 95% CI [-.03, .07]). This suggests that the perception of partner technology use did not influence feelings of rejection on the same day.

Perceptions of partner technology use frequency predicting closeness. A nearly identical analysis was conducted with perceptions of partner technology use predicting feelings of closeness on the same day. There was a significant actor effect of perceptions of partner technology use on closeness on the same day (actor estimate = .04, *SE* = .02, *p* = .01, 95% CI [.01, .08]) (see Figure 17); contrary to expectations, however, as an actor's perceptions of a partner's technology use increased (relative to their own fourteen day average), the actor's feelings of closeness to the partner also increased on that same day. Although this effect was in the opposite direction of prediction, it is possible that participants interpreted "frequency of partner technology use" to encompass both the time spent together and the time spent apart from one another. As such, it makes sense that if people perceive that their partners use technology more frequently to communicate *with each other*, feelings of closeness should be enhanced on days that partners are perceived to use technology more. Contrary to expectations, there was not a significant partner effect of perceived partner technology use on feelings of closeness on the same day

(partner estimate = .02, *SE* = .02, *p* = .31, 95% CI [-.02, .05]). Collectively, the same day analyses with perception of partner technology use as the independent variable suggest that perceptions of partner technology use did not affect perceived partner responsiveness and feelings of rejection on the same day. Additionally, contrary to H7, perceptions of partner technology use predicted *increases* in closeness on the same day, suggesting that as perceptions of a partner's technology use increased, feelings of closeness also increased.

Lagged analyses (H6 and H7). Next, analyses were conducted with perceived partner responsiveness on day t-1 predicting feelings of rejection and closeness on day t.

Yesterday's perceived partner responsiveness on today's rejection. Results showed a significant actor effect of yesterday's perceived partner responsiveness on today's feelings of rejection (actor estimate = -.13, *SE* = .06, *p* = .034, 95% CI [-.26, -.01]); in line with expectations, greater perceived partner responsiveness yesterday (relative to one's fourteen-day average) significantly predicted decreased feelings of rejection today (see Figure 18). This suggests that when partners were perceived as being responsive, people felt less rejected on the subsequent day—thus, there may be a carry-over effect of responsiveness that can help mitigate feelings of rejection. The partner effect was also significant (partner estimate = -.17, *SE* = .06, *p* = .007, 95% CI [-.29, -.05]). This suggests that as an actor's perceived partner responsiveness increased (relative to their own 14-day average) on the previous day, a partner's feelings of rejection on the subsequent day was reduced (see Figure 18). In other words, when actors' perceived partner

responsiveness on a previous day was greater, their partners reported reduced feelings of rejection on the following day.

Yesterday's perceived partner responsiveness on today's closeness. A nearly identical analysis was conducted with perceived partner responsiveness on day t-1 predicting feelings of closeness on day t. Contrary to expectations, there were no significant actor or partner effects of yesterday's perceived partner responsiveness on today's feelings of closeness, though the direction of the effects was in line with predictions (actor estimate = .04, *SE* = .04, *p* = .361, 95% CI [-.04, .12], partner estimate = .01, *SE* = .04, *p* = .79, 95% CI [-.07, .10]). This suggests that the effect of perceived partner responsiveness may be more "temporally sensitive" for feelings of closeness.

Study 4 Discussion

The daily diary study examined the effects of smartphone-related technoference in everyday life across a two-week period, to test the idea that daily experiences of technoference influence perceived partner responsiveness, feelings of rejection/isolation, and relationship outcomes (i.e., closeness). Although we hypothesized that the time one spends on technology would negatively predict perceived partner responsiveness, positively predict rejection, and negatively predict closeness on the same day for both one's self and one's partner, results showed no such effects. Similarly, we hypothesized that perceptions of a partner's technology use would predict reduced perceived partner responsiveness, increased rejection, and reduced closeness on the same day for both one's self and one's partner; there were no significant actor or partner effects on perceived partner responsiveness or rejection.

There was a significant actor effect of perceptions of a partner's technology use on feelings of closeness on the same day; however, this effect was in the opposite direction of the prediction—actors who perceived that their partners were on technology more frequently reported significantly greater feelings of closeness to that partner on the same day. It could be the case that participants interpreted the "perception of partner technology use" to encompass time spent apart as well as time spent together. If this was the case, and partners were using technology to connect with each other, it makes sense that increased communication with one's partner would lead to increases in feelings of closeness. Alternatively, it could be the case that satisfied couples interpret their partner's technology use in a more favorable light than couples who do not feel as close to their partners.

The time lag analysis showed that, in line with expectations, greater actor and partner perceived partner responsiveness yesterday predicted decreased feelings of rejection today. However, yesterday's perceived partner responsiveness did not predict today's feelings of closeness, suggesting that perceived partner responsiveness may need to be experienced more consistently (i.e., on the same day) in order for perceived partner responsiveness to influence feelings of closeness.

CHAPTER 6: GENERAL DISCUSSION

The present set of studies sought to investigate how technology use influences both personal and relationship outcomes. Research suggests that technology has increasingly become problematic for people's relationships and well-being (Halpern & Katz, 2017; McDaniel & Coyne, 2016; McDaniel, 2017; Przybylski & Weinstein, 2013; Roberts & David, 2016; Vanden Abeele, Antheunis, & Schouten; 2016), and the primary goal of the present research was to test *how* interference from technology (technoference) might affect personal and relationship outcomes. The theoretical argument outlined in the Introduction posited that technology use while in the presence of partners may be akin to receiving (or doling out) "mini silent treatments." Furthermore, the theoretical analysis suggested that these smartphone-related mini silent treatments are particularly aversive because of the ambiguity and uncertainty that is unique to smartphone use. In line with the interpersonal process model (Reis and Shaver, 1988), perceived partner responsiveness was proposed as the key mechanism that explains how technoference may negatively influence personal and relationship outcomes. Four studies collectively tested the links between technoference, perceived partner responsiveness, feelings of rejection, loneliness, and closeness to one's partner using correlational, experimental, and daily diary methodologies.

Interpretation of Findings

Findings from the set of four studies were mixed. Some hypotheses were supported, however, there were many unexpected null findings, and several findings were in the opposite direction of predictions. In the correlational study, results showed that technoference can negatively influence personal and relationship outcomes, particularly

when technoference is perceived to be perpetrated by one's partner, and these effects were mediated by perceived partner responsiveness.

Experimental results were mixed and collectively suggested that being ignored by one's partner more generally (i.e., when a partner is distracted by a smartphone OR paper reading material) drives more negative personal and relationship outcomes. This was evidenced by significantly higher reports of rejection and loneliness for those in the technoference or book-reading conditions compared to a neutral control group in Study 2, and significantly higher reports of rejection and lower reports of closeness for those in the technoference or book-reading conditions compared to a neutral control group in Study 3. Specifically, in Study 2, those in the technoference and book-reading conditions reported significantly lower perceived partner responsiveness, and significantly higher levels of rejection and loneliness compared to those in the control condition. However, only for reported feelings of loneliness did participants significantly differ between the technoference and book-reading condition. The lack of significant differences between the book-reading and technoference groups for personal and relationship outcomes ultimately suggests that being spurned for a smartphone may not be any worse than being spurned for any other distracting activity. This finding was replicated in Study 3; there were no significant differences between the technoference and book-reading conditions for any personal or relationship outcomes (regardless of their responsiveness condition).

In Study 2, the effect of a partner's distracting activity on feelings of rejection and loneliness was mediated by perceived partner responsiveness such that distraction led to significant decreases in perceived partner responsiveness, which in turn led to increased feelings of rejection and loneliness. This finding is in line with results from Study

1. Collectively, the mediational results from Studies 1 and 2 suggest that perceived partner responsiveness is a key mechanism for how technoference (and distracting partner activities in general) negatively influences personal and relationship outcomes.

The theoretical argument outlined in the Introduction identified ambiguity and feelings of uncertainty as key components that make smartphone use in the context of face-to-face interactions uniquely aversive. However, results did not support this idea. When conducting follow up exploratory analyses to investigate why there were no differences between groups, levels of reported uncertainty were not significantly different between the smartphone and book-reading groups in either of the experimental studies. Thus, the idea that smartphones are unique due to the ambiguity and uncertainty associated with them did not garner support from the present studies. It may be the case that the manipulation used (i.e., vignettes) did not adequately capture how technoference is experienced in a more ecological setting. Examination of participants' written responses to the manipulations suggested that participants had difficulty bringing to mind instances of when partners ignored them in favor of a book/newspaper/magazine, so it may be the case that a different "distraction comparison group" should be utilized in the future.

Although results suggest that technoference may not be unique compared to being ignored in favor of any other activity (i.e., reading a book) for predicting/explaining more negative personal and relationship outcomes, that is not to say that there is nothing unique about technoference. Experimental results showed that being distracted by either book-reading or technoference led to significant reductions in perceived partner responsiveness and closeness, as well as increases in rejection and loneliness. Though it is intuitive to suggest that distracted partners are less able to respond to one's needs,

the sheer ubiquity of technoference may be what makes it unique from other distracting activities, and results suggest that the effects of being distracted do significantly affect personal and relationship outcomes.

The daily diary results were not in line with expectations. Though we originally hypothesized both actor and partner effects of technoference on perceived partner responsiveness, rejection, and closeness, results showed that both increased time and increased perceptions of time spent on technology did not predict reductions in perceived partner responsiveness, increases in rejection, or reductions in closeness on the same day. Contrary to expectations, when actors perceived greater partner technology use, reported feelings of closeness on the same day *increased*. As mentioned previously, it may be the case that participants interpreted "partner technology use frequency" to encompass time spent together as well as time spent apart, which makes the increase in closeness easier to interpret. If participants perceived that their partners used technology frequently to communicate with each other, it makes sense that feelings of closeness to that partner would be enhanced on days that partners were perceived to use technology more.

Strengths and Limitations

The present set of studies had a number of strengths. Research questions were tested using a variety of methodologies. The experimental design in Studies 2 and 3 allows for more confidence that partner activities (i.e., distraction) have causal effects for perceived partner responsiveness, feelings of rejection, loneliness, and closeness. Additionally, findings from Study 2 were able to be directly replicated in Study 3 (though not all effects were successfully replicated), and consistently demonstrated that partners'

distracting activities led to increases in feelings of rejection. Additionally, the daily diary methodology in Study 4 was intensive, and allowed for an in-depth look at how technology use and perceptions of technology use may influence personal and relationship outcomes.

Although results were not in line with expectations, these findings are nevertheless important. It may be the case that the amount of time spent on smartphones in daily life (and the amount of time partners are perceived to spend on smartphones in daily life) is not in and of itself detrimental to personal and relationship outcomes. It may be the case that technoference occurs relatively infrequently, and/or that the definition of technoference should be constrained to include only instances in which technology is perceived as problematic in the moment. The positive association between perceptions of partner technology use and increased feelings of closeness in daily life suggests that when technology is used to bridge communication gaps, this can positively influence romantic relationships. While it is not groundbreaking to find associations between increased communication and increased closeness, these daily diary results suggest that technoference may not be as problematic for romantic partners as recent research has suggested. This finding is in line with recent research on adolescent well-being and technology, which showed (in a sample using three large, nationally representative datasets including over 350,000 participants within the UK and US) that the negative effect of digital technology on well-being is modest (Orben & Przybylski, 2019).

It may also be the case that participants who met the criteria for the daily diary analysis were particularly happy, close couples who did not experience many instances of technoference. Examination of the descriptive statistics showed that participants

reported high levels of closeness and perceived partner responsiveness, and low levels of loneliness and rejection. In the future, it may be prudent to recruit a sample of couples from the community that would be more likely to have greater variation in personal and relationship outcomes (irrespective of technoference).

The set of studies also had some limitations. Study 1 was cross-sectional; thus causality cannot be evaluated. For the experiments, a vignette was used as the manipulation, and relied on participants' memory and imagination. It would be prudent to replicate the experiments in the lab, and more directly manipulate perceived partner responsiveness and partner activity (i.e., by recruiting partners as confederates and directly manipulating perceived partner responsiveness). It is important to note that when recruiting participants for the experimental studies, it was much more difficult to recruit participants who read paper material on a regular basis (versus used a smartphone regularly). As technology has advanced, fewer people seem to read paper books, newspapers, and magazines, and it could be the case that there was something unique about the sampled "book-readers" that makes results more difficult to interpret. For example, it may be the case that avid book-readers become entranced in their reading material at similar levels to those who are entranced by their smartphones. It may be prudent to develop a different "distraction activity" to test against technoference in future studies.

Additionally, in Study 3, when people were asked to recall an instance of their partner multitasking while on either a book or smartphone, descriptive results showed that participants recalled their partners putting their books/phones down in both the responsive and unresponsive conditions (41% thought of their partner putting the book

down in the book-reading responsive condition, 52.5% thought of their partner putting the book down in the book-reading unresponsive condition, 42.9% thought of their partner putting the smartphone down in the technoference responsive condition, and 59.4% thought of their partner putting the smartphone down in the technoference unresponsive condition). It is possible that thinking of instances in which partners put down a distracting activity signaled a level of perceived responsiveness that mitigated the effect that split attention would have on emotional responses and closeness. It is also possible that the vignette manipulation was simply not effective, and that people had difficulty recalling situations in which their partners were multitasking while being responsive. It should be noted, however, that participants did not significantly differ in reported levels of difficulty for recalling an experience between conditions. There was no significant interaction effect of partner activity and responsiveness on recall difficulty ($F(2, 366) = 2.37$, $p = .095$, $\eta_p^2 = .013$), no significant main effect of partner activity on recall difficulty ($F(1, 366) = 0.01$, $p = .986$, $\eta_p^2 = .000$), and no significant main effect of responsiveness on recall difficulty ($F(1, 366) = 0.76$, $p = .384$, $\eta_p^2 = .01$). These findings suggest that using a vignette for manipulating partner activity and perceived partner responsiveness may not be effective, and future studies should employ in-lab manipulations to better represent how distraction may unfold in a more ecological setting.

In Study 4, participants were recruited from WSU's subject pool (i.e., a convenience sample), and the number of analyzable dyads was reduced when the necessary restrictions were imposed for data analysis (i.e., participants must have spent at least some time with their partners on the same diary day, and must have used an objective measure for their smartphone use). The analyzable sample may have been

underpowered to detect small effects that may be present. Finally, participants in Study 4 did not report on the specific apps/activities they were engaging in while on their phones over the fourteen-day period. It may be the case that personal and relationship outcomes are affected by particular types of phone use, such as social media (Kross et al., 2013); however, this could not be evaluated in the present set of studies.

Future Directions and Suggestions for Future Research

People use their phones to communicate with others, and importantly, smartphones are instrumental for maintaining current romantic relationships (Faulkner & Culwin, 2005; Thurlow, 2003; Tulane & Beckert, 2013). However, people also frequently use smartphones to communicate with others with whom they do not have a romantic relationship (i.e., friends, family, co-workers, etc.; Andreassen & Pallesen, 2014). As mentioned previously, one limitation of the present set of studies was that the nature of people's technology use was not assessed. Thus, it could be the case that perceptions of increased partner technology use tap into instances in which couples use technology to communicate with *each other*. For the purpose of the present studies, this would not be deemed true "technoference," because the primary assumption of technoference is that the technology use is *interfering* with face to face interactions with one's romantic partner (rather than supplementing them).

Part of the purpose of the present studies was to test if the amount of time spent on technology in daily life could be detrimental to personal and relationship outcomes; since there was no compelling evidence in the daily diary study that time spent on smartphones negatively influences personal and relationship outcomes, future research should focus in on instances of *problematic* technology use more specifically. Additionally,

future research should investigate if the specific content of one's technology use influences personal and relationship processes. It may be the case, as other research has shown, that specific types of smartphone use (i.e., social media; Kross et al., 2013) are what may lead to more detrimental outcomes.

Conclusion

The present set of studies demonstrated the importance of using multiple methods to address research questions. Although smartphone use was assumed to be uniquely detrimental to personal and relationship outcomes, when tested empirically using vignette-style manipulations, this assumption did not hold. This research suggests that there may be nothing uniquely aversive about smartphone use, but rather, the ever-presence of smartphone use is what makes technoference unique in a modern context. Additionally, this research demonstrated that when considering technoference, a more specific definition should be used that incorporates an individual's perception of *problematic* smartphone use. Perceived partner responsiveness was consistently shown to be a key mechanism that explained reductions in self-esteem, relationship satisfaction, and closeness, and increases in rejection and loneliness. Future research should focus on understanding how to reduce instances of problematic technology use; the present research suggests that enhancing perceived partner responsiveness may be one way in which the negative effects of distraction may be mitigated in the context of close relationships.

Table 1.

Descriptive Statistics of Study Variables

	Study 1		Study 2		Study 3		Study 4	
	N = 319		*N* = 339		*N* = 372		*N* = 126	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Time Self on Spends on Technology (Hours)	2.11	1.92	N/A	N/A	N/A	N/A	3.19	1.68
Time Partners Spend on Technology (Hours)	2.25	2.10	N/A	N/A	N/A	N/A	N/A	N/A
Perceived Self Problematic Tech Use	2.04	1.27	N/A	N/A	N/A	N/A	N/A	N/A
Perceived Partner Problematic Tech Use	2.29	1.50	N/A	N/A	N/A	N/A	N/A	N/A
Perception of Self Tech Use Frequency	3.90	1.40	N/A	N/A	N/A	N/A	N/A	N/A
Perception of Partner Tech Use Frequency	4.20	1.54	N/A	N/A	N/A	N/A	1.28	0.51
Perceived Partner Responsiveness	3.98	1.64	4.62	1.91	3.48	1.75	4.19	0.64
Rejection	2.05	1.26	2.68	1.73	3.11	1.66	1.62	0.72
Loneliness	2.07	1.15	2.58	1.65	3.14	1.69	N/A	N/A
Self-Esteem	3.18	0.65	1.88	0.60	2.34	0.69	N/A	N/A
Relationship Satisfaction	4.83	1.26	3.27	1.31	4.34	1.82	N/A	N/A
Closeness	3.77	1.01	3.06	1.50	2.77	1.34	3.51	0.89

Table 2.

Descriptive statistics and bivariate correlations for Study 1

	M	*SD*	PPR	Rejection	Loneliness	Self Esteem	Satisfaction	Closeness
Technology Variables								
Time Self Spends on Tech (Hours)	2.11	1.92	.015	.104	.098	-.153**	-.034	.039
Self Frequency Technology Use	3.90	1.40	.068	.042	.081	-.026	.098	.125*
Perceived Self Problematic Tech Use	2.04	1.27	-.187**	.176**	.215**	-.231**	-.166**	-.125*
Time Partner Spends on Tech (Hours)	2.25	2.10	-.136*	.155**	.199**	-.261**	-.192**	-.082
Partner Frequency Technology Use	4.20	1.54	-.177**	.102	.145**	-.082	-.124*	-.031
Perceived Partner Problematic Tech Use	2.29	1.50	-.396**	.220**	.267**	-.192**	-.352**	-.205**
TDIS	2.39	0.83	-.275**	.180**	.202**	-.259**	-.217**	-.084
TILES	4.13	1.58	-.258**	.156**	.179**	-.138*	-.187**	-.090

Note: ** indicates significance at the 0.01 level (2-tailed) and * indicates significance at the 0.05 level (2-tailed).

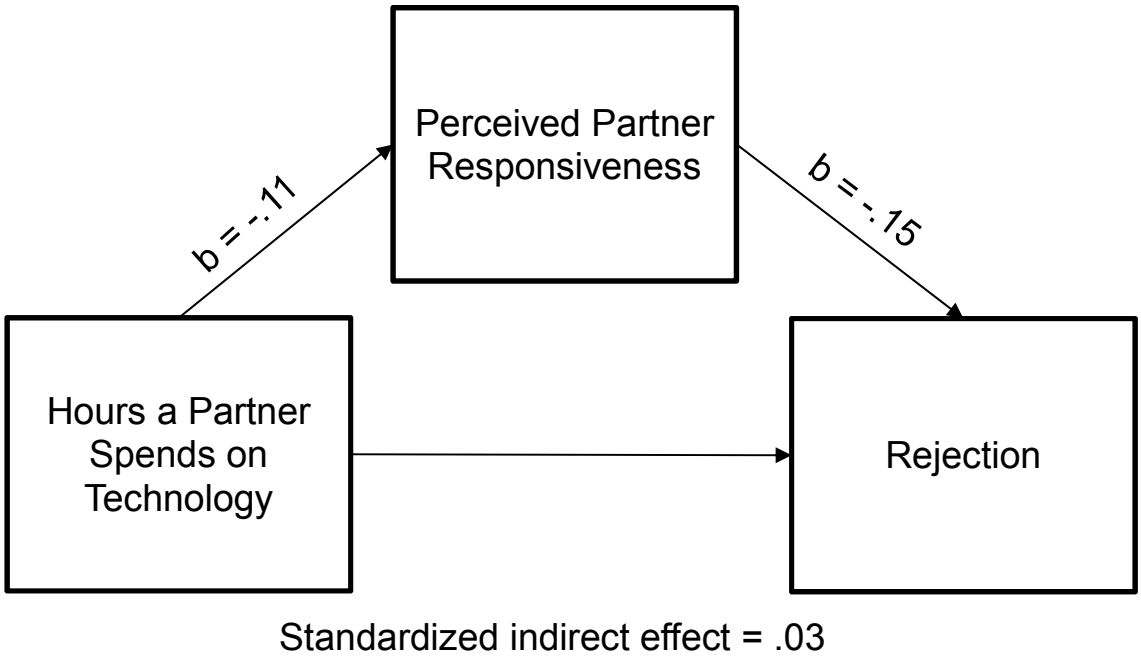


Figure 4. The effect of partner hours on technology on rejection via perceived partner responsiveness in Study 1.

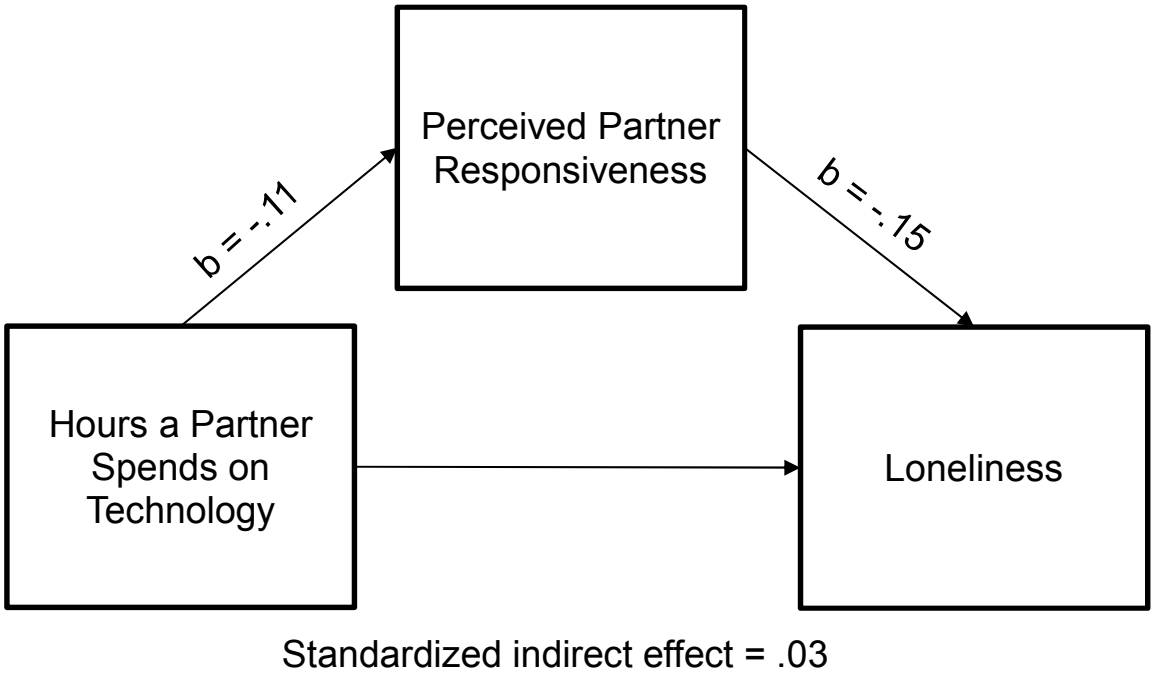


Figure 5. The effect of partner hours on technology on loneliness via perceived partner responsiveness in Study 1.

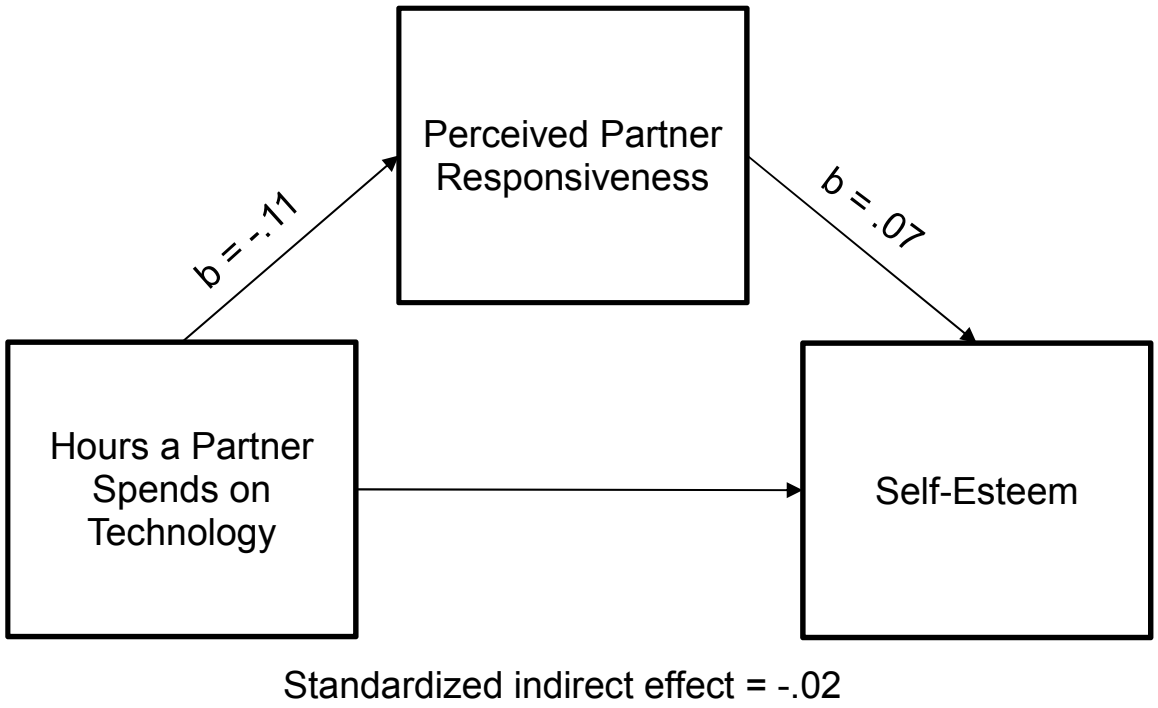


Figure 6. The effect of partner hours on technology on self-esteem via perceived partner responsiveness in Study 1.

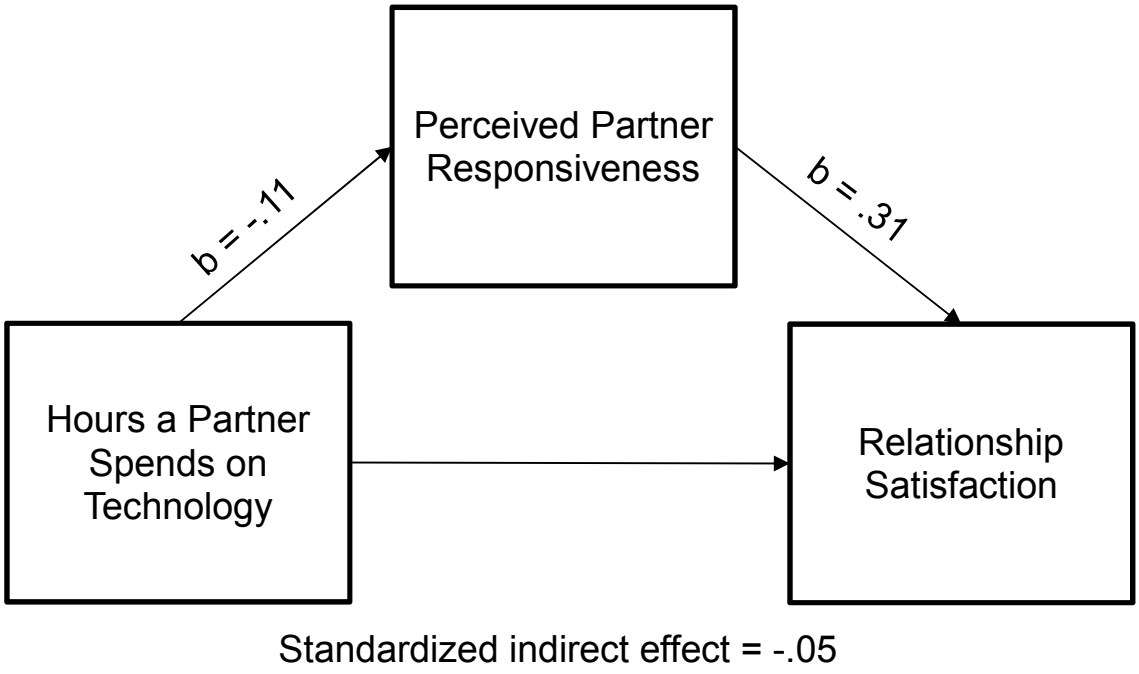


Figure 7. The effect of partner hours on technology on relationship satisfaction via perceived partner responsiveness in Study 1.

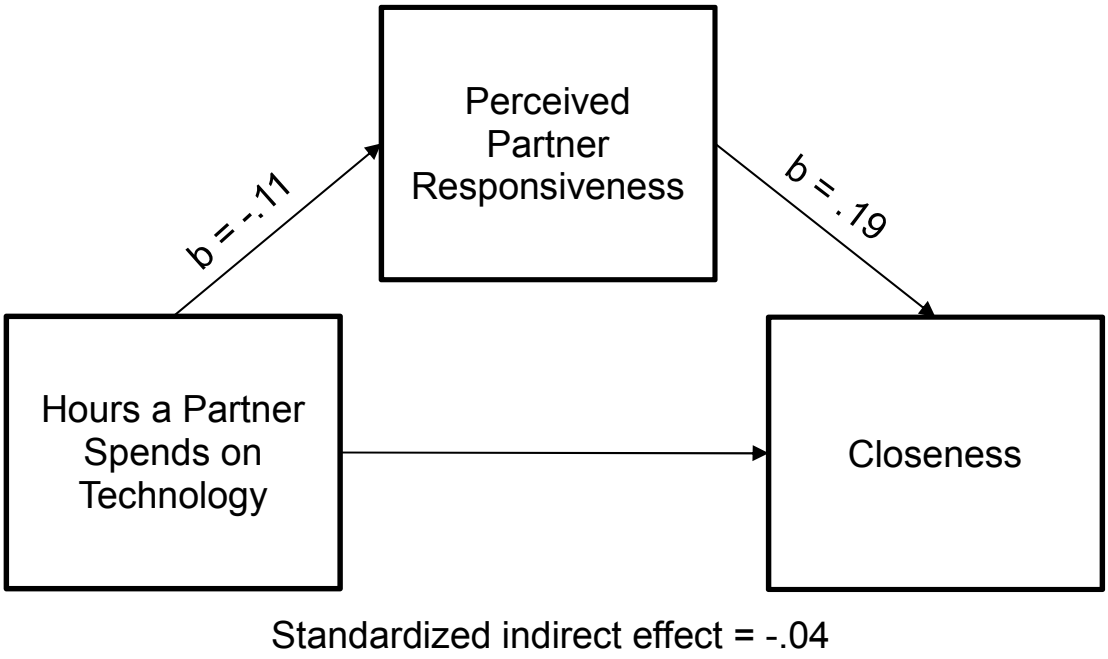


Figure 8. The effect of partner hours on technology on closeness via perceived partner responsiveness in Study 1.

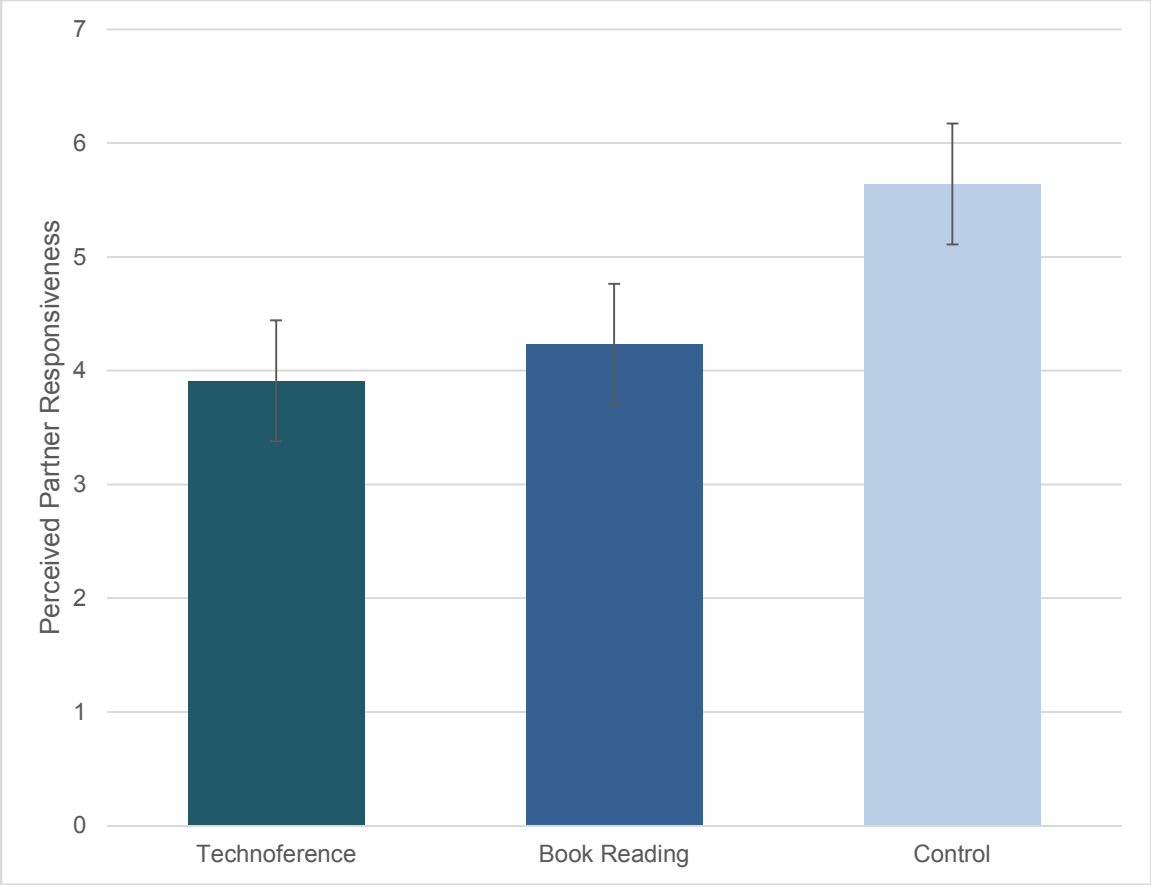


Figure 9. The effect of partner activity on perceived partner responsiveness in Study 2.

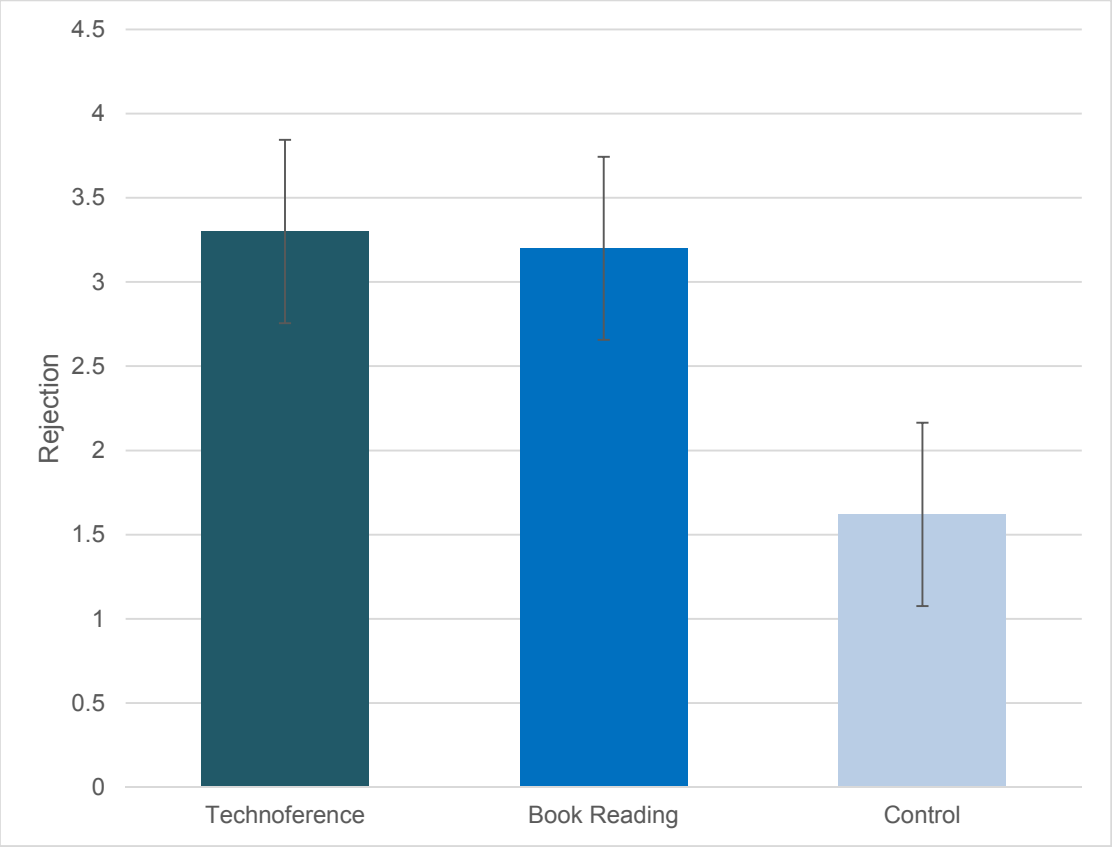


Figure 10. The effect of partner activity on rejection in Study 2.

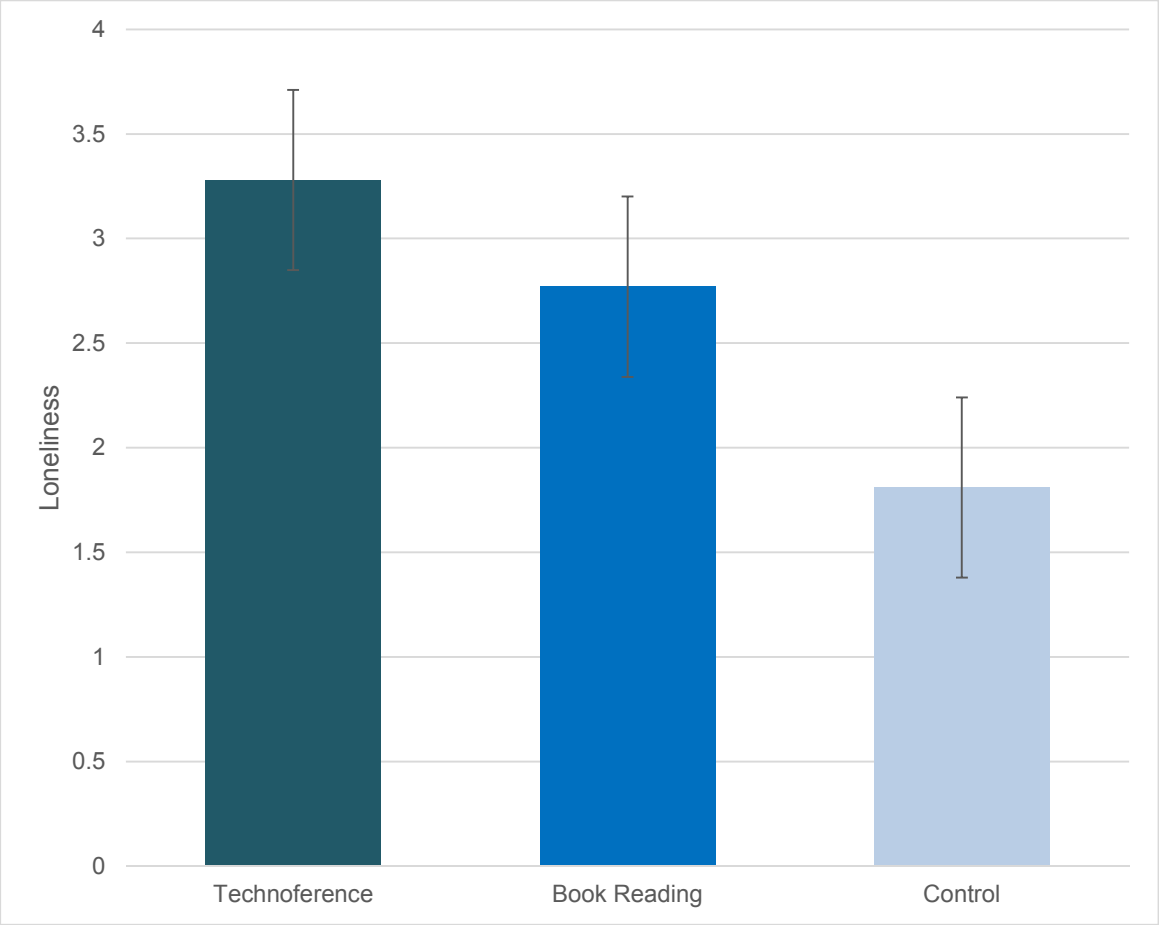


Figure 11. The effect of partner activity on loneliness in Study 2.

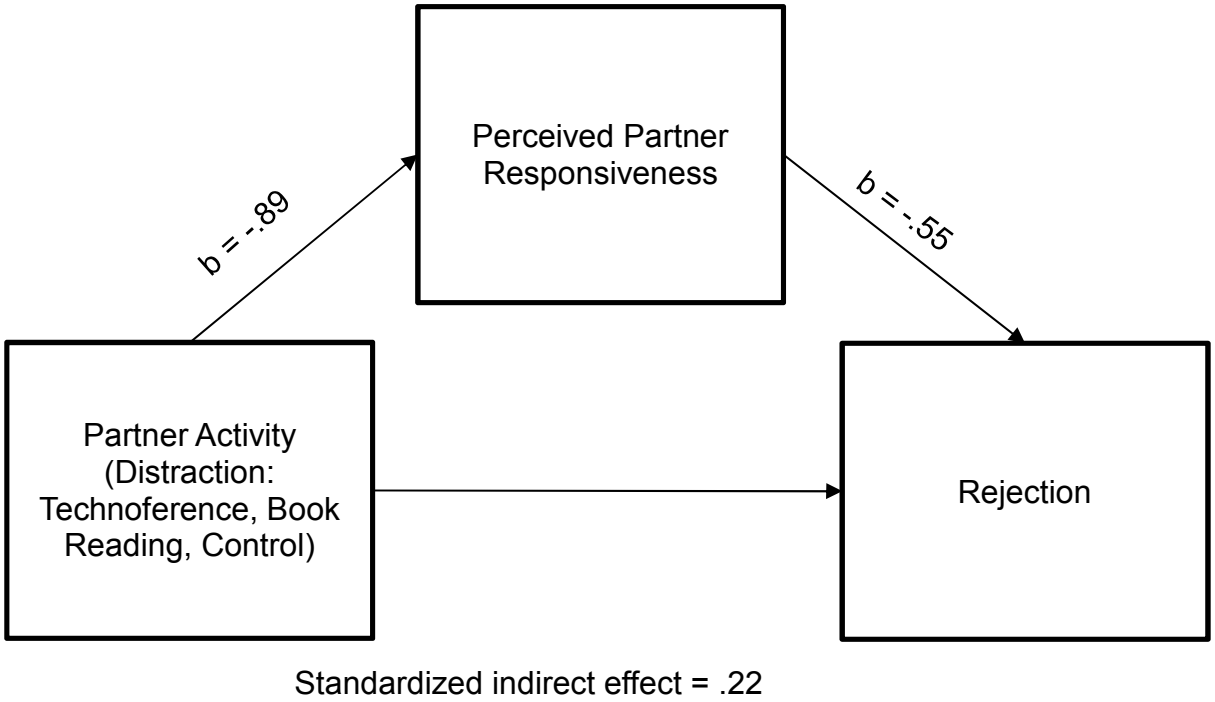


Figure 12. The effect of partner activity on rejection via perceived partner responsiveness in Study 2.

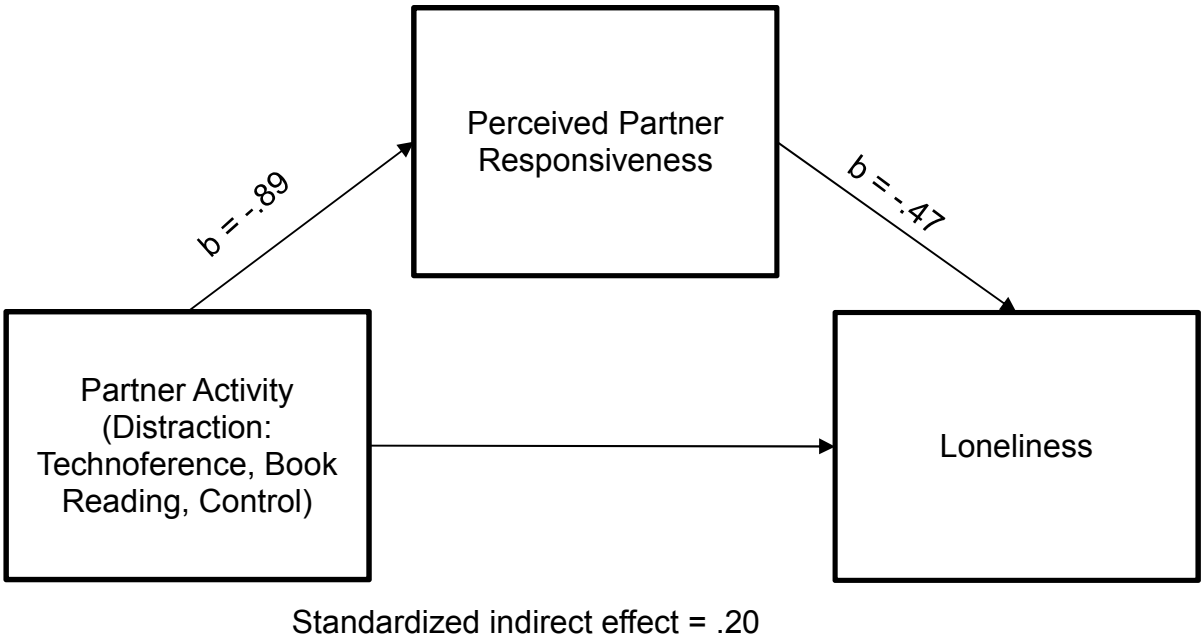


Figure 13. The effect of partner activity on loneliness via perceived partner responsiveness in Study 2.

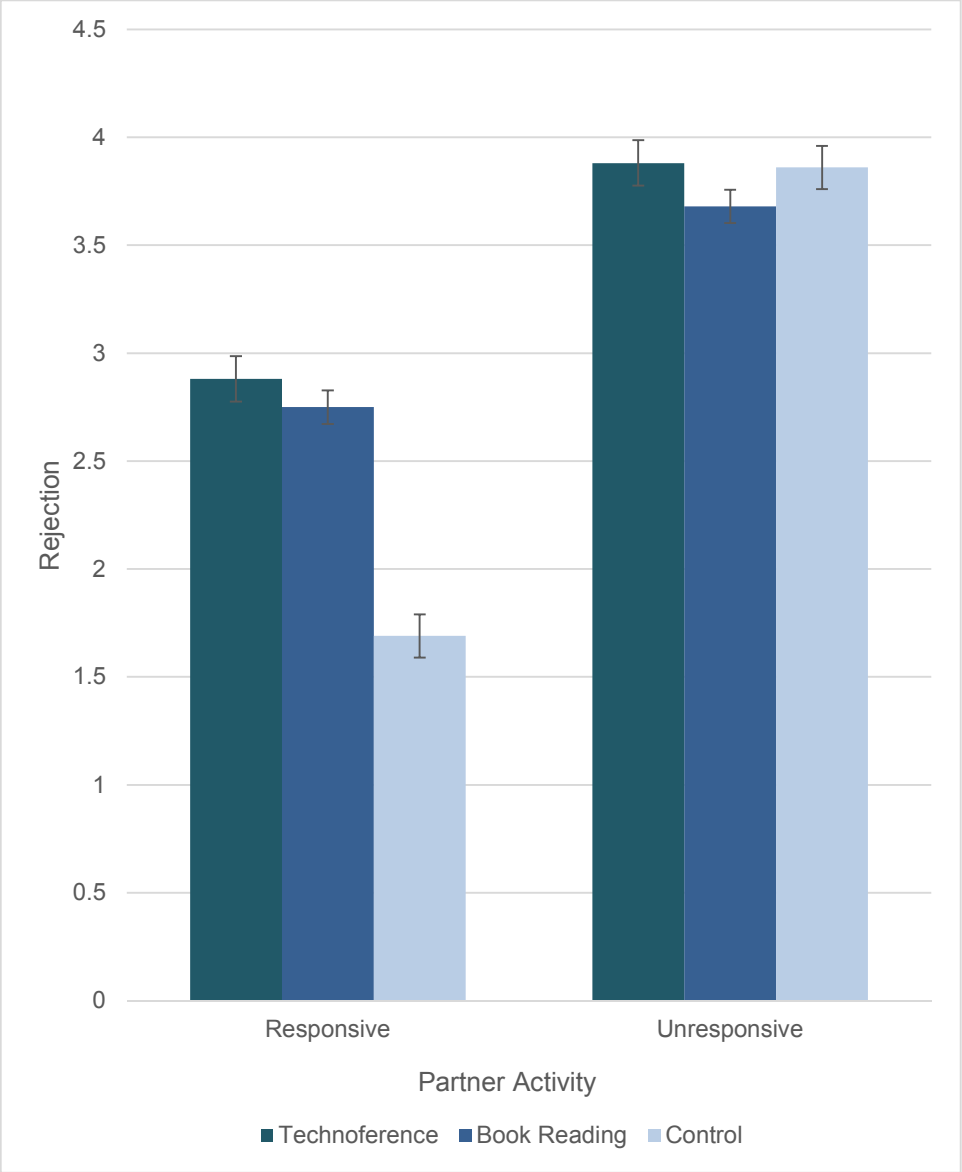


Figure 14. The effect of responsiveness condition and partner activity on rejection in Study 3.

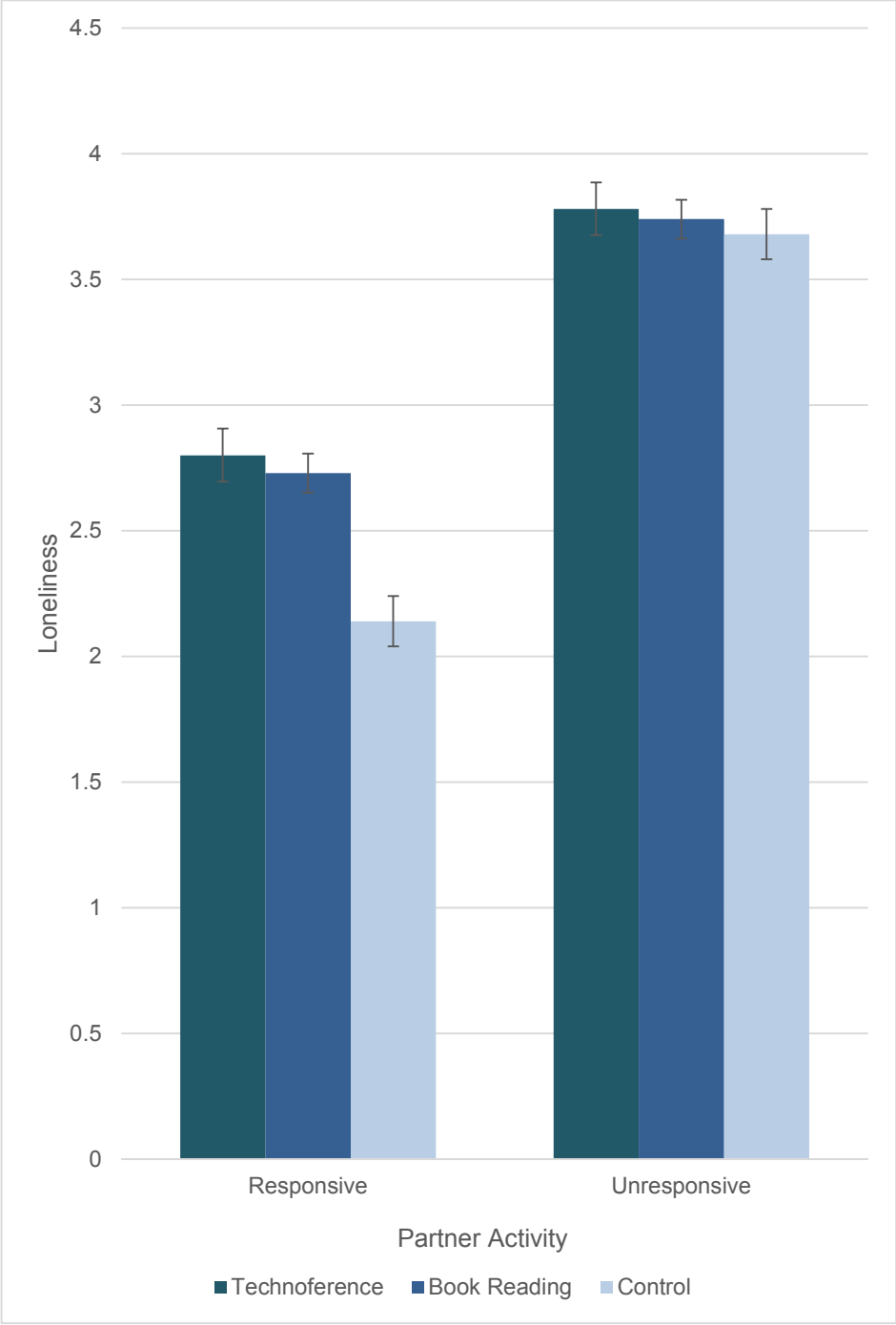


Figure 15. The effect of responsiveness condition and partner activity on loneliness in Study 3.

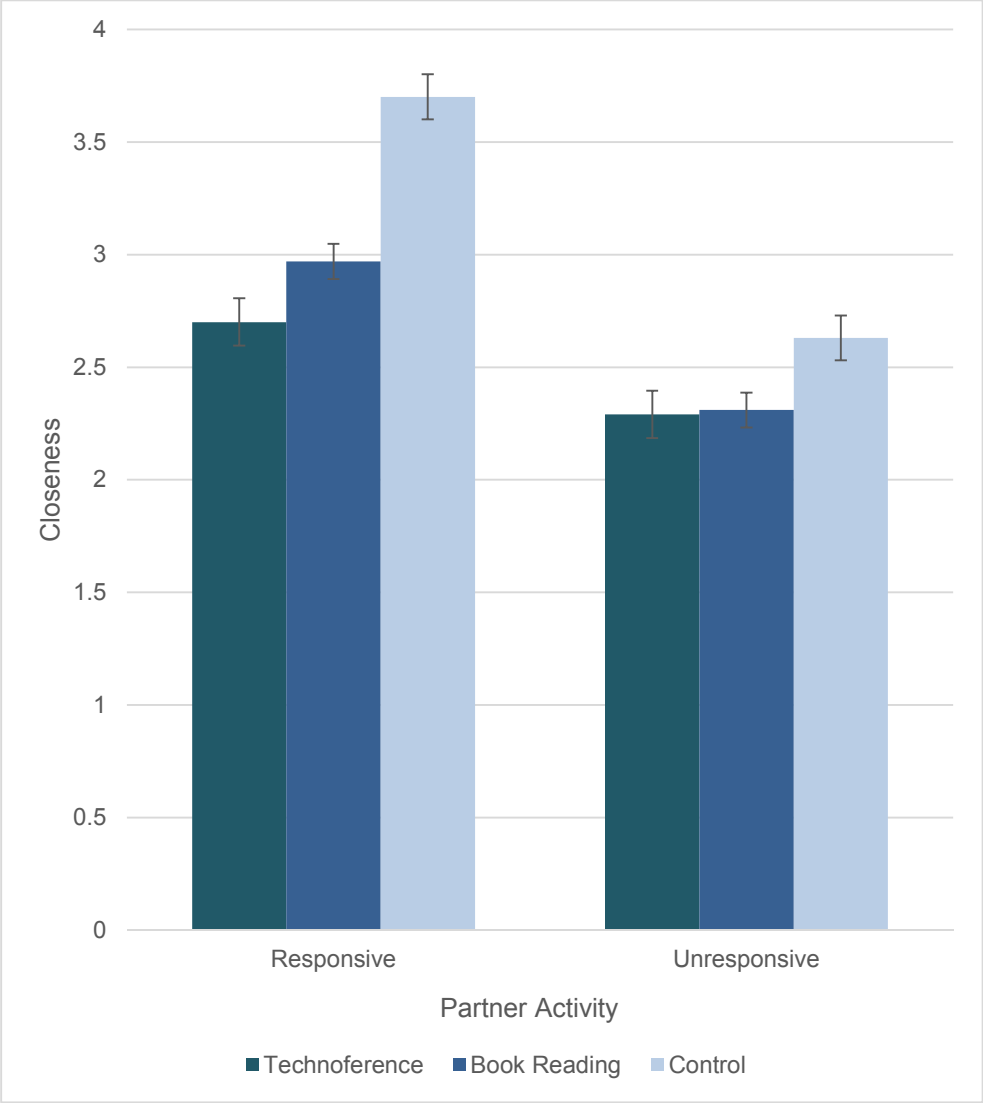


Figure 16. The effect of responsiveness condition and partner activity on closeness in Study 3.

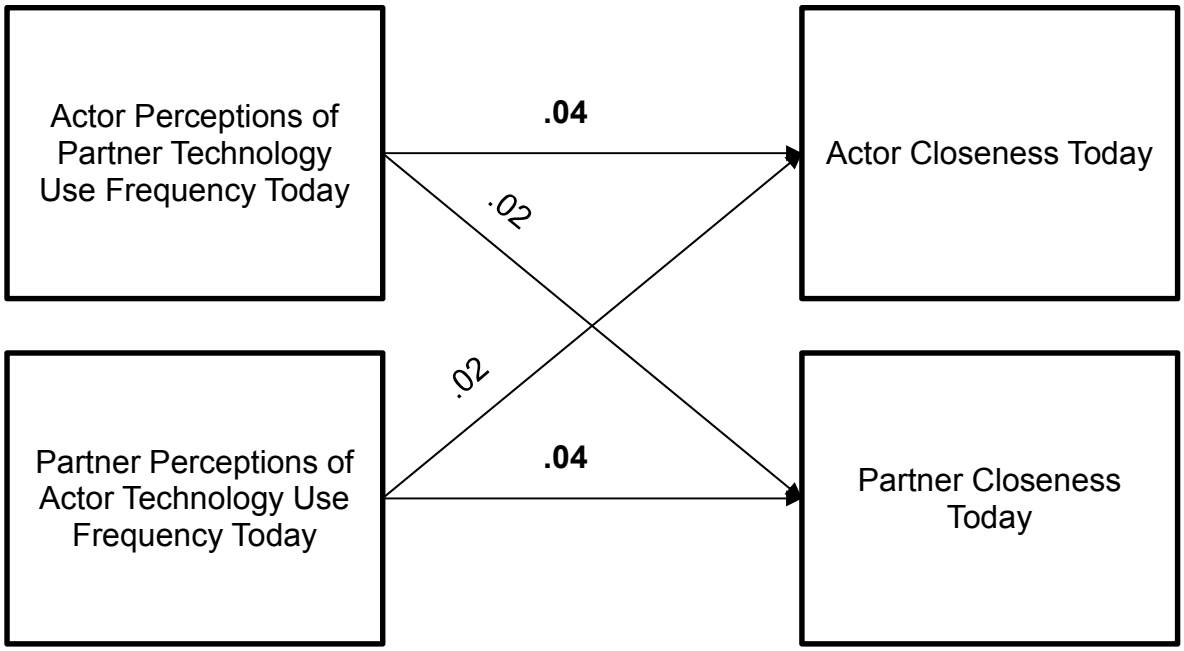


Figure 17. The effect of perceptions of partner technology use on one's own and one's partner's closeness on the same day in Study 4.

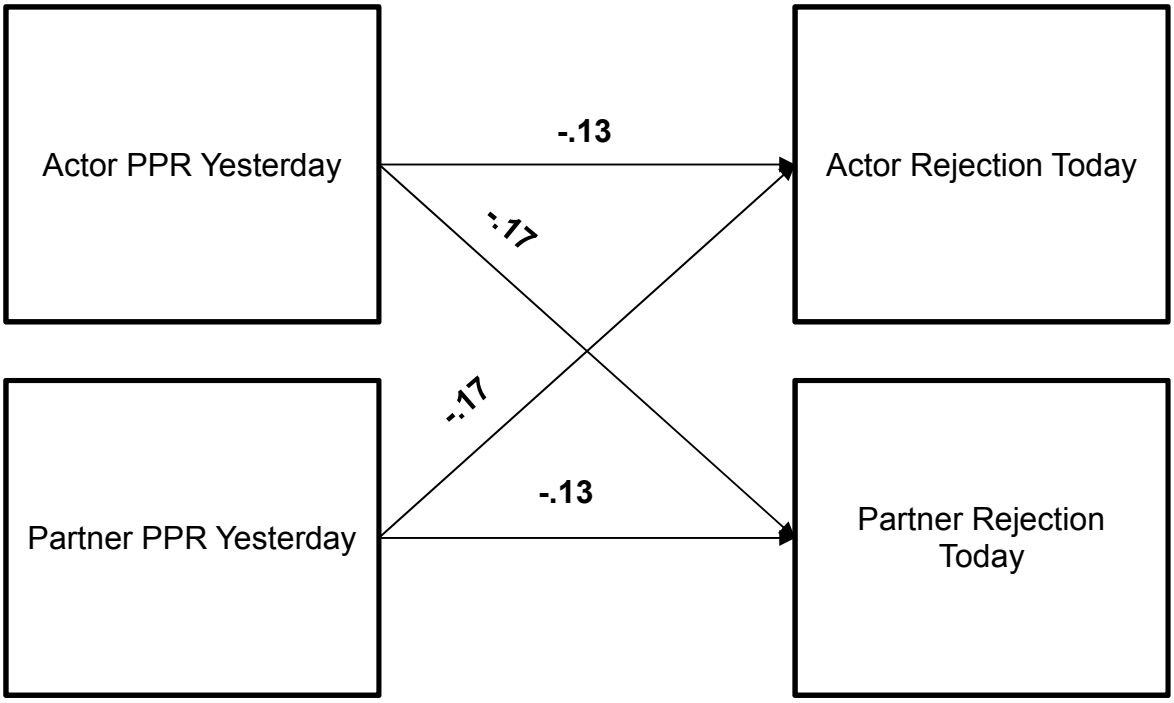


Figure 18. The effect of yesterday's perceived partner responsiveness (PPR) on one's own feelings of rejection and one's partner's feelings of rejection today in Study 4.

APPENDIX A

STUDY 1 COMPLETE MEASURES

Technology interference in life examples scale (McDaniel & Coyne, 2016). This scale is designed to tap into how technology devices get in the way of interacting with a partner. Participants rated these items on an eight- point scale: 0 (*never*), 1 (*less than once a week*), 2 (*once a week*), 3 (*once every few days*), 4 (*once a day*), 5 (*2 to 5 times a day*), 6 (*6 to 9 times a day*), and 7 (*10 or more times a day*).

1. During a typical mealtime that my partner and I spend together, my partner pulls out and checks his/her phone or mobile device.
2. My partner sends texts or emails to others during our face-to-face conversations.
3. When my partner's phone or mobile device rings or beeps, he/she pulls it out even if we are in the middle of a conversation.
4. During leisure time that my partner and I are able to spend together, my partner gets on his/her phone, mobile device, or tablet.
5. My partner gets distracted from our conversation by the TV.

Technology device interference scale*; *(McDaniel & Coyne, 2016). This scale is designed to tap into more specific instances of technology interference in daily life. Six-point Likert-type scale: 0 (*never*), 1 (*rarely*), 2 (*sometimes*), 3 (*often*), 4 (*very often*), and 5 (*all the time*).

1. In general, how frequently do cell phones/smartphones get in the way of (or even interrupt) interacting with your romantic partner?
2. In general, how frequently does TV get in the way of (or even interrupt) interacting with your romantic partner?

3. In general, how frequently do computers get in the way of (or even interrupt) interacting with your romantic partner?
4. In general, how frequently do iPads/Tablets get in the way of (or even interrupt) interacting with your romantic partner?

Intrusiveness of technology use. These items are designed to get at the perception of how intrusive technology is in one's romantic relationship. Responses are on a 1 to 7 scale (1 = Not at all to 7 = An extreme amount).

1. In general, how intrusive (to your relationship) is your PARTNER'S use of technology?
2. In general, how intrusive (to your relationship) is YOUR use of technology?

Conflict over technology use; adapted from Romantic Partner Conflict Scale (Zacchilli, Hendrick & Hendrick, 2009). These items are designed to get at how much conflict occurs in the relationship due to technology. The first two items are on a 1 to 7 scale (1 = Not at all to 7 = An extreme amount). For adapted items (items 3-8), responses are on a 1 to 5 scale (1 = Strongly disagree to 5 = Strongly agree).

1. In general, how problematic to your relationship is your PARTNER'S use of technology?
2. In general, how problematic to your relationship is YOUR use of technology?
3. My partner and I have frequent conflicts over technology use.
4. Our conflicts over technology use usually last quite awhile.
5. When my partner and I disagree about technology use, we argue loudly.
6. I suffer a lot from technology use-related conflict with my partner.
7. I become verbally abusive to my partner when we have conflict over technology use.
8. My partner and I often argue because of technology use.

Average time that the self and partner spends on technology devices. These questions specifically inquire about the estimated amount of time that the self and partner

spend on the collective use of phones, laptops, and tablets while in the presence of each other. Responses are typed into a text box and are labeled in both hours and minutes. These items included:

1. In general, while you and your partner are together, how much time do YOU spend on your technology device(s) (tablet, cell phone, computer)?
2. In general, while you and your partner are together, how much time does your PARTNER spend on technology device(s) (tablet, cell phone, computer)?

Self-disclosure. These items are designed to tap into how much one discloses thoughts, feelings, and information to one's partner. Responses are on a 1 to 5 scale (1 = Not at all to 5 = Extremely). Items included:

1. I talk about my thoughts.
2. I talk about my feelings.
3. I talk about facts/information.

Perceived partner responsiveness (Reis, Clark, & Holmes, 2004). These items are designed to get at how validated, cared for, and understood one feels by their partner. Responses are on a 1 to 6 scale (1 = Not at all to 6 = Very Much). Items included:

1. In my relationship, in general, my partner makes me feel like he/she values my abilities and opinions.
2. In my relationship, in general, my partner understands me.
3. In my relationship, in general, my partner makes me feel cared for.

Self-esteem (Rosenberg, 1965). This scale is designed to tap into feelings of personal value and self-esteem. Responses are on a 1 to 4 scale (1 = Strongly agree to 4 = Strongly disagree). Items included:

1. On the whole, I am satisfied with myself.
2. At times I think I am no good at all. (R)

3. I feel that I have a number of good qualities.
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 certainly feel useless at times. (R)
7. I feel that I'm a person of worth, at least on an equal plane with others.
8. I wish I could have more respect for myself. (R)
9. All in all, I am inclined to feel that I am a failure. (R)
10. I take a positive attitude toward myself.

Feelings of rejection. These items are designed to tap into feelings of social rejection. . Responses are on a 1 to 7 scale (1 = Strongly disagree to 7 = Strongly agree) for the first item and a 1 to 5 scale for the second item (1 = Never to 5 = Always). Items included:

1. In general, I feel socially rejected.
2. How often do you feel socially rejected?

Feelings of loneliness. These items are designed to tap into feelings of loneliness or isolation. Responses are on a 1 to 7 scale (1 = Strongly disagree to 7 = Strongly agree) for the first item and a 1 to 5 scale for the second item (1 = Never to 5 = Always). Items included:

1. In general, I feel lonely.
2. How often do you feel lonely?

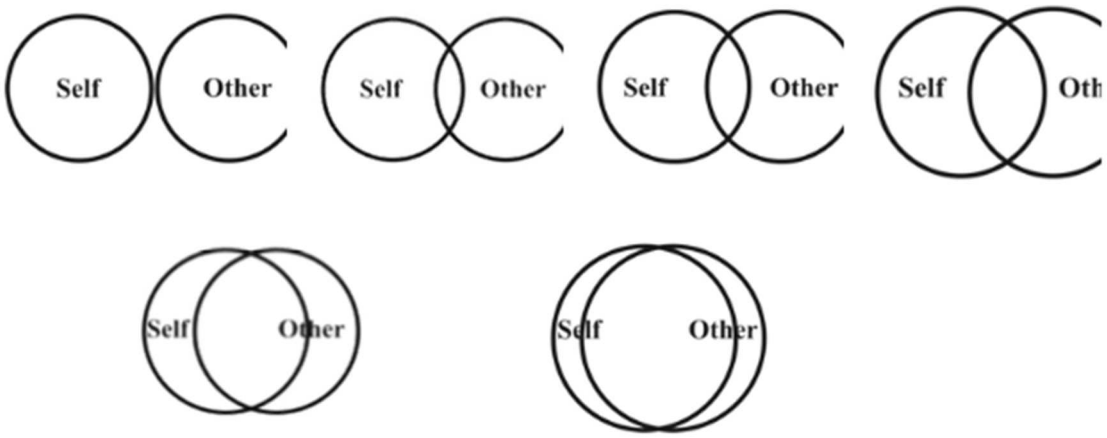
Relationship satisfaction; Rusbult's investment model scale; (Rusbult, Martz, & Agnew, 1998). These items are designed to tap into multiple components of relationship functioning. The first five items are on a 1 to 4 scale (1 = Don't agree at all to 4 = Agree completely), and the second five items are on a scale of 0 to 8 (0 = Don't agree at all to 8 = Agree Completely). Items appear below:

1. My partner fulfills my needs for intimacy (sharing personal thoughts, secrets, etc.).

2. My partner fulfills my needs for companionship (doing things together, enjoying each other's company, etc.).
3. My partner fulfills my sexual needs (holding hands, kissing, etc.).
4. My partner fulfills my needs for security (feeling trusting, comfortable in a stable relationship, etc.).
5. My partner fulfills my needs for emotional involvement (feeling emotionally attached, feeling good when another feels good, etc.).
6. I feel satisfied with our relationship.
7. My relationship is much better than others' relationships.
8. My relationship is close to ideal.
9. Our relationship makes me very happy.
10. Our relationship does a good job at fulfilling my needs for intimacy, companionship, etc.

Inclusion of other in self scale (closeness; Aron, Aron, & Smollan, 1992). This item displays two circles (one labeled the "self," and one labeled the "other,") with varying degrees of overlap. Participants are instructed to select the picture that best describes their relationship with their romantic partner. A score of 1 represents circles with no overlap and a score of 5 represents circles that almost entirely overlap, with greater scores indicating greater feelings of closeness to one's romantic partner.

Please select the picture below that best describes your relationship with your spouse:



APPENDIX B

STUDY 2 MANIPULATION

"In every relationship people experience times when their partner wants to multitask while having a conversation. We would now like you to recall a situation in which you were having a meaningful conversation with your partner (in person), and your partner was [on their smartphone/reading a paper book, newspaper, or magazine]. Please take a moment to remember one specific situation in which your partner was simultaneously [on their smartphone/reading a book, newspaper, or magazine] while you were discussing something meaningful. Picture where you were, what you were saying, and how you were feeling. ."

At this point, a single question was asked: "Were you able to think of a situation?" and participants only continued with the survey if they answered "yes." This mid-survey question was intended to reduce the amount of unusable data, and reduce the amount of money spent on participant payment for unusable data. If participants were eligible to continue, they read the following prompt:

"Once you have recalled a situation, please take three minutes to write about it in detail. Try to immerse yourself in the experience and relive the situation, focusing on what was said and how it made you feel."

For the control condition:

"In every relationship, people have conversations with their partners. We would now like you to recall a situation in which you were having a meaningful conversation with your partner (in person). Please take a moment to remember one specific situation in which you and your partner were discussing something

meaningful. Picture where you were, what you were saying, and how you were feeling. .” [Eligibility check question].

“Once you have recalled a situation, please take three minutes to write about it in detail. Try to immerse yourself in the experience and relive the situation, focusing on what was said and how it made you feel.”

APPENDIX C

STUDY 2 COMPLETE MEASURES

Technoference manipulation check. To be certain that the manipulation of technoference was successful, participants reported on the degree to which technology seemed to interfere with the ability to have a conversation on a 1 to 7 scale (1 = Not at all to 7 = Extremely). It was expected that higher scores would be reported in the technoference condition relative to the other two conditions.

Manipulation check: Successful recall. To be certain that participants were able to recall the situation outlined in the manipulation, participants reported on the degree to which they were 1) successful at remembering the situation, and 2) had difficulty remembering the situation, on a 1 to 7 scale (1 = Not at all to 7 = Extremely). Additionally, participants reported on how recently the event occurred and how often they experience events like the one they had described.

Perceived partner responsiveness (adapted; Reis, Clark, & Holmes, 2004). These items were designed to get at how validated, cared for, and understood one felt by their partner during and/or immediately after the recalled event had transpired. Items for understanding included “During your conversation, how much was your partner able to understand what you were thinking?” and “During your conversation, how much was your partner able to understand how you were feeling?” Items for validation included “During your conversation, how much did your partner make you feel like they valued your opinion?” and “During your conversation, how much did your partner make you feel like they valued your beliefs?” Items for caring included “During your conversation, to what extent did you feel like your partner really cared about your thoughts?” and “During your

conversation, to what extent did you feel like your partner really cared about your feelings?" Responses were on a 1 to 6 scale (1 = Not at all to 6 = Very Much).

Uncertainty about partner's activity. These items were meant to tap into the degree to which participants felt uncertain about what their partner was doing during the recalled situation. Items included "During your conversation, how certain were you of what your partner was doing?" and "During the conversation that I brought to mind, I knew exactly what my partner was doing." Responses were on a 1 to 7 scale (1 = Not at all to 7 = Extremely).

Self-esteem (Rosenberg, 1965). This scale was designed to tap into feelings of personal value and self-esteem experienced during (or just after) the recalled event. Items included:

1. During the event that I recalled, I felt satisfied with myself.
2. During the event that I recalled, I thought I was no good at all. (R)
3. During the event that I recalled, I felt that I had a number of good qualities.
4. During the event that I recalled, I was able to do things as well as most other people.
5. During the event that I recalled, I felt I did not have much to be proud of. (R)
6. During the event that I recalled, I certainly felt useless at times. (R)
7. During the event that I recalled, I felt that I was a person of worth, at least on an equal plane with others.
8. During the event that I recalled, I wished I had more respect for myself. (R)
9. During the event that I recalled, all in all, I was inclined to feel that I was a failure. (R)
10. During the event that I recalled, I took a positive attitude toward myself.

Feelings of rejection. These items were designed to tap into feelings of social rejection experienced during the recalled event. Items included “During the situation that I just recalled, I felt rejected by my partner,” and “During the situation that I just recalled, I felt like I was cast aside by my partner.” Responses were on a 1 to 7 scale (1 = Strongly disagree to 7 = Strongly agree).

Feelings of loneliness. These items were designed to tap into feelings of loneliness or isolation experienced during the recalled event. Items included “During the situation that I just recalled, I felt lonely,” and “During the situation that I just recalled, I felt isolated.” Responses were on a 1 to 7 scale (1 = Strongly disagree to 7 = Strongly agree).

Relationship satisfaction; (Gordon & Chen, 2016). These items were designed to tap into how satisfied one felt during the recalled event. Items included “During your conversation, how much did you feel that you had a warm and comfortable relationship with your partner?” and ““During your conversation, how satisfied were you with your relationship?” (1 = Not at all to 6 = Completely). Additionally, items on a 1 to 4 scale (1 = Don’t agree at all to 4 = Agree completely) included: “During the situation that I recalled/imagined, my partner fulfilled my needs for intimacy (sharing personal thoughts, secrets, etc.), “During the situation that I recalled/imagined, my partner fulfilled my needs for companionship (doing things together, enjoying each other's company, etc.),” and “During the situation that I recalled/imagined, my partner fulfilled my needs for security (feeling trusting, comfortable in a stable relationship, etc.).”

Closeness; Inclusion of other in self scale (Aron et al., 1992) and single item intimacy scale. This item displayed two circles (one labeled the “self,” and one labeled the “other,”) with varying degrees of overlap. Participants were instructed to select the

picture that best described their relationship with their romantic partner during the event that they just recalled. A score of 1 represents circles with no overlap and a score of 5 represents circles that almost entirely overlap, with greater scores indicating greater feelings of closeness to one's romantic partner. In addition, participants responded to the following single item intimacy scale: "During the situation that I recalled/imagined, I felt close to my partner." Responses were on a 1 to 7 scale (1 = Disagree completely to 7 = Agree completely).

APPENDIX D

STUDY 3 MANIPULATION

"Sometimes when we interact with another person, the other person wants to multitask by [being on a smartphone vs. reading a book/newspaper/magazine, or kindle] at the same time, and it feels like the other person doesn't respond to our desire to have a meaningful conversation. Other times, when the other person is [on a smartphone vs. reading a book/newspaper/magazine, or kindle], we feel that the person is still able to be responsive to our conversation.

For this next task, we would like you to recall a time that you and your romantic partner were having a conversation about a topic that was personally meaningful to you. Specifically, we would like you to think of an instance in which your partner was [using a smartphone vs. reading a book/newspaper/magazine, or kindle], and they were [still vs. not] being responsive to what you were saying throughout the conversation. That is, recall a time that your partner was [still vs. not] being responsive to your thoughts and feelings as they tried to multitask during your conversation. Please take a moment to recall one particular instance. Picture where you were, what you and your partner were saying, and how you were feeling."

[Continued eligibility question: "Were you able to think of a situation?" (Yes versus No)].

"Once you have recalled a specific situation, please take three minutes to write about it in detail. Try to immerse yourself in the experience and relive the situation, focusing on what was said and how it made you feel."

APPENDIX E

STUDY 3 COMPLETE MEASURES

Technoference manipulation check. To be certain that the manipulation of technoference was successful, participants reported on the degree to which technology seemed to interfere with the ability to have a conversation on a 1 to 7 scale (1 = Not at all to 7 = Extremely). It was expected that higher scores would be reported in the technoference conditions relative to the book reading conditions, regardless of responsiveness.

Responsiveness manipulation check. To be certain that the manipulation of perceived partner responsiveness was successful, participants reported on the degree to which their partner was responsive to their desire to interact on a 1 to 7 scale (1 = Not at all to 7 = Extremely). It was expected that higher scores would be reported in the responsive conditions relative to the unresponsive conditions, regardless of the "partner activity" condition.

Manipulation check: Successful recall. To be certain that participants were able to recall the situation outlined in the manipulation, participants reported on the degree to which they were 1) successful at remembering the situation, and 2) had difficulty remembering the situation, on a 1 to 7 scale (1 = Not at all to 7 = Extremely). Additionally, they reported on how recently the event occurred and how often they experience events like the one they had described. These items were identical to those in Study 2.

Perceived partner responsiveness (adapted; Reis, Clark, & Holmes, 2004). These items were designed to get at how validated, cared for, and understood one felt by

their partner immediately after the recalled event had transpired. These items were identical to those in Study 2.

Uncertainty about partner's activity. These items were meant to tap into the degree to which participants felt uncertain about what their partner was doing during the recalled situation. These items were identical to Study 2.

Self-esteem (Rosenberg, 1965). This scale was designed to tap into feelings of personal value and self-esteem experienced just during the recalled event. These items were identical to those in Study 2.

Feelings of rejection. These items were designed to tap into feelings of social rejection experienced during the recalled event. These items were identical to Study 2.

Feelings of loneliness. These items were designed to tap into feelings of loneliness or isolation experienced during the recalled event. These items were identical to those in Study 2.

Relationship satisfaction; (Gordon & Chen, 2016). These items were designed to tap into how satisfied one felt during the recalled event. These items were identical to those in Study 2.

Closeness; Inclusion of other in self scale (Aron, et al., 1992) and single item intimacy scale. These items were identical to those in Study 2.

APPENDIX F

STUDY 4 COMPLETE MEASURES

Baseline measures. The baseline survey included all measures that were reported in Study 1; these included the TIDES and TILES (McDaniel & Coyne, 2016), intrusiveness of technology, conflict over technology, average time spent on technology per day (both for self and partner), self-disclosure and perceived partner responsiveness (Reis, Clark, & Holmes, 2004), self-esteem (Rosenberg, 1965), feelings of rejection, loneliness, relationship satisfaction (Rusbult et al., 1998), and inclusion of other in self (closeness; Aron et al., 1992). (See Appendix A for full measures).

Morning daily diary measures. Within three hours of waking, participants reported on whether or not they and/or their partner used a technology device within 30 minutes of going to sleep the previous night (with "yes," "no," or "N/A" as responses), closeness to one's partner that morning (i.e., "how close did you feel to your partner this morning?" on a 0 = not close at all to 5 = extremely close scale), relationship satisfaction (i.e., "In general, how satisfied were you with your relationship this morning?" on a 0 = not at all to 5 = extremely scale, and "Please indicate the degree of happiness, all things considered, of your relationship today" on a 0 = Extremely Unhappy to 6 = Perfect scale).

Participants reported on emotions felt that morning (i.e., "how happy/cheerful/hostile/irritable/disappointed/lonely/rejected/anxious/angry/worried/sad do you feel this morning?" on a 1 = not at all to 5 = extremely scale).

Participants reported on the amount of time spent on technology since waking (in minutes), amount of time one's partner spent on technology since waking (in minutes),

and whether or not the amount of time was estimated using a phone use application (with "yes," "no," or "N/A" as responses).

Participants reported on subjective measures of technoference (i.e., "How bothersome was your partner's use of technology this morning" on a 1 = not at all to 7 = extremely scale, "At any point today since the morning survey, did you ask **your partner** to put away his or her technology device?" with "yes" or "no" as possible answers, "To what extent did technology use **prevent you** from engaging in activities or conversations with your partner today," and "To what extent did technology use **interrupt** conversations between you and your partner today" on a 1 = not at all to 7 = extremely scale).

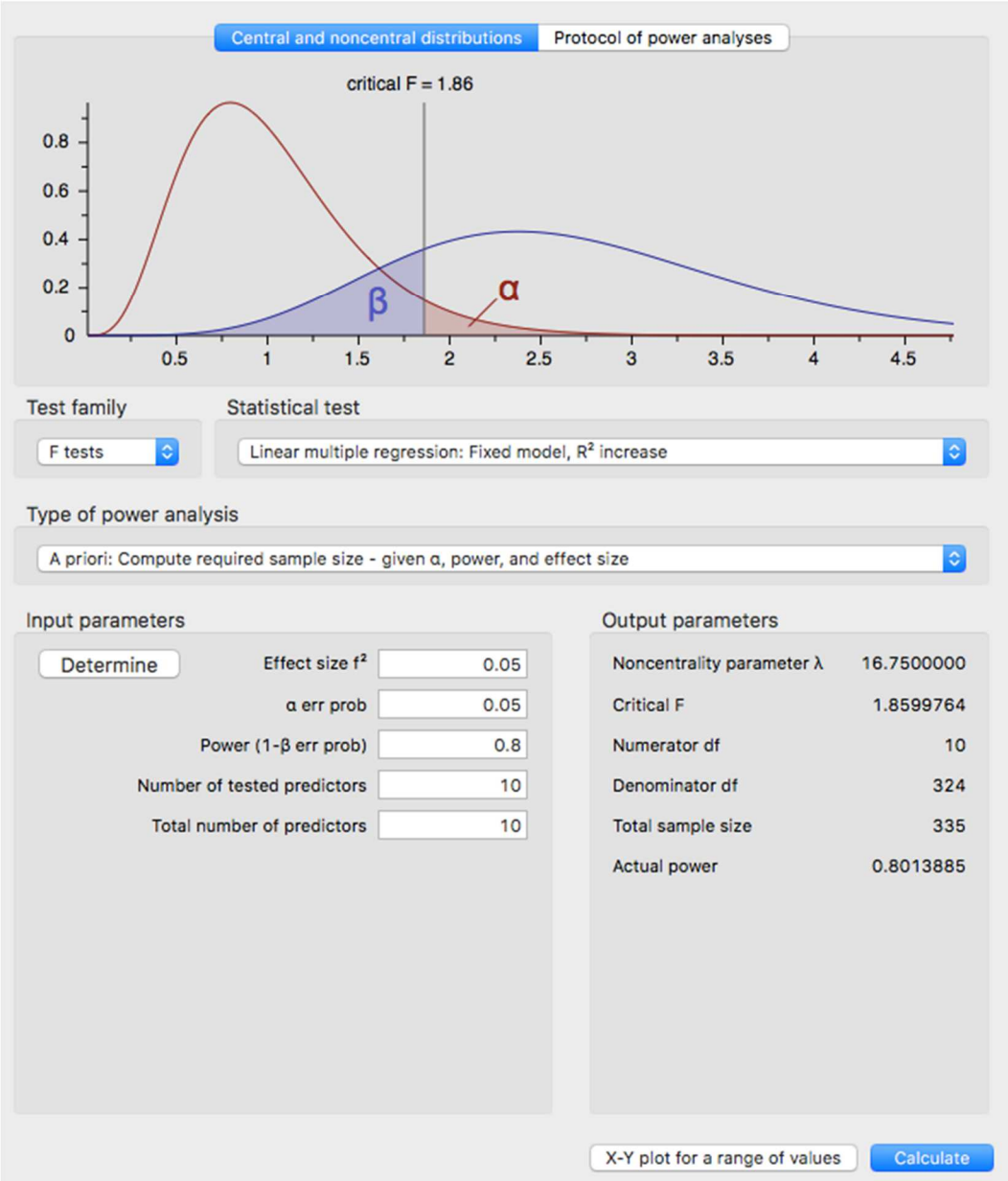
Participants also reported on the quality of last night's sleep (i.e., "how well did you sleep last night" on a 1= terrible to 8 = great scale).

Evening daily diary measures. Evening diary measures included all of the morning diary measures (excluding sleep-related items), with the addition of measures of perceived partner responsiveness (i.e., "When you think about today, how much did your partner: really care about you, understand the way you felt about things, appreciate you" on a 1 = not at all to 5 = extremely scale), self-disclosure (i.e., "Please rate the degree to which you disclosed (talked about) the following with your partner today: thoughts, facts and information, feelings" on a 1 = not at all to 5 = extremely scale), feelings of rejection (i.e., "today I felt rejected by my romantic partner" on a 1 = completely disagree to 7 = agree completely scale), loneliness (i.e., "today, I felt lonely" on a 1 = completely disagree to 7 = agree completely scale), and self-esteem (i.e., "I felt good about myself today," and "today I felt inferior to others" on a 1 = completely disagree to 7 = agree completely scale).

Participants reported on closeness (IOS; Aron et al., 1992) and satisfaction (i.e., “In general, how satisfied were you with your relationship this morning?” on a 0 = not at all to 5 = extremely scale, and “Please indicate the degree of happiness, all things considered, of your relationship today” on a 0 = Extremely Unhappy to 6 = Perfect scale).

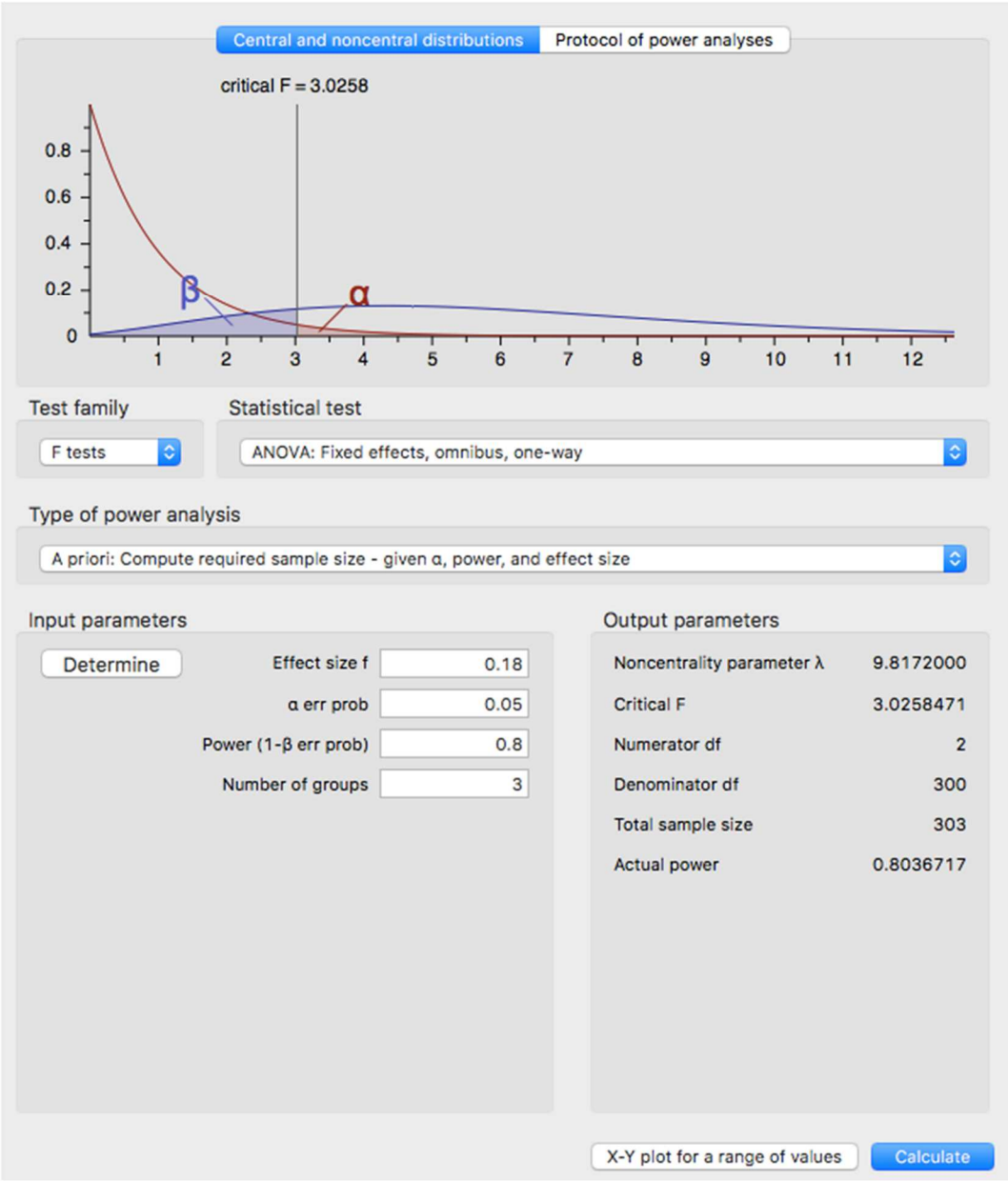
APPENDIX G

A PRIORI POWER ANALYSIS STUDY 1



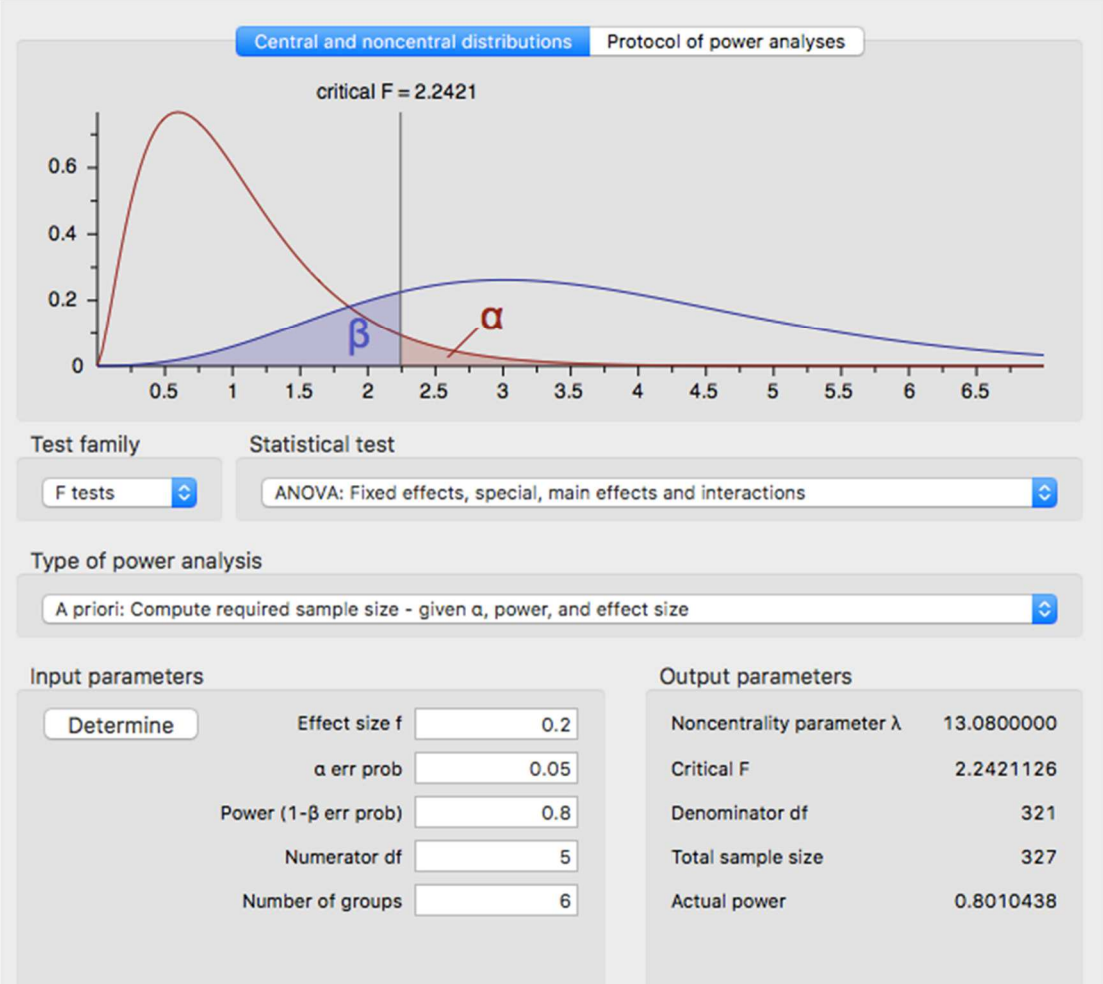
APPENDIX H

A PRIORI POWER ANALYSIS STUDY 2



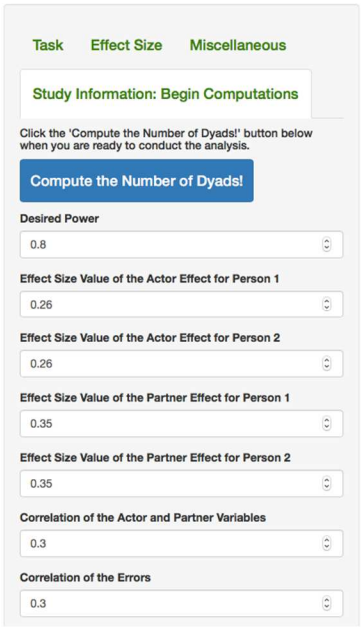
APPENDIX I

A PRIORI POWER ANALYSIS STUDY 3



APPENDIX J

A PRIORI POWER ANALYSIS STUDY 4



Model Figure | View Power Estimates

	Effect	Power	N	df	Beta	r	partial r	ncp
Actor Effect for Person 1	.260	.803	102	99	.260	.365	.274	2.840
Actor Effect for Person 2	.260	.803	102	99	.260	.365	.274	2.840
Partner Effect for Person 1	.350	.807	59	56	.350	.428	.359	2.875
Partner Effect for Person 2	.350	.807	59	56	.350	.428	.359	2.875
Difference in Actor Effects	.000	.05	0					0.000
Difference in Partner Effects	.000	.05	0					0.000
Average of Actor Effects	.260	.801	47					2.806
Average of Partner Effects	.350	.813	28					2.848

The task is to determine the minimum sample sizes necessary to detect the actor and partner effects for an Actor-Partner Interdependence Model analysis with distinguishable dyads given a desired level of power and alpha.

Alpha is set to .050. N refers to the number of dyads. The N given is the smallest number of dyads required to detect the effect when power is at least 0.8.

The measure of effect size is beta, the standardized regression coefficient. The correlation between the two members' scores on X is .300, and the correlation of the errors is .300. The term "ncp" is the non-centrality parameter or the regression coefficient divided by its standard error.

At minimum, 102 dyads are needed to have adequate power to detect an actor effect for Person 1 of size .260 (i.e., a beta of .260 or a partial r of .274).

At minimum, 102 dyads are needed to have adequate power to detect an actor effect for Person 2 of size .260 (i.e., a beta of .260 or a partial r of .274).

At minimum, 59 dyads are needed to have adequate power to detect a partner effect for Person 1 of size .350 (i.e., a beta of .350 or a partial r of .359).

At minimum, 59 dyads are needed to have adequate power to detect a partner effect for Person 2 of size .350 (i.e., a beta of .350 or a partial r of

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ABSTRACT

INTERPERSONAL PROCESSES AND CONSEQUENCES OF "TECHNOFERENCE" IN ROMANTIC COUPLES

by

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Smartphone use during in-person interactions with romantic partners ("technoference") has become commonplace, and research has begun to investigate the negative effects of technoference on romantic relationships. However, little research has explored the *mechanisms* by which technoference influences romantic relationships, and the specific interpersonal processes that are disrupted by technoference must be identified and tested. The present dissertation aims to integrate the interpersonal process model (Reis & Shaver, 1988) with Williams' model of ostracism (Williams, 1997) to provide a theoretical framework for understanding how technoference uniquely influences romantic relationships. Using a combination of correlational, experimental, and daily diary methodology, four studies are proposed to test the idea that technoference uniquely interferes with romantic couples' in-person interactions by reducing perceived partner responsiveness and inducing feelings of rejection and reduced self-worth, which ultimately lead to undermined relationship functioning (i.e., feelings of closeness).

AUTOBIOGRAPHICAL STATEMENT

Julia Briskin graduated magna cum laude with a Bachelor of Arts in Psychology from the University of Michigan in 2012, and received her Master of Arts in Psychology from Wayne State University in 2017. She is currently a social-personality doctoral student at Wayne State University, working with Dr. Rich Slatcher, Dr. Catalina Kopetz, and Dr. Tim Bogg. Her research focuses on the question of why people engage in behavior that seemingly disrupts their close relationships and undermines their long-term goals. Specifically, her research investigates why people engage with technology devices (i.e., smartphones) across consequential contexts (i.e., during interpersonal interactions, while driving), as well as the intra and inter-personal consequences of such behavior.