

ALWAYS AVAILABLE, ALWAYS ATTACHED: THE SOCIAL USES OF MOBILE
PHONES AND SOCIAL MEDIA IN CLOSE RELATIONSHIPS

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Although there is a high level of concern about the effects of the near constant use of digital media in everyday life, the findings are mixed and inconclusive. In this dissertation, I propose that one way to understand the inconclusive results is through investigating the communication dynamics of close relationships in digital media. Bridging together media multiplexity theory and attachment theory, the contributions of this dissertation are threefold. First, I study communication across the multimedia landscape to more closely capture the totality of interpersonal communication in close relationships, rather than communication on individual media. Second, this study advances connected availability as one psychological process explaining how communicating with close partners on mobile phones and social media influences subjective well-being. Third, connected availability was conceptualized as a mutually influential dyadic process that could simultaneously explain the positive and negative consequences of communication technologies.

An experience sampling method was employed to study media use and subjective well-being in 114 cohabitating romantic dyads. Five brief surveys were distributed at random intervals for seven days to both members of the couple. The data suggest that cohabitating romantic couples regularly blended together offline and online communication, and this mixed-media communication influenced their subjective well-being. Results from the longitudinal dyadic data analysis found that the integration of communication technologies in close relationships was neither good nor bad for subjective well-being. The relationship between media multiplexity and subjective well-being was multidimensional, including positive, negative, and curvilinear effects.

The perception that a romantic partner is immediately available for help through the interpersonal multimedia landscape was associated with increased subjective well-being for that person as well as improved subjective well-being in their partner. This result suggests that people may feel happier after communication technology use because their partner perceives a greater ability to connect with them anytime, anywhere. Thus, connected availability explained many of the positive consequences but none of negative consequences, which was counter to expectations. This dissertation builds a relational perspective on the well-being consequences of living in a highly digital world and a multiplexity-level dimension to the debate surrounding communication technologies and subjective well-being.

BIOGRAPHICAL SKETCH

Samuel Hardman Taylor received his bachelor's degree in Communication from Southern Utah University in 2012. He moved to Texas Christian University to continue his education where he received a master's degree in Communication Studies in 2014. In 2019, Sam graduated from Cornell University with a PhD in Communication. In the fall of 2019, Sam will start as an assistant professor at the University of Illinois at Chicago in the Department of Communication. Sam is originally from Mona, UT, which had a population of less than 1000 people when he was growing up there. Sam is the second to youngest in a family of 11 children. Sam is a first-generation college student, and he is the first person in all of his extremely large family to receive a doctorate.

For the two people who are always available to me,

Mom & Kory

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CHAPTER 1: INTRODUCTION

Growing Concern About Being Almost Constantly Online

There is considerable concern among health professionals, educators, parents, families, technology developers, and researchers about the effects of mobile phones and social media on subjective well-being (Jelenchick, Eickhoff, & Moreno, 2013; Shakya & Christakis, 2017).

These concerns are rooted in an understanding that spending time on communication technologies may promote isolation by displacing face-to-face communication and quality social relationships (Turkle, 2015). Teens are often at the center of these concerns (Twenge, Martin, & Campbell, 2018), but the concern about the wellness and health implications of digital media is widespread, reaching across the lifespan (Chan, 2015b; Chang, Choi, Bazarova, & Löckenhoff, 2015). A national sample of Americans found that young-aged adults and middle-aged adults report a high saturation of mobile phone use, social media use, and perception of being constantly connected to the internet, and this trend is growing among all generations (Jiang, 2018; Perrin & Jiang, 2018). This level of media saturation has created a situation where people are almost always connected to their mobile phones and social media accounts (Vorderer, Hefner, Reinecke, & Klimmt, 2017).

Although the amount of time that people spend online and looking at screens is at the center of public concerns and the focus of many research studies, the evidence for the effect of time spent using communication technologies on well-being is inconsistent (Verduyn, Ybarra, Résibois, Jonides, & Kross, 2017). Some articles conclude that mobile and social media use can improve well-being and reduce loneliness (Burke & Kraut, 2016; Burke, Marlow, & Lento, 2010; Gonzales, 2014). On the other hand, using mobile and social media has been shown to have a net-negative impact on well-being (Kross et al., 2013; Shakya & Christakis, 2017;

Verduyn et al., 2015). Other research suggests that there is essentially no effect of communication technologies on well-being (Orben & Przybylski, 2019a). Whereas concerns about the effects of digital media on wellness are high, research to date has been inconclusive and produced limited guidance on what should be encouraged as healthy digital media use.

There are numerous explanations to this puzzle of inconclusive findings, and I address three of those concerns in this dissertation. First, research often does not consider the relationship between the communicators. This is problematic because it is unreasonable to assume the same effects on well-being from communicating with close friends and family members versus acquaintances or strangers (Feeney & Collins, 2015). As a result, I focus on communication within close relationships to understand how being almost constantly online can influence subjective well-being. Second, the lack of consistent results is partially due to the principal interest in direct effects of digital media on well-being, instead of the interpersonal processes and mechanisms that underlie these effects (Valkenburg & Peter, 2009b). Although scholars have begun to address the underlying mechanisms of how communication technologies influence well-being, such as social capital or social comparison, there is room to build communication theory explaining why being almost constantly online can impact well-being, particularly in regard to the role of close relationships (Taylor & Bazarova, 2018b). Third, investigations into digital media and well-being often center around one medium, but mobile phone or social media communication do not happen in a vacuum. Interpersonal communication is manifested through a diverse set of offline and online media, and this blurring of communication brings new challenges and opportunities for understanding the social uses and effects of communication technologies (Madianou & Miller, 2013).

I address each of these three limitations by merging strands of theory on interpersonal communication, communication technologies, and subjective well-being to offer a relational perspective on the simultaneous benefits and risks of being almost always available to close relationships via mobile phones and social media. Using media multiplexity theory (MMT) as a framework, I argue that the uses and affordances of the diverse set of media used for interpersonal communication by intimate partners are associated with subjective well-being. (Haythornthwaite, 2005). Building from an attachment theory framework, I explicate connected availability, which refers to the perception that intimate partners are immediately available for communication anytime, anywhere, as a mechanism for why the uses and affordances communication technologies can regulate a person's happiness (Bowlby, 1969). Maintaining a sense of connected availability with intimate partners is predicted to increase subjective well-being because of the security offered by attachment bonds. However, connected availability is dyadic process, which means that keeping a close partner always available can have effects that extend onto a person's partner as well. Being constantly available to close partners is commonly regarded as an additional life stressor that may have potentially deleterious consequences for subjective well-being (Ling, 2016). Therefore, the mechanism of connected availability may explain, in part, some of the mixed results on digital media and subjective well-being.

In summary, this dissertation addresses some public concerns about the effects of mobile phones and social media on subjective well-being by advancing a close relationships perspective on this issue. The goal of this dissertation is to address the growing public concern about how the frequent use of mobile phones and social media influences subjective well-being through close relationships. To accomplish this objective, Chapter 2 covers the definition of subjective well-being and reviews research on communication technologies and well-being. Chapter 3 brings

together media multiplexity theory and attachment theory to explicate the mechanism of connected availability and proposes a series of hypotheses about the dyadic influences of media multiplexity and connected availability. Chapter 4 reviews the experience sampling method used to test these hypotheses. The results of the longitudinal dyadic data analysis are presented in Chapter 5. Finally, Chapter 6 discusses how these results address public concern about being almost constantly connected to digital media and contribute to communication research.

CHAPTER 2: LITERATURE REVIEW

The Effects of Communication Technologies on Subjective Well-Being

Recent trends in public reports of subjective well-being, and related indicators of well-being, have noted an alarming trend: well-being has been decreasing over the past several years (Twenge, Martin, et al., 2018). The ubiquity of mobile phones and social media are frequently blamed for this alarming trend (Twenge & Campbell, 2019), and in this chapter, I interrogate if this attribution is warranted by offering a broad overview of research on communication technologies and well-being. To move in the direction of understanding how being almost constantly connected through digital media can influence well-being, I start this chapter by offering a review of the structure of subjective well-being (SWB). After laying the foundation of SWB, I cover the effects of mobile phones and social media effects on SWB from research in communication, psychology, information science, and related fields. This literature review suggests a complicated relationship between living online and SWB. Ultimately, I synthesize this work by suggesting limitations and offering directions for research on the social uses of mobile phones and social media in close relationships, and I suggest a relational perspective on the effects of communication technologies on SWB to provide some clarity to the mixed findings.

Subjective Well-Being

There are numerous conceptualizations of personal well-being (e.g., eudaimonia well-being, physical well-being), but in this dissertation, I limit the scope to SWB. SWB refers to the affective experiences and evaluations about life quality (Diener, 2009). Colloquially, SWB is a synonym for overall happiness. Across cultures, striving for high levels of SWB is perhaps the most important goal humans pursue (Tay & Diener, 2011). There is increasing public policy attention toward SWB because high SWB predicts physical health and longevity (Diener, 2013).

Beginning theorizing for a close relationship perspective from SWB rather than other areas of well-being provides a heuristic groundwork for future research because affective experiences and evaluations of life quality serve as the baseline in other psychological and physiological perspectives on well-being (Robles, Slatcher, Trombello, & McGinn, 2014; Thoits, 2011). Close relationships are characterized by “strong, frequent, and diverse interdependence that lasts over a considerable period of time” (Kelley et al., 1983, p. 38), and research typically discusses romantic relationships, family relationships (e.g., parent-child, siblings), or long-term friendships.

Subjective well-being is a multidimensional construct consisting of three components: positive affect, negative affect, and life satisfaction. It focuses on both the absence of negative emotions (e.g., anger) and the presence of pleasant emotions (e.g., enjoyment). Thus, less negative emotional experiences and more positive emotions is considered higher subjective well-being. Life satisfaction is the global evaluation individuals make of their personal life. In other words, does a person judge their own life as good or bad? Empirical studies of subjective well-being show that positive affect, negative affect, and life satisfaction contribute uniquely to subjective well-being (Diener et al., 2017). The components of SWB are predicted by different processes: (1) life satisfaction is predicted by fulfillment of basic needs, (2) positive affect is associated with love and social support, (3) negative affect is negatively correlated with autonomy, respect, and mastery (Tay & Diener, 2011). Thus, SWB is not a single entity, and establishing how the use of social media contributes separately to life satisfaction, positive affect, and negative affect is critical for informing interventions and public policy around social media (Verduyn et al., 2017).

Critical for the study of digital media and well-being, SWB is a malleable aspect of people's lives. Although genetics determine a part of SWB, life experiences can substantially change perceived quality of life (Tay, Kuykendall, & Diener, 2015). What contributes to SWB depends on the timeframe, which can range from one's entire life to daily experiences down to moment-to-moment fluctuations (Diener, 2009b). Generalized communication patterns are likely to influence overall affect or life satisfaction, whereas specific communication instances may create variance from moment-to-moment in SWB (Dienlin, Masur, & Trepte, 2017; Reis, Sheldon, Gable, Roscoe, & Ryan, 2000). Investigations of SWB on multiple levels of analysis within social media research will provide the most robust picture of how SWB changes in connection to communication technologies.

A key question for the present investigation is the role of social relationships in SWB. Social relationships predict better SWB across most socio-economic statuses, cultures, and personalities (Diener, 2009b). Although the quantity of social relationships is slightly correlated with SWB, quality of close relationships is a much better predictor than quantity (Saphire-Bernstein & Taylor, 2013). In fact, many studies find that quality of social relationships is the strongest predictor of SWB, which holds true across the life-span for various family relationships, such as parent-child or marriage (M. L. Diener & Diener McGavran, 2008). As fundamentally social species, humans have an innate need for intimate interpersonal relationships (Bowlby, 1969), and the fulfillment of this need is key to SWB. A study of SWB in 155 countries found that social relationships were most closely tied to positive affect, and global evaluations of marital bonds predict life satisfaction in numerous studies (Saphire-Bernstein & Taylor, 2013; Tay & Diener, 2011). Social relationships are resources individuals use to cope with the demands of life (Beckes & Coan, 2011). Close relationship partners regulate emotions

in beneficial ways that other social relationships do not (Coan, Schaefer, & Davidson, 2006). A meta-analysis review found that quality close relationships predicts mortality at rates similar to risk factors the U.S. Department of Health and Human Services lists as public health concerns (e.g. obesity, substance abuse, sexual habits, etc.; (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015). Thus, scholars have called for public health campaigns focused on quality relationships (Holt-Lunstad, Smith, & Layton, 2010). The happiness of a person is tightly connected to their loved ones.

Communication Technologies and Subjective Well-Being

There is a growing line of inquiry investigating how the use of communication technologies impacts SWB, and other related well-being concepts. This work tends to focus on social media and/or mobile phone communication. Defining social media is a moving target, but in general the term refers to “a set of [online] features and tools that enable peer-to-peer communication in ways not supported by mass media which use “one-to-many” broadcast models” (Ellison & Vitak, 2015, p. 205). My approach to social media is general including public newsfeed content as well as one-to-one instant messenger conversations, on desktop or mobile devices. Mobile communication is also difficult to define, but is broadly considered the software, applications, and other types of services accessed through mobile phones to communicate with other people, such as text messaging, cell phone calls, or the Facebook mobile application (Humphreys, 2013). Thus, the two terms are not mutually exclusive and often conflated within this research area (i.e., screentime), so I commonly refer to them together to address the notion of being constantly tethered to digital media (Jiang, 2018). My goal in the remainder of this chapter is to provide a broadly construed overview of research investigating communication technologies and well-being and interpret some conclusions.

Initial studies of communication technology use and SWB focused on the amount of time people spent using various digital media. The results are mixed, at best. Whereas a negative relationship between time spent online and SWB, i.e., affect and life satisfaction, has been well-documented (Huang, 2010, 2017; Kross et al., 2013; Tromholt, 2016), some other studies found that time spent on social media can actually improve SWB (Dienlin et al., 2017; Gonzales, 2017; Toma & Hancock, 2013). There is also evidence that too little and too much time spent on social media is equally bad for well-being in support of the Goldilocks effect or the moderate use of social media as the most optimal for adolescents' well-being (Przybylski & Weinstein, 2017). These mixed results came from a variety of different methods including longitudinal data (Dienlin et al., 2017; Kross et al., 2013), experimental (Deters & Mehl, 2013; Tromholt, 2016), cross-sectional (Twenge, Martin, et al., 2018; Kim & Lee, 2010), and computational data (Burke & Kraut, 2016; Shakya & Christakis, 2017).

Recently, interest in the question of screentime has spiked because of an apparent mental health crisis among teens, with a sudden decrease in happiness from 2012 to 2016 (Twenge, Martin, et al., 2018) This study found that digital screentime was the only variable that increased in the national sample of adolescences over that same timeframe, which suggests that digital screentime may be linked to the downturn in well-being. Additional studies have found the association between screentime and mental health issues is stronger among female adolescents than males (Twenge, Joiner, Martin, & Rogers, 2018). These cross-sectional data were challenged by longitudinal data from adolescence and undergraduate students: depression among teens predicted more screentime not the reverse (Heffer, Good, Daly, MacDonell, & Willoughby, 2019).

A series of large-scale studies and meta-analysis suggest that there may be little to no relationship between spending time online and psychological well-being. A multinational sample of teens found that there was a negative effect for digital technology use on well-being, but the authors argued that the size of this effect was marginal and unimportant when considered in the larger scale of factors contributing to the health and happiness of a person (Orben & Przybylski, 2019b). In a second study, using a different multinational data set on teens and digital technology use, there was little evidence of a relationships between screentime and psychological well-being, $r^2 = .001$ (Orben & Przybylski, 2019a). This same research team found that there was a reciprocal negative relationship between life satisfaction and social media use using longitudinal data, but again the size of this effect was trivial (Orben, Dienlin, & Przybylski, 2019).

Combining data-logs from Facebook and longitudinal self-reports of well-being, Burke and Kraut (2016) found that overall receiving messages on Facebook was not associated with well-being. These large-scale survey studies are complemented by two meta-analysis that find similar relationships between time spent online and well-being. The first meta-analysis on the topic found a very slight negative relationship between time spent on social networking sites and psychological well-being (Huang, 2017). The second recent meta-analysis on the topic that found no relationship between overall well-being and social media use across 226 studies (Hancock, Liu, French, Luo, & Mieczkowski, 2019). This series of mixed findings suggest the relationship between frequency of screentime or digital media use and SWB requires a more nuanced understanding than time spent on digital devices. Thus, researchers began to look into the of the types of communication happening online, particularly on social media.

Types of social media use. Social media provide numerous types of communication opportunities for users, such as private messaging conversations, browsing others profiles and

posts, or interacting in threaded comments. The many types of social media use argue against the monolithic approach to social media as a single, uniform activity taken by many of the previously reviewed studies (Burke et al., 2010). Three general types of communication are often discussed in social media research: directed, broadcast, and passive communication. Directed communication refers to one-to-one interactions between two users of a social media platform (e.g., private messaging or comments on photographs). Broadcast communication consists of messages that are shared to the entire social network with no targeted recipient, such as status updates or tweets. Passive consumption is defined as the surveillance of information shared on social media without interacting with the post or profile. Examples of passive consumption include scrolling through the Facebook newsfeed or browsing another user's photographs (Burke & Kraut, 2016; Burke & Kraut, 2014; Burke et al., 2010).

The distinct types of communication enabled by social media have unique effects on SWB. Directed communication between users is positively associated with measures of well-being (Frison & Eggermont, 2016; Kim & Lee, 2010). College students who were randomly assigned to post more status updates on Facebook reported higher well-being after one week than students who did not change their use of Facebook (Deters & Mehl, 2013). Despite these consistent results about the positive impact of directed, active communication on social media, recent Facebook behavioral data suggests the opposite effect. Liking other people's content and clicking on links were negatively associated with physical health, mental health, and life satisfaction (Shakya & Christakis, 2017). Furthermore, number of status updates was negatively associated with mental health. A synthesis of these findings leads to the conclusion that there is no clear answer on how interactive social media use influences SWB, and that the relationship is

likely heterogeneous across additional factors such as personality traits, type of communication, relationship to the other person, and situational factors.

The conflicted research findings continue when passive use of media is considered. Numerous studies have found that SWB decreases with passive consumption on Facebook (Frison & Eggermont, 2017; Shaw, Timpano, Tran, & Joormann, 2015; Tandoc, Ferrucci, & Duffy, 2015; Wenninger, Krasnova, & Buxmann, 2014). However, a longitudinal study measuring passive consumption from Facebook log data, rather than self-reports, found no association between passive consumption and well-being (Burke & Kraut, 2016). Together these findings suggest that active communication (i.e., directed and broadcast) is likely more beneficial for SWB than passive consumption, but the effect is not consistent and needs replication outside of Facebook.

This review of communication technologies and SWB concludes with an unclear picture of what, if any, is the effect of communication technology use on subjective well-being. For nearly every positive effect there is another study that found a negative or null effect. Given the effects of general screentime, frequency of use, passive vs. active, etc. continue to remain unresolved, it is important to look at the processes driving these associations, to build knowledge of how being constantly connected through mobile phones and social media influences people's happiness. Understanding the underlying mechanisms addresses *why* the use of these digital media effect the well-being of an individual. Therefore, these are more powerful explanations of media effects because it provides a reason for the effects. I turn my attention to covering the research that moves beyond the question of time spent and types of media use to the various proposed mechanisms of communication technology use and subjective well-being.

The Mechanisms of Communication Technologies and Subjective Well-Being

The accumulated evidence about different, sometimes opposite, effects of social media use on SWB does not settle concerns, but it does beg the question about the processes and mechanisms responsible for these differences. Two reasons explain the differences between the two primary types of social media use, passive use and active use. Social capital is cultivated through active use, and envy is associated with more passive browsing. Social capital, which refers to gains in social resources through access to weak and strong ties in a network, is often evoked as the mechanism explaining positive effects of social media (see for review, Trepte & Scharkow, 2016). In contrast, envy is viewed as a negative force behind passive use of social media that decreases SWB because passive consumption often involves engaging in social comparison (Krasnova, Widjaja, Buxmann, Wenninger, & Benbasat, 2015; Verduyn et al., 2015). The fear of missing out, or the distress from missing social experiences with peers, is another suggested mechanism for why using social media can make people feel worse (Hunt, Marx, Lipson, & Young, 2018). Thus, increased access to communication and information resources in social media networks can activate both positive (e.g., social bonding) and negative (e.g., envy or FOMO) processes, partly depending on the type of communication in which people engage in, i.e., passive browsing vs. active posting. It is important to note that people typically engage in both passive and active activities on social media, and future research will need to understand how these activities work together rather than exclusively to impact SWB. Such an approach would begin to address the larger concern of what being constantly online means for SWB.

The social displacement hypothesis is another frequently cited reason for why communication technologies can impact SWB. The hypothesis states that more time spent online

or in front of a screen is inversely correlated with offline interactions (Hall, Kearney, & Xing, 2018). This hypothesis is contrasted against the social reinforcement hypothesis, which predicts the opposite relationship (Dienlin et al., 2017). Support for either hypothesis is, again, very inconsistent. The most well-documented case of inconsistent support for the social displacement hypothesis was a study that found a *negative* relationship between internet use and social interactions (Kraut et al., 1998), but a follow-up study found a *positive* relationship between internet use and offline interactions several years later in the same sample (Kraut et al., 2002). More recently, research has continued to offer inconsistent results regarding social displacement. An experience sampling study of college students found that the use of social media did not predict less face-to-face interactions (Hall et al., 2018). A daily diary study found evidence that telephone use displaced the amount of face-to-face communication, but email, text messaging, and Facebook use did not displace face-to-face interactions (Ruppel & Burke, 2015). Whereas, frequency of SNS use predicted more face-to-face interactions 6 months later (Dienlin et al., 2017). Offline social interactions with friends is steadily decreasing from generation-to-generation, but there is a positive relationship between social media use and offline social interactions within-generation (Twenge, Spitzberg, & Campbell, 2019). The idea that digital media use reduces face-to-face interactions is a provocative idea for why the use of digital media can harm SWB, but little consistent evidence corroborates this idea.

The establishment and maintenance of relational closeness is a mechanism that builds upon the question of displacement or enhancement (Valkenburg & Peter, 2009a, 2009b). Rather than focusing on whether or not there is more or less face-to-face interactions, this position argues that communication technology use is good for well-being to the extent that it increases relational closeness (see for review, Taylor & Bazarova, 2018b). Because quality close

relationships are imperative for SWB, if the use of mobile phones and social media promotes stronger close relationships, then digital technology use is suggested to improve SWB. The positive association between relational closeness and social media frequency has been found across numerous types of social relationships, including romantic, friendships, and family relationships (Ledbetter et al., 2011; Ledbetter, Taylor, & Mazer, 2016; Valkenburg & Peter, 2009b). Numerous cross-sectional surveys of college students in dating relationships found that the frequency and quality of mediated communication are positively associated with relational closeness and satisfaction (Caughlin & Sharabi, 2013; Toma & Choi, 2016). However, the positive association between frequency of media use and relational closeness was not replicated using longitudinal data. Rather than mere frequency of use, increases in relational closeness were predicted by the intimacy of self-disclosure happening across media (Taylor & Bazarova, 2018a), although high amounts of online self-disclosure may harm the intimacy of romantic relationships (Lee, Gillath, & Miller, 2019). I also note that there is potential for the use of digital media to decrease relational closeness, which would predict poorer well-being outcomes (Sbarra, Briskin, & Slatcher, 2019). For instance, posting on social media may produce conflict in a relationship, which can undermine relational closeness (Clayton, Nagurney, & Smith, 2013; Ridgway & Clayton, 2016). If a person believes that their partner's frequent use of communication technologies interrupts their relationship, then this can lead to less relationship satisfaction because of increased conflict (McDaniel & Coyne, 2016). Relational closeness appears promising as a mechanism for understanding how being almost constantly online can influence SWB, although evidence reviewed here suggests that there is likely not a unilateral positive or negative effect.

Who the person is communicating with when spending time online also determines the effects of communication technology use on SWB. Most often this mechanism is discussed by comparing communication with close partners and communication with weak ties or the formation of new relationships. In short, communicating with romantic partners, friends, or family over texting, email, Facebook, etc. appears more beneficial to well-being than using those same media to establish new connections. An early study investigating this question found that chatting online with existing friends improved well-being but spending time communicating with online-only friends was not associated with well-being (Valkenburg & Peter, 2007). The beneficial well-being effects of receiving Facebook communication were limited exclusively to communication in close relationships (Burke & Kraut, 2016). Only when people received composed and targeted communication from their intimate ties, they reported improvements in well-being. Chan (2015b) found that using communication technologies for interpersonal communication has a positive influence on well-being, if done within close relationships. However, there was a negative relationship of using communication technologies with weak ties. Similar conclusions about the importance of quality personal relationships are reached in studies that find a negative impact of social media on well-being (Shakya & Christakis, 2017; Twenge et al., 2019). Although many studies do not incorporate the question of who talks to whom in their analysis, this evidence suggests perhaps the most consistent evidence of the previously covered mechanisms: the use of mobile phones and social media in close relationships is better for SWB than in weak tie relationships.

The complicated lives that people live out via their mobile phones and social media likely explains why there are both positive and negative effects, as documented by the various mechanisms discussed there. Anticipation of either a positive or a negative effect on SWB is

false dichotomy, given the multifaceted uses of these communication technologies. Social capital, envy, social displacement and or enhancement, and relational closeness have emerged as several reasons driving the various effects that have been observed in recent research, but there more theory is needed. For instance, one study identified 18 different explanations for why mobile phones and social media are intertwined with health and wellness (Hancock et al., 2019). More research is needed to understand these mechanisms that are driving the consequences of the frequent use of digital media on SWB.

Although there are mixed results on whether the use of mobile phones and social media benefit social relationships, the trend across the majority of the work suggests that social relationships are a major factor in determining the consequences of digital media (Taylor & Bazarova, 2018b; Valkenburg & Peter, 2007). Thus, there is evidence that there is something unique about the combination of close relationships, communication technology use, and SWB. The thread between these three topics has crystalized into a pressing research area ripe for further development to answer public concerns about digital media. Whereas a recent conceptualization focuses on how smartphones harm SWB because of the displacement of the close relationships (Sbarra et al., 2019), it is unclear why the use of digital media for communication in close relationships is associated with SWB.

Building the Relational Perspective of Being Almost Constantly Online

Thus far, I have argued that combining social media, close relationships, and SWB research is one way to answer the tangled web of research findings on this topic forward. Although the importance of close relationships for SWB is widely accepted (Robles et al., 2014), in the digital age, new questions emerge about how personal relationships have changed due to the near constant use of mobile phone and social media technologies, and how those

communication technologies have changed the process by which close relationships influence SWB. Previously, I have theorized a relational perspective on communication technology use and SWB, see Figure 1. I hypothesized two pathways of interpersonal communication processes of close relationships in digital media that may lead to increases or decreases in SWB (Taylor & Bazarova, 2018b). The first pathway argues that mobile phones and social media can impact SWB to the extent that they help foster quality close relationships. This pathway is referred to as the indirect effect path. The second pathway posits that the use of digital media in established close relationships (i.e., romantic partners, family) can influence SWB through interpersonal affect regulation. This pathway is referred to as the direct effect path. Although these two pathways offer a research agenda for building a relational perspective of being constantly online and SWB, there remain many unanswered questions regarding a relational perspective.

Indirect Pathway: SWB Through Increasing Relational Closeness



Direct Pathway: SWB Through Social Media Communication in Established Close Relationships



Figure 1. Adapted from “A Relational Perspective on Social Media and Well-Being” by S. H. Taylor, N. N. Bazarova, and Z. Papacharassi (Ed.), 2018, *A Networked Self: Love*, p. 91. Copyright 2018 by Taylor & Francis

Whereas taking a relational perspective helps to identify what about the frequent use of mobile phones and social media for interpersonal communication is contributing to SWB, the current state of the relational perspective on communication technology use and SWB has several limitations. One limitation is little work on the mixing of media for interpersonal communication. Media are treated as independent islands of interpersonal communication, yet interpersonal communication happens on many interconnected media (Parks, 2017). Therefore, understanding communication across the media landscape is critical for understanding the link between communication technologies and SWB. Another limitation is that the current conceptualization of the direct effect path lacks description of what has changed about

interpersonal relationships as a result of the ubiquity of digital media. Theoretical development regarding what has been revolutionized in interpersonal relationships, based on the interpersonal models of health and wellness (see for review, Feeney & Collins, 2015), is needed. A third limitation is the failure to conceptualize close relationships as dyadic and reciprocal processes where partners are examined as mutually influential (Kenny, Kashy, & Cook, 2006).

Interpersonal communication is happening in pairs and these pairs are likely mutually influential, but this is most often forgotten in work studying the social uses of communication technologies in close relationships. My goal is to address each of these limitations in the next chapter and propose a series of hypotheses to test the aforementioned direct effect path of the relational perspective to technology use and SWB.

CHAPTER 3: THE PRESENT STUDY

Connected Availability in Close Relationships

The effects of digital media use on subjective well-being (SWB) is likely driven, to some extent, by the personal relationships that inhabit those communication technologies. This raises questions about how personal relationships can explain the mixed effects of communication technologies on subjective well-being. Answering this question requires both an in-depth look at how personal relationships contribute to a person's SWB and how those functions of personal relationships have changed as a result of the frequent use of communication technologies. Therefore, it is necessary to find synergy between theories of personal relationships and theories of mediated interpersonal communication to answer the present research question. Media multiplexity theory (Haythornthwaite, 2005) and attachment theory (Bowlby, 1969) represent two disparate theories that when combined could offer insight into why and how the always connected nature of contemporary close relationships might matter for SWB.

In this dissertation project, I bridge together media multiplexity theory and attachment theory to explain the social uses and effects of communication technologies in close relationships. The goals of this chapter are (1) to advance understanding of being almost constantly connected across a diverse set of media, (2) to address how the frequency and ease of communication technology use has changed the interpersonal affect regulation process, and (3) to explain the dyadic interdependence of being always available in close relationships. In total, these three goals help to serve the final goal of untangling why there are both positive and negative effects of communication technologies on SWB. The always available perception of close relationships, when considered at a dyadic perspective, may have both positive and negative consequences. Although close relationships is a broad category of relationships, I limit

my focus to long-term romantic relationships because of the complicated media diets of these relationships and their particular importance in SWB (Caughlin & Sharabi, 2013; Saphire-Bernstein & Taylor, 2013; Taylor & Bazarova, 2018b).

Media Multiplexity Theory

Close relationships are best described as mixed-media relationships because the lines between the various communication technologies are blurred in communication between romantic partners, family bonds, and close friends (Parks, 2017). The permanent connection in close relationships is driven by a mix of different media technologies. For instance, data from cell phone companies show that most mobile phone text message and cell phone calls are sent between people who regularly connect face-to-face (Ling, Bjelland, Sundsøy, & Campbell, 2014). Although communication technologies were once thought as tools for geographically distant social relationships, mobile phones and social media are intensely used to connect with collocated partners and family members (Carpenter & Spottswood, 2013; Coyne, Padilla-Walker, Fraser, Fellows, & Day, 2014; Coyne, Stockdale, Busby, Iverson, & Grant, 2011). Within a given day, a married couple that lives together may converse face-to-face while getting ready for the day, text about picking up their child at school, like the other partner's Instagram post, make a cellphone call about dinner, and then have dinner together in the evening. Therefore, studying technology use in close relationships, particularly cohabitating romantic relationships, requires thinking about interpersonal communication as a mixed-media communication, rather than seeing media as segregated.

Media multiplexity theory (MMT) offers one holistic approach to thinking about how interpersonal communication is weaved together across media (Haythornthwaite, 2005). Media multiplexity is an overarching media theoretical construct that is composed of several

subdimensions (Taylor & Bazarova, 2018a). The *number of media* is the traditional conceptualization of media multiplexity, which simply refers to the sum of communication channels used within an interpersonal relationship for communication. *Multimedia frequency* refers to the total frequency of communication across all media used for communication. Similarly, *multimedia disclosure* is the extent to which a person shares personal information, thoughts, and feelings over a variety of media with a partner. Each multimedia construct can also be broken down into the variability across media, such that variability across media suggests that a dyad is using media for different types of communication (e.g., different media reserved for different types of disclosure in case of multimedia disclosure variability). Overall, MMT describes the totality of interpersonal communication across many media, rather than explaining the strategic choices between the affordances of all media available (Madianou, 2014). As such, media multiplexity can be thought of as one framework for conceptualizing the constant use and combination of communication technologies for interpersonal communication that is at the center of public concern regarding the effects of communication technologies on SWB. This conceptualization of media considers media as “‘channels’ or the physical mechanisms and software of message transmission” (Parks, 2017, p. 506), which places face-to-face communication as one of many other potential media.

MMT predicts that communication across a dyad’s media ecology is a function of their interpersonal bond. The theory consists of five interconnected tenets, which were recently amended by Taylor and Bazarova (2018a). First, greater relational closeness predicts greater media multiplexity (Ledbetter et al., 2016; Sosik & Bazarova, 2014). However, MMT predicts a curvilinear relationship between the use of media multiplexity and subsequent relational closeness (Taylor & Bazarova, 2018a). Communicating across a diverse set of media with a

close partner increases relational closeness, but there is a tipping point where too much media use predicts less relational closeness. Third, as relational closeness increases, so does the variability in the frequency and intimacy of communication across media. Fourth, the introduction of new media is more disruptive to non-close relationships, such as coworkers, distant relatives, than close relationships (Taylor & Ledbetter, 2017). Fifth, people allocate their media use out by the closeness of their relationship such that all individuals are granted access to certain media (e.g., email and Facebook) but only close friends and family are given access to other media (e.g., texting and “Finstagram” account) (Haythornthwaite, 2002).

MMT is growing in robustness in explaining how people are using multiple media for interpersonal communication. The theory has explained relational uses of various communication technologies over the course of a decade (Baym & Ledbetter, 2009; Ledbetter & Kuznekoff, 2012), and demonstrates some validity in geographically close and long-distance relationships (Barakji et al., 2019; Jiang & Hancock, 2013). There is room to improve the explanatory power of this theory in three directions relevant to the current investigation: (1) explaining how the diverse set of multiple media used by close relationships relate to SWB, (2) adding accessibility of partners into the media multiplexity framework, and (3) providing a deeper understanding of the mechanisms underneath the effects of media multiplexity.

Media multiplexity and SWB. The scope of MMT is currently limited to relational outcomes, but there is room to move this theory towards SWB. Empirical evidence on media use in relationships suggests that media multiplexity is positively associated with relational closeness, which should then extend to the SWB because of the close connection between quality relationships and SWB (Diener, 2009b; Valkenburg & Peter, 2009). However, little evidence exists about the effect of media multiplexity on SWB, as most research on SWB focuses on only

medium (e.g., Taylor, Hutson, & Alicea, 2017). In one exception, greater media multiplexity in close relationships predicted more well-being among people 35 years and older, but media multiplexity with weak tie relationships predicted less well-being among individuals 18 to 35 (Chan, 2015b). Therefore, I predict the various forms of media multiplexity (i.e., multimedia number, multimedia frequency, and multimedia disclosure) are associated with greater SWB when investigated in the context of close relationships.

H1: The use of a greater number of media predicts (a) greater positive affect, (b) less negative affect, and (c) greater life satisfaction.

H2: Multimedia frequency is (a) positively associated with positive affect, (b) negatively associated with negative affect, and (c) positively associated with life satisfaction.

H3: Multimedia disclosure is (a) positively associated with positive affect, (b) negatively associated with negative affect, and (c) positively associated with life satisfaction.

Media multiplexity and accessibility. The explanatory power of this theory could also benefit from incorporating media affordances into a media multiplexity framework. Borrowed from Gibson's (1979) concept of affordances, media affordances strike a middle-ground between deterministic and constructivist arguments about media by asserting that the materiality of the communication technology and user of the communication technology work together to determine behavior (Evans, Pearce, Vitak, & Treem, 2017). The exact definition of a media affordance is highly contested, but generally media affordances represent the possible actions a person perceives from a communication technology, and these actions are determined by combination of the design of the communication technology and the goals or needs of the person (Fox & McEwan, 2017; Rice et al., 2017).

One affordance of communication technologies that is often discussed post-hoc with media multiplexity is accessibility (Taylor & Bazarova, 2018a; Utz, 2017), or "the capability of easily achieving or reaching communication, regardless of time, place, structural limitations, technological literacy and other constraints" (Fox & McEwan, 2017, p. 7). Keeping close partners easy to reach at all times is part of what has changed about social relationships in the digital age (Ling, 2012). However, addressing accessibility in an MMT framework requires reconciliation between MMT and media affordances.

Emerging from the early technological determinism debates, MMT explicitly argued against the technologies determining communication, suggesting the media can be socially constructed to complete nearly any communication task (Haythornthwaite, 2005). That is, MMT suggests the communication capacity of any single medium is ambiguous, and this equivocation results in the dyad constructing how a particular medium is used for communication, rather than the medium itself (Haythornthwaite, 2002). Thus, a couple can communicate intimacy over text messaging, face-to-face, or video chat, if that medium has been constructed for that purpose within that dyad. The majority of research on MMT has taken this assumption about communication technology use in social relationships (e.g., Taylor & Ledbetter, 2017). As a result of the social constructionist perspective, affordances were written out of the theoretical perspective of the theory, but there have been recent calls to merge MMT with the media affordances perspective (Ledbetter, 2015).

The question of media affordances gets even more complicated at a multiplexity-level. Holistic approaches to interpersonal communication shift the focus away from a single medium to the integrated set of affordances offered by the media ecosystem and how people exploit those affordances (Madianou, 2014), and media affordances are defined at several different levels: (1)

hardware, (2) software (or the individual media), and (3) contextual factors (Humphreys, Karnowski, & von Pape, 2018). Discussing affordances in an MMT framework is puzzling because the affordances of a medium are contextualized at several levels. Although contextualization is needed for individual media too, when considering MMT and media affordances, what contextual factors will matter becomes clearer because MMT lays out boundary conditions for how to think about media. For instance, affordances in media multiplexity change the question to what is afforded by the media ecosystem, not an individual medium. Yet, the media ecosystem can redefine the perceived affordances of a single medium because media are understood in relationship to one another (Zhao, Lampe, & Ellison, 2016). Another factor is the relationship of the communicators. Relational dynamics alter the utilization of affordances (Jiang, Bazarova, & Hancock, 2013). Others have argued that affordances only drive self-disclosure in the early stages of relational development, and affordances become moot for self-disclosure once a relationship reaches a high degree of closeness (Ruppel, 2015). Then, of course, there are situational factors that challenge the static nature of affordances. For instance, the emotional arousal associated with Facebook is contingent upon the spatial situation of the Facebook use (Bayer et al., 2018). Being at home, compared to away from home, can change the Facebook posting experience. Teasing apart media multiplexity and affordances remains perplexing because of the additional layers of contextualization needed. Yet, combining the two approaches seems intuitive because the multimedia landscape is affording communication actions to couples.

Taken together, these different perspectives on media affordances suggest that accessibility needs to be (1) thought of in the broader media landscape, (2) considered in a particular relationship context, and (3) contingent on the physical context. How easy a medium

makes it to reach each other for communication is likely redefined when new media are added into the media repertoire of a dyad. Accessibility needs to be contextualized within the relationship of the dyad (Ruppel, 2015). Given that my focus is only on close relationships, I am interested in the accessibility of connecting with a close partner via a medium. If one member of a dyad uses Facebook, for example, but the other does not, then Facebook's accessibility is limited in that relationship. MMT would suggest the closeness of the relationship would determine the perceived accessibility as well. Finally, I also recognize that the perceived accessibility can change from situation-to-situation depending on factors such as geographic location and time of day (Bayer et al., 2018). When a couple is at home, face-to-face communication is likely to have high accessibility, but when a couple is away from home the perceived accessibility of face-to-face communication should drop off.

Why would the perceived accessibility of medium predict SWB? There is evidence that being accessible to close ties via communication technologies predicts better well-being outcomes. If it is hard to reach intimate bonds, then stress ensues (Ling, 2016). Experimental studies have shown that negative affect is predicted by the inaccessibility of a mobile phone (Cheever, Rosen, Carrier, & Chavez, 2014). When individuals do not have immediate access to their smartphones, their physiological signs of stress increase (Markowitz, Hancock, Bailenson, & Reeves, 2017). The use of a smartphone application that enables the sharing of brief, mundane life moments with close ties was associated with greater positive affect than other social media (Bayer, Ellison, Schoenebeck, & Falk, 2016). Although there is evidence that the affordance of accessibility may have some negative consequences on SWB, this usually only exists when considered outside of close bonds (Ling, 2012; Reinecke et al., 2018). Ultimately, the ease of connection with a partner of various media offers a degree of felt security (Cui, 2016; Licoppe,

2004). The perceived ease of communication with a close partner via a medium is likely good for SWB. Thus, I hypothesize the following about accessibility.

H4: Accessibility of close relationships via media is (a) positively associated with positive affect, (b) negatively associated with negative affect, and (c) positively associated with life satisfaction.

Although the relationship between the perceived accessibility afforded by a medium and SWB appears clear, there is much that remains unclear about accessibility of a dyad's media ecosystem. Romantic couples and other close relationships have a myriad of communication channels available at any given moment, but the perceived accessibility offered by a single medium may differ from person-to-person, even within a couple (Zhao et al., 2016). Therefore, I propose to look at the variability in reports of accessibility to understand how the accessibility afforded by media changes within a dyad over the course of a day. This will also help to understand the extent to which the accessibility afforded by a medium is situational or invariant (Humphreys et al., 2018). Second, it is unknown what media offer greater accessibility than others when the entirety of the media landscape is considered. Although other studies have found that text messaging, email, and instant messaging were associated with the highest accessibility, accessibility in these instances was decontextualized outside of a dyad's media ecology (Ledbetter, 2015). Given that affordances are reinterpreted within the media ecosystem, establishing which media people consider their romantic relationships accessible on versus inaccessible will clarify how accessibility is contextualized within a relationship. I propose the following two research questions to better understand the affordance of accessibility as a construct of media multiplexity.

RQ1: How much variance in accessibility is explained by media, after controlling individual and day of week variations?

RQ2: Which media are associated with the greatest accessibility?

The mechanisms of media multiplexity. The third way I foresee improvements on MMT is a movement towards the mechanisms of media multiplexity, or addressing the question of why does media multiplexity have effects on SWB? Although there has amassed a body of work on how communication across media predicts relational outcomes and moderators of this association (see for review, Ledbetter, 2015), there is little understanding of why media multiplexity is implicated in the health and wellness of people and their relationships. Because the theory starts from the assumption that the nature of relational ties drives media use, the implied mechanisms of MMT are the relational underpinnings of media use (Haythornthwaite, 2002). Although there is evidence that media multiplexity can extend to SWB, the mechanism remains a mystery. Thus, MMT is at a crossroads where new relational dynamics are needed to advance understanding of the well-being consequences of media multiplexity. It was suggested that the permanent connection of relational bonds sustained through media multiplexity may represent one mechanism explaining the effects (Utz, 2017). Building the theory towards understanding availability across media requires branching outside of Haythornthwaite's (2005) original framework into the psychological processes of intimate bonds. I turn to attachment theory to unpack the notion of permanent connection in intimate relationships.

Attachment Theory

Attachment theory offers one explanation for why staying connected with close relationships via communication technology can influence SWB, which helps to address the third limitation of MMT discussed previously. Originally developed by Bowlby (1969), this theory

explains how pair bonds are formed and used to regulate affect and foster personal growth.

Although the theory was developed to explain infant-parent bonding, the processes of attachment last throughout a person's entire life and remain critical in their health and wellness (Hazan & Zeifman, 1994). In adult relationships, committed romantic relationships are regularly considered attachment bonds, but other types of relationships may develop into an attachment bond (Mikulincer & Shaver, 2003). Given the amount of work on attachment, a full literature review of attachment theory is beyond the scope of this chapter (see Mikulincer & Shaver, 2017), but I draw upon Bowlby's theory and empirical evidence to understand why attachment relationships are associated with SWB.

According to this theory, humans have an inborn, biological attachment behavior system that regulates their propinquity to attachment figures to keep them safe from threats (Bowlby, 1969). The attachment system regulates proximity of attachment figures, similar to other physiological systems in the body that regulate body temperature or blood pressure (Hazan & Shaver, 1994). Obstacles in maintaining proximity to attachment figures result in anxiety, which in turn results in behaviors that try to reestablish proximity (Mikulincer & Shaver, 2017). Attachment figures are sought after until the contact is established. When an attachment figure is available, feelings of positive affect and felt security result. When an attachment figure is not available, feelings of negative affect and anxiety result. The degree of proximity necessary to satisfy the attachment system is determined by many factors including age, physical location, emotional state, etc. As a person grows older, their ability to maintain availability of attachment figures through a variety of means that are not physical propinquity increases (Bowlby, 1969).

Attachment bonds are comprised of four components (Hazan & Zeifman, 1999).

Proximity seeking is maintaining or monitoring the availability of an attachment figure. If a

person senses stress or danger she tends to seek out her attachment figure, referred to as a *safe haven*. *Separation anxiety* is another defining feature of attachment bonds. Because of the security offered by having an attachment figure available, separations from an attachment figure are a signal of potential danger. As a result, protest and distress result when an attachment figure is not available. During times with no immediate threat, attachment bonds also operate as a *secure base* for individuals that promotes exploration and growth. People can explore the world around them or seek personal goals because they know they can fall back to their attachment figure, if necessary (Feeney & Thrush, 2010). A distinguishing factor between parent-child attachment and adult attachment bonds is that children tend to be attached to their parents, not vice versa. Adult attachment bonds are usually, but not always, reciprocal. Adult attachment relationships are also usually characterized as a sexual relationship (Hazan & Zeifman, 1994). Together these four components of attachment bonds suggest that the availability of an attachment figure—keeping an attachment figure near—is a key element to increasing positive affect, reducing negative affect, and improving overall life satisfaction (Bowlby, 1973; Collins & Feeney, 2000).

Although Bowlby (1969) predicts that all humans are equipped with the attachment system, there are systematic differences in how people cope with stressors and seek proximity to their attachment figure. Ainsworth and colleagues first discovered individual differences among infants (Ainsworth, Blehar, Waters, & Wall, 1978), and these differences in *attachment style* have extended into adulthood (Hazan & Shaver, 1987). Attachment styles are the expectations, emotions, and behaviors a person anticipates from interactions with attachment figures, and these mental representations of attachment figures are grounded in previous interactions (Fraley, Waller, & Brennan, 2000). Attachment styles are conceptualized along two orthogonal

dimensions: anxiety and avoidance (Mikulincer & Shaver, 2017). Anxious attachment refers to the extent to which a person worries about the availability of an attachment figure during times of distress, and is influenced by their own feelings of worthiness. Avoidant attachment is the degree to which someone distrusts relationships for providing support and seeks to establish independence from attachment figures.

To date, attachment and communication technologies research tends to focus on the individual differences in attachment style, rather than the normative processes of attachment. Anxious attachment is predictive of frequent texting to romantic partners and the use of social network sites to develop intimacy (Gentzler, Oberhauser, Westerman, & Nadorff, 2011; Morey, Gentzler, Creasy, Oberhauser, & Westerman, 2013; Oldmeadow, Quinn, & Kowert, 2013; Weisskirch, 2012). Avoidance is negatively related to frequency of texting and voice telephone calls (Jin & Peña, 2010). On the other hand, securely attached individuals appear to use texting and voice telephone calls often too (Drouin & Landgraff, 2012; Morey et al., 2013). Therefore, the use of digital communication within romantic relationships is normative and does not appear to be a sign of fear of intimacy or anxiety about a partner's faithfulness. There are several studies on the dark side of communication technology that find attachment anxiety is associated with more intimate partner surveillance, sexting, Facebook jealousy, and use of communication technologies to break-up (Drouin & Tobin, 2014; Fox & Tokunaga, 2015; Fox & Warber, 2014; McDaniel & Drouin, 2015; Weisskirch & Delevi, 2011). Whereas, avoidance is associated with less Facebook surveillance and jealousy post break-up, but positively associated with sexting (Drouin & Landgraff, 2012; Marshall, Bejanyan, Di Castro, & Lee, 2013; McDaniel & Drouin, 2015).

Although knowing an attachment style's role in the use of communication technologies has value to understanding communication in close relationships, there is little understanding how mobile phones and social media have altered the normative processes of the attachment system. Theorizing how the normative processes of attachment connect to communication technologies explain what has fundamentally changed about relationships because of the permanent connection to one another via digital media. In the original formulation of the theory, proximity and availability were synonyms, but availability was redefined as a readily accessible attachment figure, rather than actual or immediate presence, and the anticipated willingness for them to respond appropriately (Bowlby, 1973). The theory is clear that even infants can modulate their affect through an available attachment figure with a variety of strategies. With regard to how proximity seeking changes with adolescence development, Bowlby stated, "Another change that occurs with age is that attachment behavior can be terminated by an increasingly large range of conditions, many of which are purely symbolic. Thus, photographs, letters, and telephone conversations can become more or less effective means of 'keeping contact' so long as intensity is not too high" (Bowlby, 1969, p. 261). Given the liberal definition of availability, availability lays the groundwork to understand how availability of an attachment figure has changed in modern attachment relationships because of digital media.

Attachment availability. Across the adult attachment research, availability is discussed primarily as either the actual physical presence of an attachment figure or the symbolic mental representation of an attachment figure (i.e., imagining attachment figure). In terms of physical proximity, the physical presence of an attachment figure helps to regulate affect and stress (Floyd et al., 2009), but highly satisfied pairs tend to receive more benefits than less satisfied couples (Coan et al., 2006). However, the physical presence is not necessary to receive the felt

security associated with attachment figures. Experiments find that imagining the face of an attachment figure or viewing a photograph of them can aid in coping with stress or pain (Master et al., 2009; Selcuk, Zayas, Günaydin, Hazan, & Kross, 2012) and improve physiological functioning (Bloor, Uchino, Hicks, & Smith, 2004; Smith, Ruiz, & Uchino, 2004). There is even evidence that psychologically priming people with attachment security can improve their well-being (McGuire, Gillath, Jackson, & Ingram, 2018). In other words, even the subtlest reminders of love and affectional bonds can improve SWB (Mikulincer & Shaver, 2015). Thus, the assumption that physical copresence (or face-to-face communication) is required for the beneficial aspects of attachment bonds is unsupported.

Adult attachment relationships in the digital age commonly maintain availability through communication technologies. This tendency is well-documented in mobile communication research. Licoppe (2004) argues the mobile phone lifted constraints of location for interpersonal communication; thus, making relational partners accessible regardless of physical distance. Brief, lightweight mobile phone calls and text messages are used to create a continuous conversation between partners; establishing a “connected presence” with one another. If the connected presence is jeopardized, the felt security of the relationships is threatened because it indicates that the partner is engaged in an activity more important than the relationship. This relational practice of keeping intimate partners near through mobile communication technologies is exhibited through the microcoordination of social activities (Ling & Lai, 2016) and the fact that the majority of text messages and phone calls happen between only four to six people not vast networks of social relationships (Ling et al., 2014). Cui (2016) found that mobile instant messaging applications further create a sense of psychological togetherness when close relational partners are physically separated. Because of the embeddedness of mobile phones in

society, being inaccessible via mobile phone is a problem for the person who lacks a mobile phone as well as their personal relationships (Ling, 2012). The continuous flow of conversations between intimate partners was initially thought to bind intimate bonds tighter together at the expense of broader social networks (Ling, 2008), but this assumption has been overturned with the development of mobile social media and other technological advancements (Campbell, 2019). That is, people can use mobile phones to maintain their close relationships and also form new relationships (Schrock, 2016).

Connected availability. Overall, attachment figure availability is possible offline, online, and even imagined. Viewing the connected and continuous management of relationships through the lens of attachment extends work on digital relationships in several directions. First, rather than connected presence regulating well-being, it is the availability of an attachment figure, that is a partner's perceived ready accessibility and willingness to respond (Bowlby, 1973). This availability is maintained to protect from stressors or dangers, and any removal of that availability should be appraised as distressing. Through an attachment lens, the protest people display when separated from their mobile phones is a reasonable reaction because it is a threat to keeping availability (Cheever et al., 2014; Ling, 2016, 2018). Incorporating attachment also helps to define what is unique about the intimate relationships at the center of these investigations (Ling, 2012). Building Licoppe's (2004) notion of connected presence into an attachment perspective, I refer to the perception that an attachment figure is immediately reachable to help cope with stressors, offer comfort, and otherwise enhance affect regardless of geographic location, time of day, or current activity as *connected availability*. In other words, individuals receive comfort from believing that their partner is constantly available to aid them anytime, anywhere. People appear attached to their digital devices, but my reasoning argues that

they are literally psychologically attached to the other person. Keeping that bond within digital reach helps to ward off stress and bolster happiness, just as though they were physically collocated with one another. This logic is similar to other scholars who have stated that “People are not hooked on their gadgets—they are hooked on each other” (Rainie & Wellman, 2012, p. 6), but understanding the attachment behavioral system explains why people are psychologically hooked. Small reminders of attachment availability offer security (Mikulincer & Shaver, 2015).

Second, although connected availability may appear revolutionary to human relationships, it is not. The maintenance of constant availability of attachment figures is an evolutionarily engraved behavior that follows individuals from cradle to grave (Bowlby, 1969). If the attachment behavior system follows people from cradle to grave, then I argue it likely follows them when they turn on their computer or mobile phone. In this way, the availability maintained through the blurring of offline and online media mirrors the infant-to-parent proximity maintenance. However, what is new is mutually assumed availability of adult attachment relationships. Previously, such availability was reserved in mental representations of attachment figures (Selcuk et al., 2012). Now, the ambient connection to an attachment figure is expected and simultaneously taken for granted (Ling, 2012). Ambient availability is no longer just a possibility because of digital technologies; it is presumed, especially in attachment relationships. This presumption is displayed by the frequent checking of mobile phones, email, and other media (Bayer, Campbell, & Ling, 2016). The desire to stay available to social contacts as an individual personality trait did not extend to close relationships nor is attachment style uniformly associated with the use of communication technologies (Drouin & Landgraff, 2012; Trieu, Bayer, Ellison, Schoenebeck, & Falk, 2019). This suggests a more normative change to attachment behaviors.

In summary, attachment bonds are assumed available to provide comfort, aid, encouragement, etc. regardless of the physical location, activity, and time of day because of the wide variety of media at their disposal to communicate. As a result, people seek out immediate interpersonal communication as an attachment behavior. The psychological mental models commonly considered useful in adult attachment are the only way to regulate affect when physically distant because people assume the ability to make actual contact with their attachment figure anytime, anywhere. This tethering to attachment figures via multiple media is connected availability. The set-goal of the attachment system has not changed, but the method of achieving this goal has changed, which is of “very little consequence compared to the set-goal” (Bowlby, 1969, p. 373). Thus, people keep their partner always available because of their attachment bond. Because of the qualitative difference between attachment bonds and other social bonds, the effects of connected availability are not anticipated to generalize to the networked availability of social relationships (Fox & McEwan, 2017). Connected availability represents an underlying change to the developmental trajectory of attachment behaviors that maintain proximity and how comfort from them is received, but not a fundamental change to the underlying attachment behavior system. Thus, connected availability to attachment bonds predicts better SWB.

H5: Connected availability is (a) positively associated with positive affect, (b) negatively associated with negative affect, (c) positively associated with life satisfaction.

Dyadic connected availability. Connected availability is dyadic, such that the assumption of connected availability is reciprocal in adult attachment bonds (Bayer, Campbell, et al., 2016). While connected availability can improve people’s SWB, the demands of connected availability can be burdensome for their partner. The added task of having to remain always available to a significant other while carrying on with other life responsibilities has the potential

to harm SWB (Ling, 2012). When taking a dyadic perspective, connected availability can explain the existence of positive and negative effects from the integration of mobile and social media in everyday life (Verduyn et al., 2017). Ling (2016) argues reciprocity in connected availability is set to aid one another with life stressors and ensure safety, which is consistent with an attachment perspective. However, the effects of co-availability in attachment are less known because reciprocal regulation of being always available is not present in parent-child bonds. Therefore, the reciprocal perception of immediate availability is an untested condition of adult pair bonds.

With connected availability, relatedness and autonomy needs of an individual collide. Maintenance of connected availability induces stress and burnout because of a lack of autonomy (Fox & Moreland, 2015). When studying mobile relational maintenance expectations among friends, Hall and Baym (2012) discovered a simultaneous benefit and harm to relationship satisfaction. Calling and texting one another frequently created a sense of pressure and guilt that friends had to respond immediately, while also increasing the psychological satisfaction of the relationship. Analysis of mobile log data found that people, surprisingly, responded to close ties less quickly via text message than acquaintances (Birnholtz, Davison, & Li, 2017). Phone calls, on the other hand, were less likely to be sent to voicemail when they came from an intimate partner. This suggests that close partners negotiate their availability with one another through multiple media.

The cognitive orientation towards constant monitoring of online content predicted both higher stress and more social connection, which suggests that ambient availability via communication technologies is functional and dysfunctional for well-being outcomes (Reinecke et al., 2018). Focus groups about the mobile messaging app WhatsApp found that the integration

of WhatsApp into everyday communication routines generated the “always on” state of digital life (Matassi, Boczkowski, & Mitchelstein, 2019). Being “always on” prompted negotiations about timely responsiveness and created anxiety and stress from the demands of having to respond. To get around such pressures, people often report telling lies about their availability (Reynolds, Smith, Birnholtz, & Hancock, 2013). Managing availability is the most commonly reported reason for lying to romantic interests (Markowitz & Hancock, 2018).

The push and pull of a person’s sense of connected availability appears to potentially have deleterious effects on their partner’s SWB. Keeping a permanent connection with an attachment figure may promote SWB within an attachment figure, but I hypothesize that connected availability will negatively affect SWB when considered at a dyadic-level, due to the additional stress of being always on and responsive to partners (Ling, 2016). This hypothesis presents a partner effect of connected availability (Kenny et al., 2006). Partner effects model the effect of a person’s connected availability on their partner’s SWB, showing the negative interpersonal consequences of reciprocal connected availability.

H6: Partner connected availability is (a) negatively associated with positive affect, (b) positively associated with negative affect, (c) negatively associated with life satisfaction.

Bringing Together Media Multiplexity, Connected Availability, and Subjective Well-Being

Communication in attachment bonds traverses numerous communication media to establish connected availability. Licoppe (2004) stated that studying the management of relationships requires a perspective on the “whole available technospace” (p. 135). Although connected availability may be associated with the use of mobile phones (Campbell, 2019), it is reasonable to extend this idea across the interpersonal media ecosystem. The idea of keeping up contact is argued throughout many areas of research in communication technologies. In fact,

Tong and Walther (2011) theorized that one of the main relational maintenance functions of computer-mediated communication was establishing a sense of availability when physical presence is not available. Social grooming on social networking sites follows a similar idea suggesting that people signal to their friends trust and attention through the frequent use of one-click interactions and comments on posts (Ellison, Vitak, Gray, & Lampe, 2014). The number of different types of communication on social networking sites and frequency of those types of communication promotes greater relational connection (Sosik & Bazarova, 2014). Also, the importance of face-to-face communication cannot be ignored in the maintenance of close relationships, especially when taking a multimedia perspective (Caughlin & Sharabi, 2013). The combination of checking in via text messages, seeing a partner at home in the living room, or liking a Facebook post should result in the heightened sense that a partner is always available. The diverse number of communication technologies used for interaction and the frequency of use of those media, multimedia frequency, should predict a greater sense of having immediate connection to a partner. Based on the logic presented, this suggests an indirect effect. Media multiplexity generates the sense that attachment bonds are always together and responsive to bids for connection. In turn, having attachment bonds always available for communication alters SWB. Figure 2 presents a conceptual dyadic model of the indirect relationship of media multiplexity on SWB through connected availability. Table 1 contains all key terms and definitions related to the hypotheses.

H7: The use of a greater number of media predicts greater connected availability.

H8: Connected availability mediates the relationship between the number of media and subjective well-being.

H9: Multimedia frequency is positively associated with connected availability.

H10: Connected availability mediates the relationship between multimedia frequency and subjective well-being.

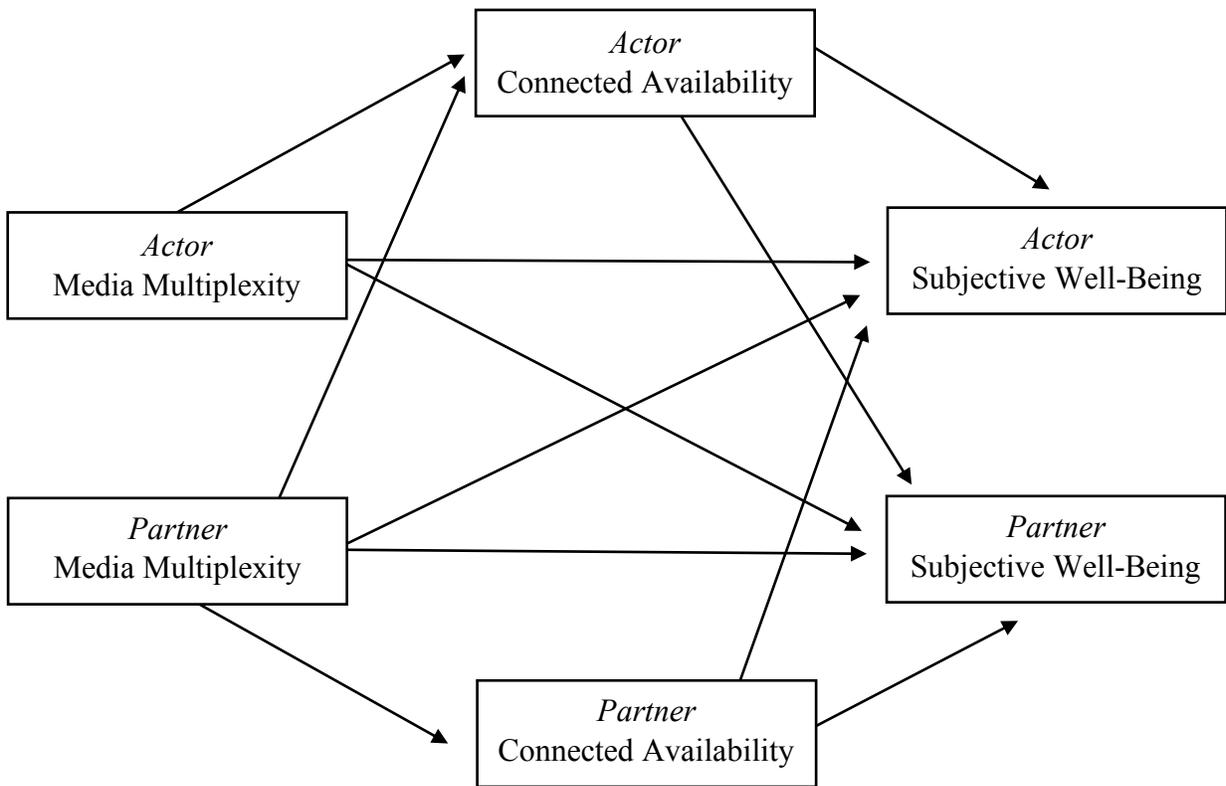


Figure 2. *A Conceptual Dyadic Model of the Media Multiplexity to Subjective Well-Being Through Connected Availability.*

Table 1. *Key Terms and Definitions*

Key Terms	Definitions
Subjective Well-Being	The affective experiences and evaluations about life quality
A. Positive Affect	The presence of pleasant emotions
B. Negative Affect	The absence of negative emotions
C. Life Satisfaction	Global evaluations individuals make of their personal life
Media Multiplexity	A holistic approach to thinking about how interpersonal communication is weaved together across media
A. Number of Media	The sum of communication channels used within an interpersonal relationship for communication
B. Multimedia Frequency	The total frequency of communication across all media used for communication
C. Multimedia Disclosure	The extent to which a person shares personal information, thoughts, and feelings over a variety of media with a partner
D. Accessibility	"The capability of easily achieving or reaching communication, regardless of time, place, structural limitations, technological literacy and other constraints" (Fox & McEwan, 2017, p. 7)
Connected Availability	The perception that an attachment figure is immediately reachable to help cope with stressors, offer comfort, and otherwise enhance affect regardless of geographic location, time of day, or current activity

There remains debate over whether multimedia disclosure will predict connected availability. Haythornthwaite (2005) argues that a high-level of self-disclosure is characteristic of relationships engaged in high media multiplexity, but others argue that short, routine communication throughout the day is what keeps individuals ambiently together (Bayer, Ellison, et al., 2016; Cui, 2016; Licoppe, 2004; Ling, 2008). Of course, mundane, routine communication is the lifeblood of close relationships (Duck, Rutt, Hurst, & Strejc, 1991), and the frequent discussion of intimate topics over several media is associated with less closeness (Taylor & Bazarova, 2018a). However, most models of close relationships include self-disclosure as a core process in interpersonal health (Reis & Clark, 2013). That is, disclosing to a partner and then having them demonstrate understanding and care creates the necessary conditions to improve

well-being (Feeney & Collins, 2015), and digital media encourage more intimate self-disclosures to maintain a romantic relationship, especially for long-distance couples (Jiang & Hancock, 2013). Efforts to understand collocated, marital communication have found that mobile phone communication, such as texting and voice cellphone calls, is a place for intimate types of conversations, such as affection exchanges and difficult conversations (Coyne et al., 2011). If affect regulation in close relationships is conditioned on self-disclosure, then disclosure across media may also lead to the heightened sense of accessibility and willingness to respond appropriately, see Figure 2.

H11: Multimedia disclosure is positively associated with connected availability.

H12: Connected availability mediates the relationship between the multimedia disclosure and subjective well-being.

Connected availability may be predicted by the mere ease of reaching a partner via media. With the variety of media available, it is reasonable to anticipate a person will report feeling connected availability when their attachment figure is immediately reachable for communication. The ease of connecting in the digital world is often cited as the reason for accessibility in relationships (Fox & McEwan, 2017). In fact, studies of social relationships and accessibility often equate media accessibility and connected availability. It has also been documented that when a partner does not immediately respond to connection attempts, partners are perceived as unavailable (Ling, 2016). The perceived accessibility via media goes straight to the root of attachment figure available: the perception that an attachment is easy to contact and quick to respond (Bowlby, 1973). The connection between the accessibility afforded by media multiplexity and connected availability is clear. In the end, I suggest the reason that the accessibility of a partner via various media predicts SWB is due to a fostered state of connected

availability created by media that afford easily reaching one another. Figure 2 offers a conceptual model for these predictions.

H13: Accessibility of a partner via media is positively associated with connected availability.

H14: Connected availability mediates the relationship between accessibility and subjective well-being.

CHAPTER 4: METHOD

Participants

Recruitment. One hundred fourteen romantic couples in long-term relationships were recruited to participate in this study. A community sample of participants were recruited through several techniques including, social networking site posts, snowball sampling, and Facebook advertisements. Recruited romantic couples were eligible to participate if they cohabitated with one another, which ensured a blend of analog and digital communication (i.e., no long-distance relationships). Cohabiting romantic couples were screened using two additional criteria to participate in the study. Although I recruited long-term romantic couples, this did not guarantee their psychological attachment to one another. Therefore, an attachment bond screening criterion was used. In the pre-survey, dyads were given the WHOTO scale (Hazan & Zeifman, 1999) to determine if they met the four requirements of an attachment bond: proximity seeking, safe haven, separation anxiety, and secure base. Both members of the dyad needed to report each other as an attachment figure to participate, as described in the pre-study measures section of this chapter. Both members of the dyad were required to own an iPhone or Android smartphone with internet access to participate in the experience sampling method. Opposite-sex couples, same-sex couples, and other LGBTQ identifying couples qualified for participation in this study because the gender composition of the dyad was not predicted to alter the proposed process hypothesized in this study (Finkel, Simpson, & Eastwick, 2017). Thus, the members of the dyad were indistinguishable (Kenny et al., 2006).

Participants received up to \$30 per person (\$60 per dyad) in an Amazon or Starbucks giftcard for participation in the study. Participants received \$25 if they completed the pre-survey, at least 40% of the ESM surveys, and the post-survey. If participants completed less than 40% of

the ESM surveys or failed to complete the post-survey, their payment was reduced to \$5. To incentivize dyads to complete the study, participants were given a bonus of \$5 if their partner also completed the study. Participants who do not respond to a minimum of 10% of survey questions were disqualified from final analysis. All hypotheses, procedures, measures, sampling strategy, and data analysis plan for this study were preregistered prior to data collection. The preregistration is available in Appendix A and at <https://osf.io/4hw97>. Hypotheses were changed to increase the specificity and clarity of the hypothesis, but the substance of the hypotheses were not changed in a meaningful way.

An *a priori* power analysis from the actor-partner independence model estimated a sample size of 130 dyads could detect a between-subjects partner effect of .15 with 80.2% power (Kenny et al., 2006). To meet this power threshold, an initial sample of 157 couples were recruited to participate in this study. After 18 couples were screened for not reporting reciprocal attachment bonds a total of 139 couples remained. 25 couples did not complete enough of the survey for analysis, so the final number of dyads was 114, or 228 participants. The attrition rate was 18.00%. This rate is similar other studies using dyads and longitudinal data collection (Knobloch & Theiss, 2011; Taylor & Bazarova, 2018a). Given that 114 couples were below the anticipated sample size from the power analysis, a post-hoc sensitivity analysis from the actor-partner independence model estimated that a sample size of 114 dyads could detect a between-subjects actor effect of .25 with 97.7% power and a partner effect of .15 with 66.0% power (Ackerman & Kenny, 2016).

Attrition analysis. To determine if there were systematic differences between the final sample and couples who dropped out of the study, I conducted several analyses regarding attrition. Because this is a dyadic study, if one member of the dyad completed but the other did

not, then both members of the couple was coded as dropouts. Multilevel modeling was used to test if attrition rates differed by numerous factors captured at the baseline measurement in the presurvey (i.e., age, relational closeness, subjective well-being, felt security, and media multiplexity). The attrition analysis accounted for the data structure that individuals were nested within dyads in their baseline reports. Results of this attrition analysis suggested that the final sample had more life satisfaction ($M = 5.60, SE = .08$) compared to the those dyads who did not complete the study ($M = 5.13, SE = .17$), $p < .05$, and the final sample reported more felt security ($M = 6.34, SE = .06$) than couples who did not to complete the study ($M = 6.04, SE = .13$), $p < .05$. Participants who were included in the final sample were younger ($M = 29.6, SE = .45$) than participants from the dyads who dropped out of the study ($M = 33.4, SE = .96$), $p < .001$. Attrition was not associated with baseline positive affect, negative affect, number of media, or multimedia frequency, $p > .05$. In sum, the couples who were retained for the final sample were younger, in more secure relationships, and had more life satisfaction than couples who did not complete the full study.

Sample descriptive information. The average age of the final sample was 29.6 ($SD = 5.35$). Females consisted of 50.9% of the sample, males 47.8% and other gender 1.3%. The average age by gender was 29.2 for females ($SD = 5.31$), 30.2 for males ($SD = 5.38$), and 24.7 for other genders ($SD = 1.15$). Most of the sample was married (82.5%), in an opposite-sex relationship (89.5%) and identified their race as white (87.3%) and non-Hispanic, Latino, or Spanish (94.7%). Of the LBGQTQ couples, 5 couples were female-female dyads, 2 couples were male-male, and 2 included at least one member who identified their gender as other. Table 2 contains detailed demographic data breakdowns for each these categories. The education level of

the sample was 3.51% high school or GED, 18.4% some college, 39.0% four-year college degree, 10.1% some postgraduate education, and 29.0% postgraduate degree.

Table 2. *Demographic Data of Sample*

Gender	n(%)
Female	116(50.88%)
Male	109(47.81%)
Other	3(1.32%)
Race	
Asian	11(4.82%)
Black or African-American	4(1.75%)
Native American/American Indian or Alaska Native	2(0.88%)
Native Hawaiian or Other Pacific Islander	1(0.44%)
Two or more races	8(3.51%)
White	199(87.28%)
Other	3(1.32%)
Latino	
No	216(94.73%)
Yes	12(5.26%)
Relationship Status	
In a romantic relationship	32(14.04%)
In a domestic partnership or civil union	8(3.51%)
Married	188 (82.46%)
Relationship Gender Composition	
Opposite Sex Couples	105(92.11%)
Same-Sex Couples	7(6.14%)
Non-Gender Binary Couple	2(1.75%)

The length of the relationship ranged from 1.3% less than 1 year, 18.4% 1 to 3 years, 34.7% 4 to 6 years, 33.3% 7 to 10 years, 9.7% 11 to 15 years, 1.8% 16 to 20 years, and 0.9% over 20 years. 12 couples disagreed on the length of their relationship. 64% of the couples had children under the age of 18 living in their home. Participants resided across the United States, and I used time zones to infer the geographic region of the participant: 29.4%% lived in the Eastern U.S., 36.0% lived in the Central U.S., 26.3% lived in the Mountain West, 8.3% lived in the Western U.S. Technology ownership was 69.3% iPhone, 30.7% Android smartphone, 27.19% a desktop computer, 90.4% a laptop computer, and 70.2% owned some type of tablet device (iPad, Kindle, etc.). Because of the uncertainty of the characteristics in any given community sample, I further describe the sample along demographic data such as household income, employment status, political party, and religion in Table 3. Finally, the U.S. Bureau of Labor Statistics occupation classification of participants is presented in Table 4.

Table 3. *Additional Descriptive Demographic Data of Sample*

Employment Status	n(%)
Employed, working 1 to 39 hours per	62(27.19%)
Employed, working 40 or more hours	108(47.37%)
Not employed, looking for work	7(3.07%)
Not employed, NOT looking for work	50(21.93%)
Retired	1(0.44%)
Household Income	
Less than \$50,000	94(41.40)
\$50,000 - \$99,999	72(31.71)
\$100,000 - \$149,999	43(18.94)
More than \$150,000	18(7.93)
Political Party	
Democrat	71(31.14%)
Independent	56(24.56%)
Republican	83(36.40%)
Something else	18(7.89%)
Religion	
Agnostic or Atheist	38(16.67%)
Buddhist	6(2.63%)
Jewish	3(1.32%)
Muslim	2(0.88%)
Protestant, Roman Catholic, LDS, or Other Christian Denominations	149(65.35%)
Other Religion	4(1.75%)
No Religious Affiliation	26(11.40%)

Table 4. *U.S. Bureau of Labor Statistics Occupation Classification of Sample*

Occupation Categories	n(%)
Architecture and Engineering	6(2.63%)
Arts, Design, Entertainment, Sports, and Media	6(2.63%)
Building and Grounds Cleaning and Maintenance	1(0.44%)
Business and Financial	23(10.09%)
Community and Social Service	5(2.19%)
Computer and Mathematical	7(3.07%)
Educational Instruction and Library	30(13.14%)
Farming, Fishing, and Forestry	1(0.44%)
Healthcare Practitioners and Technical	15(6.58%)
Healthcare Support	1(0.44%)
Homemaker, Stay Home Mom/Dad	32(14.04%)
Installation, Maintenance, and Repair	2(0.88%)
Legal	1(0.44%)
Life, Physical, and Social Science	12(5.26%)
Management	22(9.65%)
Office and Administrative Support	10(4.39%)
Personal Care and Service	2(0.88%)
Production	1(0.44%)
Protective Service	1(0.44%)
Sales and Related	7(3.07%)
Student	36(15.79%)
Unemployed	4(1.75%)
Unidentifiable	3(1.32%)

Procedure

Pre-study. Participants completed a three-part study to test the effects of connected availability on SWB that lasted approximately 9 days. The study was completed online through a series of automatic emails, which were triggered at each stage in the process. After consenting to participate in a study about romantic relationships and communication technology use, the first member of the dyad completed a pre-study survey that included a variety of demographic information as well as reports of SWB, relational satisfaction, relational closeness, attachment styles, use of various communication technologies, and the perceived accessibility afforded by a diverse set of communication technologies. After this survey was completed, the system generated an email to their partner to complete the same survey. Once both partners had completed the pre-study survey, the couple was invited to sign up for the experience sampling method (ESM) part of the study.

ESM. The ESM was employed in the second part of the study to test the moment-to-moment fluctuations in SWB, connected availability, and communication behaviors among the romantic couples. ESM pinged participants at random intervals 5 times per day to respond to brief surveys. Participants were asked to respond about their experiences in the moment, rather than reflect onto how they once felt. ESM captures SWB in the moment, and this moment-to-moment data can be associated with recent communication with partners. ESM offers advantages over other types of data collection because participants have a small-time window (i.e., the last hour) to remember their behavior and this time window reduces memory recall biases in survey data collection (Tourangeau, Rips, & Rasinski, 2000). Memory recall bias is particularly an issue when reporting on communication technology use (Boase & Ling, 2013). Numerous studies have established that ESM is a useful method for studying SWB and communication technologies *in*

situ (Hall, 2018; Kross et al., 2013). As with other intensive longitudinal study designs, ESM has potential downfalls. One potential problem is survey exhaustion because participants are asked to complete many surveys in a short period of time (Hektner, Schmidt, & Csikszentmihalyi, 2007). Another concern is the repeated ESM surveys might operate as an intervention that can alter the same response to have different meanings, which could limit the longitudinal interpretability of the data (Kashy & Donnellan, 2012). These concerns notwithstanding, the rich data generated from a one-week splice into a couple's relationship offer unique insights into within-person changes in communication and SWB not offered by other types of longitudinal data analysis.

For the ESM portion of the study, 5 times per day both members of a dyad received a text message with a link to a short online survey to fill out. Surveys emphasized reporting on subjective feelings at the moment, rather than global appraisals of SWB and connected availability, and their communication with their partner in the last hour. Surveys arrived via text message for 7 consecutive days and took approximately 2 minutes to complete each time. A total of 35 surveys were possible per person. Of the total possible 7980 surveys, 6252 were answered, or the response rate was 78.34%. The minimum cut-off for inclusion in the same was 10% completed surveys (approximately 4 surveys) to try and keep as many dyads intact in final sample as possible. Participants received survey signals between the hours of 8 AM and 10 PM. After pilot testing the ESM on eight individuals, it was clear that the response window to the ESM pings needed to be somewhat larger because of the demanding schedules of participants. Participants had 2 hours to complete the ESM survey before the link would timeout. If another survey invitation came before the previous was answered, the previous link was deactivated. The survey invitations had a minimum 60 minutes between invitations to allow time for communication between partners and fluctuation in SWB. Although both members of the

romantic couple were completing the ESM, the signals were not yoked. So, the signals were arriving at random time points within the dyad. The ESM was conducted using the software SurveySignal (Hofmann & Patel, 2015), with the cost of \$1079.00.

Post-study. The final part of the survey was the post-study survey. The morning after the ESM was completed, participants were emailed a post-study survey to life satisfaction, relationship satisfaction, and stressful life events (i.e., troubles with the boss), see Appendix B. If participants did not respond immediately, they were sent a follow-up email 2 days and 7 days after asking them to complete the survey. The survey link expired 14 days after the initial email. Participants were sent their compensation via email giftcard within 7 to 10 days. Again, all data in the post-study was collected for both members of each dyad.

Pre- and Post-Study Measures

A battery of personality and relational variables were included in the pre- and post-study measures to describe the sample but were not central to the theoretical model in this study. Pre-study measures were used for the attrition analysis. The pre-study survey asked participants about their demographic information (e.g., age, gender) as well as information about their relationship (e.g., relationship length, number of children). Both the pre- and post-survey measured of SWB and media multiplexity. Positive affect ($M = 3.30$, $SD = .68$, $\alpha = .88$) and negative affect ($M = 1.91$, $SD = .54$, $\alpha = .81$)(PANAS, Watson, Clark, & Tellegen, 1988), and life satisfaction ($M = 5.53$, $SD = 1.02$, $\alpha = .87$) were captured using established trait scales (SWLS; Diener, Emmons, Larsen, & Griffin, 1985). For media multiplexity, the average number of media reported being used with a partner in the past year was 5.73, $SD = 1.58$, out of a possible 11 media. Participants also reported on the frequency of media use patterns with their romantic partner, $M = 31.92$, $SD = 6.21$ (Taylor & Bazarova, 2018a). Felt security of the

relationship—the degree of certainty about their partner’s love and commitment to them—was also measured in the presurvey using Marigold, Holmes, and Ross's (2007) scale, $M = 6.50$, $SD = .80$, $\alpha = .92$. All survey questions from the pre-survey, ESM, and post-study are available in Appendix B.

Attachment bonds. The WHOTO scale was used to operationalize the formation of an attachment bond (Fraley & Davis, 1997; Hazan & Zeifman, 1999). The open-ended questionnaire asks participants to list up to five people in their lives who serve attachment functions. The questionnaire assesses the formation of an attachment bond across four dimensions: proximity seeking, safe haven, separation anxiety, and secure base. Participants are asked to provide the term that best defines their relationship. There are a total of 5 blank spaces per question, and participants were asked to list their relationships in order of significance, starting with the most significant. The open-ended responses were then coded by two undergraduate research assistants. The research assistants were instructed to look for the use of terms such as spouse, partner, wife, or husband in response to each question. If one of these terms was used in response to the question, the research assistants recorded that condition of the attachment bond as satisfied. Research assistants also recorded the placement of the partner in the WHOTO list, (i.e., first to fifth). The research assistants double-coded 25% of the sample. The agreement between the undergraduate research assistants was 100%. After coding was completed, I tallied the number of times the participants reported their romantic partner in the WHOTO scale across the four questions, looking for a minimum of two to equal an attachment bond. Most participants reported their romantic partner in all four categories ($n = 201$), and attachment was reported across three categories for some ($n = 24$) and only two categories for very few ($n = 3$). Both members of the couple needed to report each other as an attachment figure, according to these

criteria, in order to be included in the final sample. Thus, every couple in the exhibited a reciprocal attachment bond. Because the WHOTO requires manual coding, all screening of dyads happened after the entire study was finished.

The WHOTO scale I used as was shortened version of Hazan and Zeifman (1999). To measure proximity seeking, participants were asked to list up to 5 people meet this criterion: “Person(s) you make sure to see or talk to frequency.” The question for safe haven was “Person(s) you seek out when worried or upset.” Separation anxiety was measured with this question “Person(s) whose absence make you feel like something is not quite right.” Secure base was reported using one final question “Person(s) you know will always be there for you.”

Between-subjects accessibility. I measured accessibility at between-subjects level in the presurvey for comparison between media using a 3-item shortened measure from Trieu et al. (2019) across 10 different media: text messaging, face-to-face, cellphone calls, email, landline telephone, desktop instant messaging, social networking sites, Snapchat, mobile messaging apps, and video chat. Responses were solicited on a 7-point Likert scale (1) strongly disagree to (7) strongly agree (e.g., “My partner is always available via [text message/cellphone calls].”, “My partner is easy to reach through [text message/cellphone calls]”, and “My partner responds right away to [text message/cellphone calls].”). The overall accessibility mean was 4.22 with a standard deviation of 1.98. This measure demonstrated reliability over all the various media because Cronbach alphas ranged from .90 to .98.

Experience Sampling Measures

Subjective well-being. Three key dependent variables in this study are related to subjective well-being in the ESM: positive affect, negative affect, and life satisfaction. Affect will be measured with two questions, “How positive do you feel right now?” and “How negative

do you feel right now?”, 1 = Not at all, 10 = Very much. Following SWB research, positive and negative affect were treated as separate variables (Choi & Bazarova, 2017; Diener, Oishi, & Tay, 2018). Life satisfaction will be measured using one question, “How satisfied are you with your life right now?” on a 10-point Likert-Scale (1 = Very dissatisfied, 10 = Very satisfied). The mean and standard deviation for SWB were as follows: positive affect ($M = 7.27$, $SD = 2.03$), negative affect ($M = 2.64$, $SD = 1.84$), and life satisfaction ($M = 7.98$, $SD = 1.61$). ESM typically use very short questions to measure response because of the frequency of ESM pings (Hall, 2018; Kross et al., 2013) and with one question items I am unable to calculate traditional measures of scale reliability. Descriptive information for the subjective well-being variables is available in Table 5.

Table 5. *Descriptive Statistics of ESM Indistinguished Dyads*

	Mean	SD	Min	Max	ICC (Dyad)	ICC (Day)
1. Positive Affect	7.27	2.03	1	10	.32	.05
2. Negative Affect	2.64	1.84	1	10	.25	.05
3. Life Satisfaction	7.98	1.62	1	10	.48	.03
4. Connected Availability	6.39	.97	1	7	.21	.09
5. Multimedia Frequency	3.67	1.49	1	15	.09	.06
6. Accessibility	7.2	2.49	1	28	.06	.05
7. Multimedia Disclosure	5.45	2.94	1	30	.14	.04

Media multiplexity. Media multiplexity is an aggregated construct representing different types of media use and communication over multiple media (Taylor & Bazarova, 2018a). Media

multiplexity was operationalized using self-report data. Participants will be asked to if they have used any of the following media with their partner in the last hour: (1) Face-to-face, (2) text messaging, (3) cellphone calls, (4) landline telephone calls, (5) desktop instant messaging, (6) email, (7) Snapchat, (8) Facebook, (9) Twitter, (10) Instagram, (11) mobile messaging apps (e.g., WhatsApp), (12) video chat, or (13) other media. These media were selected because of their popularity in the American market for communication technologies and previous work showing the cohabitating couples use these media often (Coyne et al., 2011; Rainie & Wellman, 2012), but the other media category was used to make sure no media were forgotten. Four variables related to media multiplexity were measured, as described below. All media multiplexity variables were collected for both members of the romantic couples.

Number of media. Number of media is the base measure of media multiplexity (Haythornthwaite, 2005). Participants were asked which media of the previously listed 13 media they used with their partner in the last hour, and a simple summation of the total number of media used was used to create a measure of number of media, similar to the measured used in Wohn and Peng (2015). Over the 7 days, participants reported communicating with their partners 4658 times in the last hour (i.e., 74.50% of 6252 ESM surveys). The breakdown of the number of media used in the previous hour ranged between 0 to 4: 0 media (25.50%, $n = 1594$), 1 medium (66.59%, $n = 4163$), 2 media (6.73%, $n = 421$), 3 media (1.13%, $n = 71$), and 4 media (0.004, $n = 3$). In total there were 5230 communication instances reported on in this dissertation using various combinations of offline and online media, with 1719 being mediated through some communication technology and 3511 were face-to-face communication. Table 6 provides descriptive information about the amount of use for each of the various media. Face-to-face

communication was the most commonly used for romantic couples, but it was also the most common medium used in combination with another medium.

Table 6. *Frequency of Media Use Among Romantic Partners*

Medium	Total Use n(%)	One Medium Only n(%)
1. Face-to-Face	3511(67.13%)	3043(75.40%)
2. Text Message	1047(20.02%)	678(16.80%)
3. Cellphone Calls	329(6.29%)	134(3.32%)
4. Landline Telephone	1(0.02%)	0(0%)
5. Desktop Instant Messaging	125(2.39%)	87(2.16%)
6. Email	26(0.50%)	10(.25%)
7. Snapchat	29(.55%)	6(.15%)
8. Facebook	33(0.63%)	4(.10%)
9. Twitter	16(0.31%)	2(.05%)
10. Instagram	8(0.15%)	1(.02%)
11. Mobile Messaging Apps	74(1.41%)	60(1.49%)
12. Video Chat	18(0.34%)	8(.20%)
13. Other	13(0.25%)	3(.07%)
Media Combinations	Two Media n(%)	
1. Face-to-Face & Text Message	173(43.25%)	
2. Face-to-Face & Cellphone Calls	73(18.25%)	
3. Face-to-Face & Desktop Instant Messaging	20(5.00%)	
4. Face-to-Face & Facebook	13(3.25%)	
5. Face-to-Face & MMA	9(2.25%)	
6. Text Messaging & Cellphone Calls	47(11.75%)	
7. Text Messaging & Snapchat	13(3.25%)	
8. Text Messaging & Twitter	8(1.75%)	
9. Email & Desktop Instant Messaging	5(1.25%)	

Note: There were as potential of 90 media combinations of two media. Combinations than were greater than 1% of the total frequency of two media used in combination were reported here.

Multimedia frequency. I used Taylor and Bazarova's (2018) measure of multimedia frequency to capture both the number of media and total communication across media in the last hour. At each ESM survey timepoint, participants reported the frequency of use on each of the media used in the last hour, from the previously listed 13 media options. Participants responded to the question “In the last hour, how much did you communicate with your partner using [text message/cellphone calls].” Responses were selected on a 5-point Likert scale, (1 = not at all to 5 = a great deal), and then summed together across media to create the multimedia frequency index ($M = 3.67$, $SD = 1.48$). Although I had reports from both partners, summation of frequency occurred for individuals rather than across the dyad.

Multimedia disclosure. One question from the Rochester Interaction Record (Reis & Wheeler, 1991) were used to operationalize self-disclosure over the various media. After indicating which media participants used with their partner in the last hour, participants reported the amount of self-disclosure on each of the media they with their partner in the in the last hour. Participants responded to the statement, “When communicating via [name of medium] with my partner in the last hour, I shared...”, with the response options of (1) very little to (10) a great deal. Reports were summed together to create the multimedia disclosure variable for each member of the dyad individually. Multimedia disclosure had a mean of 5.45 ($SD = 2.94$).

Connected availability. Connected availability was measured using three questions representing that idea that the participant could contact their partner at any moment in time regardless of time or location constraints for support, encouragement, help, etc. This scale was developed for this study based on Licoppe (2004) and Ling (2012). The questions were “If I needed my partner right now, he or she would be available to help” and “At this moment, I know that my partner is available to offer me support” on a (1) strongly agree to (7) strongly disagree

scale. The final question was “If you contacted your partner right now, what is the likelihood that your partner would immediately respond?” on a scale of (1) extremely likely to (7) extremely unlikely. The reliability of these three variables was .88 and an average value of 6.39 ($SD = .97$). Questions were asked to both participants in the romantic couples, but connected availability was averaged for individual members of a dyad (see Table 5).

Accessibility. Accessibility was reported for media the participant used with their partner in the last hour. Accessibility was measured for both members of the dyad using one question adapted from Trieu et al.'s (2019) scale, “In the last hour, it was easy for me to reach my partner through [text message/cellphone calls],” on a Likert scale of (1) strongly agree to (7) strongly disagree. As with multimedia frequency, accessibility was summed together over all media for each individual to create a composite score for accessibility for each ESM ping. Table 5 contains detailed descriptive analysis of accessibility.

CHAPTER 5: RESULTS

Descriptive Data Analysis

Table 5 contains the descriptive statistics for the ESM data. I calculated the intraclass correlation (ICC) for each variable by running a three-level null MLM model with repeated measures nested in day and day nested within dyad. An ICC that near 0 means that most the variability in the data is within dyads or within days variance. An ICC approaching 1 suggests that variance is between dyads or days. Of all the data, life satisfaction (.48) had the highest dyad-level ICC. This means that 48% of the variance in life satisfaction is explained by differences between dyads. Therefore, life satisfaction was more immune to within-dyad fluctuations, compared to other variables in the data set. The lowest ICCs existed in the media use variables, .14 or lower. This suggests that most of the variance in media use, such as number of media and multimedia frequency, set is attributable to within dyads. Affect and connected availability were in the middle: positive affect = .32, negative affect = .25, and connected availability = .21. There was some clustering for affect and connected availability, but I also observed a substantial amount within dyad variability. In terms of ICC for day, none of the ICCs were greater than .09. This low ICC suggests that there is limited clustering within dyad at the day-level.

Table 7 displays the between- and within-dyad correlations for media use variables and indicators of SWB. Between-dyad correlations are the associations between two variables aggregated at by dyad. Within-dyad correlations represent the relationship between two variables for a couple. For both between and within dyads, each measure of SWB (i.e., positive affect, negative affect, and life satisfaction), and connected availability were significantly highly correlated with one another. All media multiplexity variables (i.e., multimedia frequency,

multimedia accessibility, and multimedia disclosure) were positively correlated with one another on both levels of the analysis. There was less correlation between the predictor variables and dependent variables at the between-dyad level than the within-dyad level. Accessibility was the only media use variable that was significantly correlated with positive affect and life satisfaction at a between-dyad level. No media multiplexity variables were correlated with negative affect between dyads. Within-dyad multimedia frequency was positively correlated with positive affect and life satisfaction and negatively correlated with negative affect, but accessibility was not correlated with SWB within a dyad. Multimedia disclosure was positively correlated with both positive affect and life satisfaction for within-dyad. Comparing between- and within-dyad correlations shows that the association between communication technology use and SWB is multifaceted and depends on the level of analysis.

Analytical Approach

Longitudinal dyadic data analysis. The dyadic experience sampling contains several levels of dependence in the data that require consideration how to statistically model the data. Members of a dyad are dependent upon one another (Kenny et al., 2006). The longitudinal data collection results in additional dependence between the repeated measures within the individual (Snijders & Bosker, 2012). Growth curve modeling is a popular way of analyzing individual longitudinal data but growth models do not uniformly extend to dyads. Dyadic growth curve models require additional estimates because all data is nested in dyads (Kashy, Donnellan, Burt, & McGue, 2008).

Dyadic growth curve modeling was used to test the hypotheses of this dissertation. Growth models explain fluctuations in the dependent variables over time, while accounting for

Table 7. *Between-Dyad and Within-Dyad Correlation for ESM Data*

	1	2	3	4	5	6	7
1. Positive Affect	-	-.60***	.57***	.19***	.07***	.01	.06***
2. Negative Affect	-.80***	-	-.48***	-.16***	-.04**	-.01	.00
3. Life Satisfaction	.79***	-.71***	-	.16***	.09***	.02	.11***
4. Connected Availability	.43***	-.32***	.50***	-	.16***	.13***	.08***
5. Multimedia Frequency	.15	-.04	.16	.13	-	.68***	.65***
6. Accessibility	.19*	-.15	.25**	.25**	.62***	-	.57***
7. Multimedia Disclosure	.23*	-.05	.14	.11	.64***	.36***	-

Note. Correlations below the dashed diagonal line are between-dyad. Correlations above the dashed diagonal line are within-dyad.

* $p < .05$.

** $p < .01$.

*** $p < .001$

the layers of dependency in the data through multilevel modeling (MLM) (Kashy & Donnellan, 2012). The multilevel structure of longitudinal dyadic data is defined by (1) time (2) person, and (3) dyad. Although there are three structural elements, these data have a two-level structure because dyads have individuals nested within them that are crossed with time. Individuals and time are crossed because the members of the dyad were measured at approximately the same time through the day. The crossing suggests that there is additional covariance between the couple's residuals at a specific time point (Kenny et al., 2006). Level 2 is the dyad and Level 1 is the observations from both members of a dyad at a time point within a day.

An additional statistical obstacle was the sampling strategy of the dyads. The dyads in these data are indistinguishable, given the inclusion of non-heterosexual and heterosexual couples (Kenny et al., 2006). There is no systematic characteristic that separates Partner 1 from Partner 2 within the dyad, such as gender or parent-child. Any assignment of Partner 1 or Partner 2 is arbitrary and not meaningful to interpret as a result. As a result, the data analysis plan follows an indistinguished dyadic growth curve model, per the recommendations of Kashy et al. (2008). Indistinguished growth curve models resemble other growth curve models with two differences. First, parameter estimates are aggregated across dyads. Second, there are additional parameters required to estimate the correlation within the dyad. As such, the major difference for indistinguished dyads is that equality constraints are imposed on the parameters forcing the estimates to be equal for both members of the dyad. I discuss fixed effect, random effects, covariance, and equality constraints used to estimate an indistinguished growth curve model in detail below.

The fixed effects are estimated by averaging within-person regressions for each participant across the entire sample. When using dyadic growth models time is the Level 1

explanatory variable (Kashy & Donnellan, 2012). All models start with two fixed effects. The intercept of the growth model then presents the person's estimate at Time 0; whereas, the slope represents the average trajectory of change over time, i.e., the day. The decision of Time 0 has implications for the interpretation of findings, and Time 0 is set to the first data point for each day. In this dissertation, I model the change in time over the course of any given day in the seven days of the study. Parameter estimates entered into the model other than time of day represents changes in the intercept at Time 0 (Singer, 1998).

There are three random effects when estimating an indistinguished dyadic growth curve models (Kashy & Donnellan, 2012). The random intercept is the first random effect. The random intercept which measures variance among participants at Time 0 for the outcome variable, such as positive affect. Next, there is the random slope. The random slope quantifies the extent to which participants vary in their change over time, that is change over the course of the day. The last random effect estimated is the residual variance, which represents the variance between each time point not explained by the other predictors in the model.

There are five covariance parameters that are estimated for these three random factors (Kashy et al., 2008). The first covariance parameter is the between-person covariance of intercepts, which measure the degree of correspondence in between members of romantic partners at Time 0, i.e., the morning, for any given dependent variable. The second covariance estimate is the between-person slope covariance; between-slope covariance measures the similarity in change over the day for romantic partners of the same dyad. The third covariance parameter is within-person covariance of intercept and slope, which estimates whether participants with higher intercepts at Time 0 also report different levels of change than participants with lower intercepts. The fourth covariance parameter is the between-person

intercept and slope covariance. Between-person intercept and slope covariance calculate the relationship between one member of the dyad's intercept with the rate of change in the other member of the dyad. The fifth covariance parameter is between-persons covariance in the residuals, or the degree of similarity in reports of the dyad after controlling for the other model parameters.

The final step in estimating an indistinguished dyadic growth model is the equality constraints (Kashy et al., 2008). Equality constraints in parameter estimates are necessary because the model specification arbitrary assigns effects to Partner 1 and Partner 2. However, if Partner 1 and Partner 2 were switched for some of the dyads, the parameter estimates would change. This arbitrary assignment of Partner 1 and Partner 2 is the key difference when modelling indistinguished and distinguished dyads. The seven elements of the growth curve model are constrained to be equal for Partner 1 and Partner 2: (1) intercept, (2) slope, (3) random intercept, (4) random slope, (5) residual variances, (6) within-person covariance between intercept and slope and (7) between-person covariance of intercept and slope (Kashy et al., 2008).

Growth curve models for indistinguished dyads. I completed the indistinguished growth curve models using SAS PROC MIXED 9.4, following the guidelines from Kashy et al. (2008). In all analyses, I modelled the changes in the outcome variable over the course of one day. In other words, the growth model estimated the change in SWB and connected availability from morning to the evening, for each of the days for the study. I set Time 0 in all growth curve models to the morning, that is the first signal from the ESM of each day which was sent between 8 AM to 10:48 AM, and grand mean centered all predictor variables (Kenny et al., 2006). Time ranged from 0 to 4, with 4 representing reports in the evening.

To conduct this analysis, I created a person-period data set to facilitate model convergence (Singer, 1998). A person-period data set creates a row for each observation in the data set, even if the data are missing. In total, each dyad had 70 rows with 35 rows (5 observations per day X 7 days) per person. Dyad level variables (e.g., gender composition) are repeated across all 70 rows, individual level variables (e.g., age, gender) are repeated across the 35 rows for that individual, and the remaining 35 rows have data that changed from moment-to-moment (e.g., positive affect or multimedia frequency). For the random effects, Partner ID was arbitrarily assigned as either Partner 1 or Partner 2, and then a redundant dummy coded variable was created for Partner 1 and Partner 2 to implement the equality constraints (Kashy et al., 2008).

The data were restructured to include actor effects and partner effects for each member of the dyad (Kenny et al., 2006). *Actor effects* are the person's influence on their own outcome. *Partner effects* are the person's influence on their romantic partner's outcome. Partner effects can be thought of as a cross-dyad effect that model the interdependence between two individuals (Kashy et al., 2008). Using growth models for indistinguishable dyads allows for actor and partner effects to be estimated simultaneously.

The specified growth model had a total of 4 random effects. The model included two random intercepts for Partner 1 and Partner 2, and two random slopes for Partner 1 by Time and Partner 2 by Time. However, both random intercepts and random slopes were constrained to be the same for both Partner 1 and Partner 2 due to the partner indistinguishability. These equality constraints were conducted using a covariance matrix written specifically for indistinguishable dyadic growth curve analysis (Kashy et al., 2008). The final component of the random structure was that compound symmetry was used to estimate the covariance structure and error residuals

for ESM signals nested in days nested within dyad. This means that error residuals for dyads and covariance between dyads was anticipated to be homogeneous, regardless of distance between time points. The correlated errors of dyads, across days, and experience sampling signal were also set to be equal. Estimates were conducted using maximum likelihood.

I conducted the growth models for four dependent variables. The five dependent variables are (1) positive affect, (2) negative affect, (3) life satisfaction, (4) connected availability to test the hypotheses of this dissertation. I ran a total of five different models with different sets of fixed effects to determine the effects of media multiplexity on subjective well-being.

- Model 1: This model is the baseline growth curve model of time with no additional fixed effects, or unconditional growth model. From Model 1, I interpret random effects to determine the variability in the dependent variable, and I calculate the five different covariance parameters to determine correspondence between and within dyads.
- Model 2: In this model, I add to model 1 by including the number of media as a categorical predictor variable, ranging from 0 to 4 media. The number of media includes both actor effects and partner effects.
- Model 3: This model introduces additional elements of media multiplexity as predictors, including multimedia frequency, disclosure, and accessibility. This model controls for the number of media used. However, questions of frequency, disclosure, and accessibility were only asked if the number of media used was greater than or equal to one. Therefore, all instances where no media were used in the last hour are treated as missing data in Model 3. This is the reason for running

two separate models, as opposed to one model with all elements of media multiplexity. All variables in Model 2 include both actor and partner effects.

- Model 4: This model tests Model 2 with actor and partner connected availability as additional parameters.
- Model 5: The final model runs Model 3 but adds actor and partner effects for connected availability.

Degrees of freedom for the F Test were calculated using the Satterthwaite approximation. If the F Test is non-significant, I do not interpret the pairwise comparisons of means to prevent Type II error. All models contained the covariate of age, but age was never a significant predictor of in any analysis. Appendix C contains the SAS code necessary to run the five different growth models. Appendix D contains an example of the data structure required for indistinguishable dyadic growth curve models.

Indirect effects analysis. To test the indirect effect of media use on indicators of SWB, I ran the test of joint significance (Leth-Steensen & Gallitto, 2016). This test establishes the presence of an indirect effect through three straightforward steps (Mallinckrodt, Abraham, Wei, & Russell, 2006). First, the path between the predictor variable (i.e., media multiplexity) and the mediating variable (i.e., connected availability). Second, the path between the mediator variable and the dependent variable (i.e., SWB), controlling for the predictor variable. Third, if both the predictor to the mediator and the mediator to the outcome variable is significant, this is evidence of an indirect effect. Although this test is simpler than the more popularized bootstrap methods (Hayes & Scharkow, 2013), multiple recent tests of the test of joint significance suggest that this type has more power than other methods and outperforms other tests of indirect effects in Type I error (Leth-Steensen & Gallitto, 2016). This type of indirect effect tests does not provide

confidence intervals of the estimates, which is often cited as the major limitation of this approach (Hayes & Scharkow, 2013).

Modeling mediation in actor-partner independence is compounded because of the multiple indirect paths. In indistinguished dyadic data, there are four potential indirect effects: (1) actor-actor, (2) partner-partner, (3) actor-partner, and (4) partner-actor (Ledermann, Macho, & Kenny, 2011). Actor-actor refers to an indirect effect within the person, $X_1 \rightarrow M_1 \rightarrow Y_1$. That is the actor predictor variable is associated with their own mediating variable and this in turn predicts the actor's own report of the dependent variable. In actor-actor, there is not an interpersonal effect modeled. Partner-partner indirect effects are the inverse of actor-actor, $X_1 \rightarrow M_2 \rightarrow Y_1$. The independent variable predicts the partner's mediating variable, in turn the partner's mediating variable predicts their original partner's outcome variable. Thus, all mediating steps in the model are interpersonal effects. Actor-partner indirect effect model the effect of a person's effect on their own mediating variable, and that mediating variable in their partner's outcome, $X_1 \rightarrow M_1 \rightarrow Y_2$. Partner-actor indirect effect follows as the interpersonal partner effect on the mediating variable, and the intrapersonal actor effect from mediator to outcome variable, $X_1 \rightarrow M_2 \rightarrow Y_2$.

Hypothesis Testing

Unconditional growth curve model. Model 1 establishes how SWB changes over the course of a given day. The unconditional growth model establishes the baseline of how the various dependent variables and lays the foundation for building fixed effects to test the hypotheses. There are three random effects and five covariances estimated in this model.

Positive affect. The unconditional growth model estimated a significant random effect and random slope for positive affect. The average initial intercept for positive affect was 7.12 but

there was considerable variance in the intercepts among the participants. The average slope for the sample was .02 from signal-to-signal, but there was variability in how positive affect changed over the day. Romantic partners' random intercepts were moderately correlated with one another, $r_{ii} = .31, z = 2.75, p < .01$, which suggests some degree of similarity in positive affect in the morning for romantic partners. There was no significant correlation in the slope covariances for romantic partners, $r_{ss} = .29, z = .87, p > .05$. Romantic partners change in positive affect over the course of the day were not significantly correlated. The within-person covariance and between-persons covariance correlations were non-significant, $r_{Wis} = -.26, z = -1.72, p > .05, r_{Bis} = -.12, z = .75, p > .05$. The trajectory of positive affect over the day was not associated with the initial intercept within-person or across the dyad. Finally, there was a significant amount of residual variance, after computing the unconditional growth model ($\sigma^2 = 1.95, z = 33.82, p < .001$), and these remaining residuals were somewhat correlated for romantic partners, $r_{ee} = .09, z = 3.78, p < .001$. Time of day as positive associated with positive affect (Table 8). People reported increased levels of positive affect throughout the day.

Table 8. *Unconditional Dyadic Growth Curve Model of Subjective Well-Being*

Model 1	Subjective Well-Being					
	Positive Affect		Negative Affect		Life Satisfaction	
Fixed effects	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>
Intercept	7.12(.12)	59.41***	2.71(.09)	28.75***	7.89(.11)	72.11***
Time of Day	.04(.02)	2.53*	-.01(.02)	-.99	.04(.01)	4.10***
Random Effects	Estimate	<i>Z</i>	Estimate	<i>Z</i>	Estimate	<i>Z</i>
Intercept	2.27(.25)	9.10***	1.29(.15)	8.43***	1.90(.20)	9.46***
Slope	.01(.01)	2.75**	.01(.00)	1.80`	.00(.00)	.64
Residuals	1.95(.06)	33.82***	1.94(.06)	34.10***	.81(.02)	34.86***

` $p < .10$

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Negative affect. Starting with Model 1, the analysis shows that there was significant variance in the random intercepts of negative affect and random slopes for negative affect throughout the day (see Table 8). The correlation of intercepts between couples was $r_{ii} = .35$, $z = 2.95$, $p < .01$. There was moderate correlation among romantic partners in the negative affect experienced in the morning. The correlation of slopes among couples, $r_{ss} = .25$, $z = 0.48$, $p > .05$, the within-person covariance of intercept and slope, $r_{wis} = .12$, $z = .66$, $p > .05$, and the between-persons covariance of intercept and slope, $r_{Bis} = -.05$, $z = -.26$, $p > .05$ were all non-significant. There was a small correlation of the error residuals that was significant, $r_{ee} = .07$, $z = 2.95$, $p < .01$. That romantic partner's negative affect is positively associated with one another, even after controlling for the elements in Model 1. In Model 1, time was not a significant predictor of negative affect, which suggests no linear change in negative affect over the course of the day.

Life satisfaction. The random effects and covariance estimates for life satisfaction were estimated using Model 1 unconditional growth curve, see Table 8. The random intercept suggests that there was variance in the life satisfaction participants reported during their first daily report, but the parameter for random slope was non-significant. This suggests there was not much variance in the trajectory of life satisfaction over the day. The correlation of intercepts between couples was $r_{ii} = .38$, $z = 3.46$, $p < .01$. Romantic partners were similar in their reports of life satisfaction the morning. The correlation of slopes for dyads, $r_{ss} = .20$, $z = 0.15$, $p > .05$, the within-person covariance of intercept and slope, $r_{wis} = -.11$, $z = -.37$, $p > .05$, and the between-persons covariance of intercept and slope, $r_{Bis} = -.14$, $z = .45$, $p > .05$ were all non-significant. The error residuals were slightly similar across the romantic partners, $r_{ee} = .07$, $z = 3.24$, $p < .01$. Time was a significant predictor of life satisfaction over the day, $F(1, 104) = 16.82$, $p < .001$. Life satisfaction increased from time-to-time in over the course the day.

Number of media. Hypotheses regarding the effect of the number of media used in the last hour with a romantic partner on SWB were tested in Model 2. Model 2 is the test of H1. Zero media in the last hour was possibility in Model 2, and this makes number of media an ordinal variable. Actor and partner effects of number of media were modeled here. The random intervals that ESM pings arrived means that the members of a dyad may have difference answers for the number of media. When F Test is significant for number of media, I conduct mean comparisons tests.

Positive affect. H1a suggested that the more media people used with their partner in the last hour, the greater the amount of positive affect reported. In Model 2 for positive affect, the actor effect of number of media was significant, $F(4, 4587) = 3.00, p < .05$ (Table 9). Unpacking this significant effect of number of media, there were two estimates of positive affect that were significantly different from one another (See Table 10). Moving from no media to one medium was associated with greater positive affect, $p < .05$. On the other hand, moving from one medium to two media predicted significantly lower positive affect, $p < .05$. The partner effect of number of media was not a significant predictor of positive affect, $F(4, 4582) = 2.16, p > .05$. H1a received mixed support because of increases in the number of media were associated with more and less positive affect at different thresholds.

To clarify if positive affect is associated with one specific medium, I subset the data, and reran this analysis. The subset of the data included instances where participants reported only 1 instance of communication with their partner. The number of instances per medium was highly skewed, from 1 to 2065, so I only took media that were used independently at least 20 times. The model included the categorical predictor of medium with five levels: face-to-face, text messaging, cellphone calls, desktop instant messaging, and mobile messaging applications. This

same data subset is used for negative affect and life satisfactions when comparing by medium.

Table 11 displays that there were not significant differences by medium or partner reported medium for positive affect, when only when medium was reported used in the last hour.

Table 9. *Dyadic Growth Curve Model of Subjective Well-Being with Number of Media*

Model 2	Subjective Well-Being					
	Positive Affect		Negative Affect		Life Satisfaction	
Fixed effects	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>
Intercept	6.03(.61)	9.95***	2.66(.51)	7.17***	7.61(.59)	12.83***
Time of Day	.03(.02)	1.52	-.01(.02)	-.52	.03(.01)	2.63**
Actor Effects						
Number of Media = 1	.14(.05)	2.54*	-.09(.05)	-1.76`	.03(.03)	.97
Number of Media = 2	-.08(.10)	-.87	.10(.09)	1.08	-.10(.06)	-1.69`
Number of Media = 3	-.07(.20)	-.32	.29(.20)	1.44	-.16(.13)	-1.20
Number of Media = 4	-.37(.86)	-.44	-.01(.84)	-.01	.01(.56)	.02
Partner Effects						
Number of Media = 1	.11(.05)	2.13*	-.06(.05)	-1.13	.10(.03)	2.95**
Number of Media = 2	.23(.10)	2.45*	-.12(.09)	-1.27	.18(.06)	2.89**
Number of Media = 3	-.03(.21)	-.14	-.06(.20)	-.30	.11(.13)	.82
Number of Media = 4	.83(.86)	.97	-.35(.84)	-.41	-.02(.56)	-.03
Random Effects						
Intercept	Estimate	<i>Z</i>	Estimate	<i>Z</i>	Estimate	<i>Z</i>
Intercept	2.22(.25)	8.75***	1.36(.17)	8.11***	1.95(.21)	9.24***
Slope	.01(.01)	2.25**	.01(.01)	2.07*	.00(.00)	.66
Residuals	1.84(.06)	31.91***	1.82(.06)	31.91***	.79(.02)	32.35***

`*p* < .10

**p* < .05.

***p* < .01.

****p* < .001.

Table 10. *Least Squares Means for Number of Media*

	Positive Affect	Negative Affect	Life Satisfaction	Connected Availability
Actor				
0	7.31(.21) _a	2.64(.20) _{ab}	7.93(.16) _{ab}	6.07(.10) _a
1	7.45(.21) _b	2.55(.20) _a	7.96(.16) _a	6.59(.10) _b
2	7.23(.22) _{ac}	2.74(.21) _b	7.83(.17) _b	6.49(.10) _c
3	7.24(.29) _{abc}	2.93(.28) _{ab}	7.77(.20) _{ab}	6.60(.14) _{bc}
4	6.94(.90) _{abc}	2.63(.88) _{ab}	7.95(.59) _{ab}	6.66(.43) _{abc}
Partner				
0	7.00(.21) _a	2.81(.20) _a	7.81(.16) _a	6.28(.10) _a
1	7.12(.21) _b	2.75(.20) _a	7.91(.16) _b	6.50(.10) _b
2	7.24(.22) _b	2.70(.21) _a	7.99(.17) _b	6.46(.10) _b
3	6.97(.29) _{ab}	1.76(.28) _a	7.92(.20) _{ab}	6.48(.14) _{ab}
4	7.83(.90) _{ab}	2.47(.88) _a	7.80(.59) _{ab}	6.72(.42) _{ab}

Note. Means within each column that have different subscripts are significantly different from one another at $p < .05$ or greater. Mean estimates are reported from Model 2.

Table 11. *Least Squares Means for Subjective Well-Being and Connected Availability by Medium*

	Positive Affect	Negative Affect	Life Satisfaction	Connected Availability
Actor				
Face-to-Face	7.37(.17) _a	2.70(.16) _a	8.01(.14) _a	6.64(.06) _a
Text Message	7.31(.19) _a	2.76(.18) _a	7.99(.15) _a	6.30(.06) _b
Cellphone Calls	7.30(.27) _a	2.61(.25) _a	7.84(.56) _a	6.37(.09) _b
Instant Message	7.31(.30) _a	2.90(.28) _a	7.74(.21) _a	6.21(.11) _b
MMA	7.00(.34) _a	3.08(.33) _a	7.71(.24) _a	6.22(.12) _b
<i>F</i> Test	$F(4,1959) = .32, p > .05$	$F(4,1985) = .38, p > .05$	$F(4,1975) = .89, p > .05$	$F(4, 2019) = 15.84, p < .001$
Partner				
Face-to-Face	7.24(.17) _a	2.67(.16) _a	7.90(.14) _{ac}	6.41(.06) _a
Text Message	7.07(.19) _a	2.80(.18) _a	7.67(.15) _{bc}	6.36(.06) _a
Cellphone Calls	7.37(.26) _a	3.12(.25) _a	7.98(.19) _{ac}	6.30(.09) _a
Instant Message	6.97(.30) _a	2.82(.28) _a	8.03(.21) _{ac}	6.48(.11) _a
MMA	7.64(.34) _a	2.62(.32) _a	7.72(.24) _{ac}	6.20(.12) _a
<i>F</i> Test	$F(4,1959) = 1.26, p > .05$	$F(4,1985) = 1.14, p > .05$	$F(4,1975) = 2.51, p < .05$	$F(4, 2019) = 1.48, p > .05$

Note. These analyses represent estimates of dependent variables for when number of media reported was one. Only media that had greater than 20 instances of reporting were included in this analysis. MMA = Mobile Messaging Applications. Means within each column that have different subscripts are significantly different from one another at $p < .05$ or greater. Mean estimates are reported from Model 2.

Negative affect. Next, I ran Model 2 to test H1b for negative affect: the more media used in the last hour the less negative affect. As displayed in Table 9, the actor report of the number of media used was significantly associated with negative affect $F(4, 4591) = 2.56, p < .05$.

Estimated means suggest that using two media in the last hour with a partner predicted more negative affect than the use of only one medium (Table 10). Partner effect of the number of media was non-significant, $F(4, 4583) = .54, p > .05$. A person's negative affect was not predicted by their partner's reports about media use. These results offer evidence contrary to H1b, as negative affect was greater with more media use. I rerun the same subset of data to

determine if this negative affect was predicted by any one medium, and Table 11 shows that there were not significant differences by medium or partner reported medium for negative affect, when only when medium was reported used in the last hour.

Life satisfaction. The third iteration of Model 2 tested the prediction of a positive relationship between life satisfaction and the number of media used for communication in the last hour (H1c). Table 9 also displays the results of Model 2 for life satisfaction. Number of media was not associated with life satisfaction, for actors, $F(4, 4554) = 2.01, p > .05$. However, there was a significant partner effect for number of media, $F(4, 4550) = 2.99, p < .05$. The mean comparisons revealed one significant difference for the partner effects. People tended to report more life satisfaction when their partner reported communicating on one medium compared to zero, but people did not report higher life satisfaction with the number of media they reported using in the last hour (See Table 10). All other mean comparisons were non-significant. This positive effect of partner reports supports H1c. Comparing by actor medium in the subset of the data once more, Table 11 displays that there was one significant difference. The partner effect of medium as predictive of life satisfaction; life satisfaction estimates were higher when a partner reported face-to-face communication than text messaging, $p < .05$.

Media multiplexity. Model 3 is a second model of fixed effect for media multiplexity on the three components of SWB. This model includes actor and partner effects for multimedia frequency, multimedia disclosure, and accessibility. With these three fixed effects, Model 3 tests hypotheses H2, H3, and H4. Model 3 differs from Model 2 in that it does not include zero number of media used because the three fixed effects of Model 3 were only recorded when a participant reported at least 1 medium in the last hour. If Model 2 and Model 3 were combined, it

would have not been possible to test the effect of no media in the last hour. I did control for the number of media, which ranges from 1 to 4, in this analysis.

Positive affect. H2a predicted that multimedia frequency would have positive relationship with positive affect. H3a positive association between multimedia disclosure and positive affect. Finally, H4a hypothesized the accessibility of reaching a partner in the last hour via media would predict positive affect. Table 12 displays the results for Model 3. There was a positive significant effect for multimedia frequency between positive affect. For the actor effect, $F(1, 2830) = 10.36, p < .01$, the relationship between multimedia frequency and positive affect was positive. For the partner effect, $F(1, 2831) = 1.32, p > .05$, the relationship was non-significant. In other words, reporting more multimedia frequency predicted more positive affect, but their partner's reports of multimedia frequency were not associated with positive affect. This result supports H2a. Positive affect was not predicted by multimedia disclosure for actors, $F(1, 3016) = .02, p > .05$, or partners, $F(1, 3012) = .00, p > .05$. Thus, there was no support for H3a. Accessibility was, on the other hand, positively associated with positive affect. This positive association existed for both actors, $F(1, 2937) = 17.75, p < .001$, and partners, $F(1, 2939) = 5.74, p < .05$. Combined these actor and partner effects suggest that participants tended to have higher positive affect when they reported high accessibility to their partner as well as when their partner report high accessibility to them, which supports H4a.

Table 12. *Dyadic Growth Curve Model of Subjective Well-Being with Media Multiplexity*

Model 3	Subjective Well-Being					
	Positive Affect		Negative Affect		Life Satisfaction	
Fixed effects	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>
Intercept	6.58(.60)	10.89***	2.84(.52)	5.43***	7.98(.59)	13.58***
Time of Day	.01(.02)	.43	-.00(.02)	-.13	.01(.01)	.60
Actor Effects						
Multimedia Frequency	.10(.03)	3.22**	-.11(.03)	-3.66***	.06(.02)	2.81**
Multimedia Disclosure	-.00(.01)	-.13	.05(.01)	3.49***	.01(.01)	1.32
Accessibility	.14(.03)	4.21***	-.18(.03)	-.58***	.09(.02)	4.28***
Partner Effects						
Multimedia Frequency	.04(.03)	1.15	.00(.03)	.10	.01(.02)	.28
Multimedia Disclosure	.00(.01)	.01	.00(.01)	.30	.00(.01)	.12
Accessibility	.07(.03)	2.39*	-.08(.03)	-2.64**	.07(.02)	3.35***
Random Effects	Estimate	<i>Z</i>	Estimate	<i>Z</i>	Estimate	<i>Z</i>
Intercept	1.95(.25)	7.74***	1.20(.18)	6.61***	1.79(.21)	8.42***
Slope	-.00(.01)	-.12	.01(.01)	.96	.00(.00)	.66
Residuals	1.84(.08)	24.12***	1.85(.08)	24.26***	.78(.03)	24.75***

$\backslash p < .10$

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Negative affect. Model 4 continues to test H2 with additional elements of media multiplexity predicting negative affect (Table 12). There was anticipated negative associations for negative affect with multimedia frequency (H2b), multimedia disclosure (H3b), and accessibility (H4b). After controlling for number of media, the actor effect of multimedia frequency had a negative relationship with negative affect, $F(1, 2877) = 13.40, p < .001$, but there was no significant partner effect for multimedia frequency of negative affect, $F(1, 2878) = .01, p > .05$. When a person reported higher frequency of communication across all media, they also reported less negative affect (see Table 12). This negative relationship supports H2b. The actor effect of multimedia disclosure shared a positive relationship negative affect, $F(1, 3006) = 12.16, p < .001$, again not partner effect was significant here, $F(1, 3005) = .09, p > .05$. A participant's report of more self-disclosure over the dyad's media ecology predicted more

negative affect. The positive relationship is contrary to H3b. Both the actor effect, $F(1, 2961) = 33.20, p < .001$, and the partner effect, $F(1, 2963) = 6.99, p < .01$ had a negative relationship with negative affect. Participants who reported having easy access to their partner reported less negative affect. Furthermore, when a participant's romantic partner reported higher accessibility, the participant also reported less negative affect. The predicted relationship between accessibility and negative affect was supported (H4b).

Life satisfaction. For life satisfaction, I predicted a positive relationship with multimedia frequency (H2c), multimedia disclosure (H3c), and accessibility (H4c). These results are displayed in Table 12. In terms of actor effects, multimedia frequency, $F(1, 2809) = 7.90, p < .01$, and accessibility, $F(1, 2885) = 18.31, p < .001$ were positively associated with life satisfaction, but multimedia disclosure had no association, $F(1, 2957) = 1.75, p > .05$. How frequently media were used in the last hour and ease of reaching their romantic partner predicted more life satisfaction but not the amount of multimedia disclosure. In terms of partner effects, accessibility was significantly predictive of life satisfaction; whereas, multimedia frequency, $F(1, 2808) = .08, p > .05$, and multimedia disclosure were not associated with life satisfaction, $F(1, 2954) = .02, p > .05$. The interpretation of this result suggests that when a member of romantic couple perceives that their partner is immediately accessible to them, their partner's life satisfaction in the moment is greater. H2c was supported positive relationship by actor multimedia frequency; H3c was not supported by other actor or partner multimedia disclosure, and H4c was supported by both actor and partner accessibility.

Number of media and connected availability. Model 4 adds actor and partner effects for connected availability to Model 2. Connected availability is tested controlling for the number of media used for communication in the last hour. Therefore, this model determines if number of

media predicts SWB independently of connected availability. In Model 4, number of media ranges from 0 to 4 and is modelled as a categorical variable. This model tests H5 and H6, controlling for the number of media.

Positive affect. For the actor effect, connected availability was positively associated with positive affect, $F(1, 4652) = 91.86, p < .001$. For the partner effect, connected availability was positively associated with positive affect, $F(1, 4649) = 5.53, p < .05$. Supporting H5a, the actor effects suggest that when a member of a romantic couple feels like their partner is always available for communication, positive affect is higher. Contrary to H6a, this sense of availability predicted higher positive affect in their partner as well (see Table 13). In Model 4, neither the actor or partner effects for number of media were significant predictors of positive affect, (actor effect: $F(4, 4563) = 1.64, p > .05$; partner effect: $F(4, 4560) = .97, p > .05$).

Negative Affect. H5b posited that the connected availability of a romantic partner will have a negative actor effect on negative affect, but H6b posited that connected availability would share a positive partner effect on negative affect. As displayed in Table 13, actor effects, $F(4, 4569) = 2.31, p > .05$, and partner effects, $F(4, 4564) = .34, p > .05$, for number of media were non-significant. Connected availability of the actor was negatively related to negative affect, $F(1, 4538) = 86.74, p < .001$. Connected availability of the partner was also negatively related to negative affect, $F(1, 4544) = 6.65, p < .01$. A person's report of connected availability predicted less negative affect, and their partner's report of connected availability also predicted less negative affect, above and beyond their own report of connected availability. These results support for H5b and offer evidence contrary to expectations of H6b.

Table 13. *Dyadic Growth Curve Model of Subjective Well-Being with Number of Media and Connected Availability*

Model 4	Subjective Well-Being					
	Positive Affect		Negative Affect		Life Satisfaction	
Fixed effects	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>
Intercept	6.10(.58)	10.58***	3.59(.49)	7.30***	7.65(.57)	13.35***
Time of Day	.01(.02)	.74	.01(.02)	.32	.02(.01)	1.73`
Actor Effects						
Number of Media = 1	-.01(.06)	-.25	.05(.06)	.93	-.05(.04)	-1.44
Number of Media = 2	-.20(.10)	-2.12*	.22(.09)	2.32*	-.17(.06)	-2.79**
Number of Media = 3	-.24(.21)	-1.14	.45(.20)	2.23*	-.26(.13)	-1.90`
Number of Media = 4	-.57(.85)	-.67	.18(.84)	.21	-.08(.55)	-.16
Connected Availability	.28(.03)	9.58***	-.27(.03)	-9.31***	.16(.02)	8.43***
Partner Effects						
Number of Media = 1	.02(.06)	.31	.04(.06)	.81	.05(.04)	1.23
Number of Media = 2	.15(.10)	1.57	-.03(.09)	-.33	.13(.06)	2.13*
Number of Media = 3	-.12(.21)	-.60	.04(.20)	.19	.06(.13)	.42
Number of Media = 4	.67(.85)	.79	-.19(.83)	-.23	-.10(.55)	-.19
Connected Availability	.07(.03)	2.35*	-.07(.03)	-2.58**	.05(.01)	2.60**
Random Effects						
Intercept	Estimate	<i>Z</i>	Estimate	<i>Z</i>	Estimate	<i>Z</i>
Intercept	2.08(.24)	8.70***	1.28(.16)	8.09***	1.85(.20)	9.25***
Slope	.01(.01)	2.43*	.01(.01)	2.04*	.00(.00)	1.13
Residuals	1.83(.06)	31.72***	1.80(.06)	31.74***	.79(.02)	32.23***

`*p* < .10

**p* < .05.

***p* < .01.

****p* < .001.

Life satisfaction. The next set of hypotheses addressed the mechanism of connected availability between number of media life satisfaction. I predicted that actor connected availability has a positive relationship with life satisfaction (H5c) but partner connected availability has a negative relationship (H6c). Life satisfaction was positively related to actor reports of connected availability, $F(1, 4527) = 71.10, p < .001$. Life satisfaction was also positively associated with partner reports of connected availability, $F(1, 4253) = 6.76, p < .01$. These two effects suggest that assuming that partner is almost constantly available promotes life

satisfaction, and this permanent availability predicts higher reports of life satisfaction in their partner as well (Table 12). This supports H5c and again offers evidence contrary to H6c.

However, a negative association between one to two media emerged, controlling for connected availability, $F(1, 4535) = 2.50, p < .05$. After accounting for the perception of having a romantic partner almost constantly available, the use of two media rather than one predicted less life satisfaction.

Media multiplexity and connected availability. Model 5 also represents a test of H5 and H6, but this time connected availability is tested controlling for multimedia frequency, multimedia disclosure, and accessibility. Again, Model 4 and Model 5 are necessary to test in two separate models because of the instances where the number of media used was zero. The robustness of connected availability predicting SWB is demonstrated between these two models.

Positive affect. Connected availability was predicted to have a positive association with actor positive affect (H5a) and a negative relationship with partner positive affect (H6a). Results for Model 5 of positive affect are reported in Table 14. Actor reports of connected availability were associated with more positive affect, $F(1, 2922) = 88.16, p < .001$, and partner reports of connected availability were positively associated with positive affect, $p < .05$. When a participant reported that their partner was available immediately for support and encouragement and their partner reported the same, then reports of positive affect were higher. Rather than predicting less positive affect, a person reported more positive affect when their romantic partner reported connected availability. These results support H5a and are contrary to H6a. Controlling for connected availability, the only remaining significant predictor of positive affect was the actor effect of multimedia frequency, $F(1, 2837) = 4.39, p < .05$. After accounting for the sense of

omni-availability of an attachment figure, there remained a positive relationship between frequency of media use and positive affect.

Table 14. *Dyadic Growth Curve Model of Subjective Well-Being with Media Multiplexity and Connected Availability*

Model 5	Subjective Well-Being					
	Positive Affect		Negative Affect		Life Satisfaction	
Fixed effects	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>
Intercept	6.27(.58)	10.90***	3.48(.49)	7.07***	7.89(.56)	14.12***
Time of Day	-.01(.02)	-.36	.01(.02)	.60	-.00(.01)	.91
Actor Effects						
Multimedia Frequency	.07(.03)	2.09*	-.08(.03)	-2.62**	.03(.20)	1.71`
Multimedia Disclosure	.01(.01)	.40	.04(.01)	3.07**	.02(.01)	1.86`
Accessibility	.05(.03)	1.58	-.09(.03)	-2.89**	.04(.02)	1.67`
Connected Availability	.46(.05)	9.36***	-.44(.05)	-9.38***	.28(.03)	8.90***
Partner Effects						
Multimedia Frequency	.02(.03)	1.41	.02(.03)	.74	-.00(.02)	-.24
Multimedia Disclosure	.00(.01)	.40	-.00(.01)	-.03	.00(.01)	.37
Accessibility	.05(.03)	1.58	-.05(.03)	-1.66	.06(.02)	2.68**
Connected Availability	.10(.05)	2.06*	-.12(.01)	-2.47*	.04(.03)	1.54
Random Effects						
Intercept	1.78(.23)	7.72***	1.10(.17)	6.60***	1.64(.19)	8.45***
Slope	-.00(.01)	-.07	.00(.01)	.53	.00(.00)	.66
Residuals	1.81(.08)	24.07***	1.82(.07)	24.26***	.77(.03)	24.77***

` $p < .10$

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Negative affect. In Model 5, the relationship between connected availability and negative affect was tested (H5b & H6b). There predicted relationship for actor connected availability was negative and partner connected availability was negative. Supporting H5b, actor connected availability has a significant negative association with negative affect, $F(1, 2886) = 87.90, p < .001$. Opposite to expectations of H6b, the partner effect of connected availability had a negative relationship with negative affect, $F(1, 2890) = 6.09, p < .05$ (Table 14). The more a person and their partner felt like each other was immediately reachable the less negative affect reported.

Controlling for actor and partner connected availability there were several direct effects of actor response. Actor multimedia frequency, $F(1, 2887) = 6.87, p < .01$, and actor accessibility, $F(1, 2933) = 8.34, p < .01$, had a negative related to negative affect. Even after controlling for the perception of having a partner always available, the more frequently people reported using media with their partner and the ease of reaching their partner on those media predicted less negative affect. The positive relationship between actor multimedia disclosure and negative affect, $F(1, 3011) = 9.44, p < .01$, was also significant in Model 5.

Life satisfaction. For connected availability, I predicted that actor connected availability would positively impact life satisfaction (H5c) but this relationship is inverse for partner connected availability (H6c). In Model 5 for life satisfaction, only the actor effect of connected availability was significantly related to life satisfaction, $F(1, 2877) = 79.26, p < .001$. There was no significant partner effect for connected availability, $F(1, 2875) = 2.38, p > .05$. People who report more connected availability with their romantic partner report more life satisfaction. After including connected availability in the model, partner effect of accessibility remained independently associated with life satisfaction, $F(1, 2873) = 2.78, p < .01$. This suggests that that people who have partners who think they are easy to access report greater life satisfaction, even after considering the perceptions of being available for help at any given moment. These results offer support for H5 but no support for H6, see Table 14.

Connected availability. Thus far, I have focused on SWB as the dependent variable of this dissertation results section. I also theorized that media multiplexity would predict perceptions of attachment figure immediately available at all times or connected availability. To test the relationship between media multiplexity and connected availability, I run three separate growth curve models, mirroring Model 1, 2, and 3 from the SWB analysis.

Time. As with previous analysis, I start with Model 1: the unconditional growth model for connected availability over the course of one day. This model established the three random effects—intercept, slope, and residuals—and establishes the five covariances of a dyad—intercept, slope, between intercept-slope, within intercept-slope, and residuals. Model 1 tests the growth of connected availability over the day with the fixed effect of time.

Connected availability was random intercept and random slopes were both significant, as shown in Table 15. The results suggest there was a difference in the average connected availability reported in the morning, and there was additional variance in their rate of change in connected availability reports throughout the day. The covariance between romantic partner's intercepts was positively correlated with one another, $r_{ii} = .28, z = 5.30, p < .05$. There was not a significant correlation in the random slopes, $r_{ss} = .06, z = .33, p > .05$. Romantic partners were not correlated in their reports of change over the day. The within-person intercept and slope covariance were significantly negatively correlated, $r_{wis} = -.74, z = -5.99, p < .001$. Romantic partners who started the day with high connected availability tended to increase at a slower rate than individuals who reported lower. The between-person intercept and slope correlation were non-significant, $r_{Bis} = -.12, z = -.93, p > .05$. There was significant residual variability not explained by Model 1, ($\sigma^2 = .50, z = 33.04, p < .001$). Romantic partner residuals were positively correlated for connected availability, $r_{ee} = .18, z = 6.69, p < .001$. This suggests some correspondence in the reports of connected availability for the couples that is not explained by the unconditional growth model.

Number of media. The relationship between the number of media used in the last hour and connected availability was tested until Model 2, which includes the categorical fixed effect of number of media. H7 predicted that more media used for communication would predict greater connected availability between romantic partners. As shown in Table 15, both actor

Table 15. *Dyadic Growth Curve Model for Connected Availability*

	Connected Availability					
	Model 1		Model 2		Model 3	
Fixed effects	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>	<i>b</i> (<i>se</i>)	<i>t</i>
Intercept	6.22(.06)	112.68***	6.08(.21)	29.38***	6.93(.16)	44.71
Time of Day	.08(.05)	7.69***	.04(.01)	3.85***	.02(.01)	3.80***
Actor Effects						
Number of Media = 1			.52(.03)	19.56***		
Number of Media = 2			.42(.05)	9.06***	-1.36(.08)	-18.05***
Number of Media = 3			.54(.11)	5.32***	-2.63(.16)	-16.61***
Number of Media = 4			.59(.42)	1.42	-4.58(.46)	-9.93***
Multimedia Frequency					.06(.01)	5.51***
Multimedia Disclosure					-.01(.01)	-1.95`
Accessibility					.20(.01)	16.74***
Partner Effects						
Number of Media = 1			.21(.03)	8.06***		
Number of Media = 2			.17(.05)	3.75***	-.17(.08)	-2.22*
Number of Media = 3			.20(.10)	1.96*	-.27(.16)	-1.67
Number of Media = 4			.43(.41)	1.04	-.51(.46)	-1.11
Multimedia Frequency					.02(.01)	2.37*
Multimedia Disclosure					-.01(.01)	-1.47
Accessibility					.02(.01)	1.59
Random Effects						
	Estimate	<i>Z</i>	Estimate	<i>Z</i>	Estimate	<i>Z</i>
Intercept	.47	8.94***	.45(.05)	8.75***	.20(.03)	7.37***
Slope	.01	5.30***	.01(.00)	2.42*	.00(.00)	2.71**
Residuals	.50	33.04***	.44(.01)	32.42***	.27(.01)	24.66***

`*p* < .10
 **p* < .05.
 ***p* < .01.
 ****p* < .001.

effect and partner effect of the number of media on connected availability were significant. First, the number of media the actor reported using in the last hour predicted greater connected availability, $F(4, 4585) = 96.18, p < .001$. Using no media in the last hour was associated with less connected availability than using one, two, or three media, $p < .001$ (See Table 10). However, using one medium predicted more connected availability than using two media, $p < .05$. When a person reported using one, two, or three media rather than no media in the last hour, they tended to report higher connected availability with their romantic partner. Whereas, using

two media rather than only one predicted less connected availability to their romantic partner, which suggests that increasing the number of media used does not uniformly increase connected availability. The partner effect of number of media on connected availability was also significant, $F(4, 4850) = 16.39, p < .001$. Mean comparisons revealed that partner reports of one or two media were greater than zero media (Table 10). If a person reported using one or two media in the last hour, then their romantic partner reported greater connected availability, compared to using no media in the last hour. The actor and partner reports offer mixed support for H3 in that the use of any media was greater than none but increasing beyond one medium predicted less connected availability.

I re-subset the data as previously done for Model 2 to compare associations between connected availability and the various media in a dyad's media ecology. This subset included instances when only 1 medium was used in the last hour and compared across the five more commonly reported media: face-to-face, text messaging, cellphone calls, desktop instant messaging, and mobile messaging apps. Comparisons are displayed in Table 11. Comparisons by medium for connected availability suggests a significant actor effect for face-to-face communication was greater than all mediated channels, but there were not significant partner effects by medium for connected availability.

Media multiplexity. Model 3 included additional parameters of media multiplexity, namely multimedia frequency, multimedia disclosure, and accessibility, to establish the relationship between media multiplexity and connected availability (See Table 15, Model 3). Multimedia frequency (H9), multimedia disclosure (H11), and accessibility (H13) were anticipated to have a positive linear relationship with connected availability. There was a positive relationship between the actor effect of multimedia frequency and connected availability, $F(1,$

2906) = 30.40, $p < .001$. The partner effect of multimedia frequency also shared a positive association with connected availability, $F(1, 2903) = 5.64, p < .05$. Thus, when a person reported greater communication across media with their partner in the last hour they felt a higher degree of connected availability (i.e., the actor effect). Higher amounts of the multimedia frequency also predicted greater connected availability in their partner (i.e., the partner effect). Multimedia disclosure was not a significant predictor of connected availability for the actor effect, $F(1, 2796) = 3.80, p > .05$, or the partner effect, $F(1, 2791) = 2.15, p > .05$. Perceptions of the immediate availability of a partner were not associated with the amount of self-disclosure. Actor accessibility shared a positive association with connected availability, $F(1, 2997) = 280.36, p < .001$, but there was no significant partner effect for accessibility, $F(1, 2998) = 2.52, p > .05$. When a participant reported that their romantic partner was easy to reach via media, then their sense that their partner is always available to offer support, comfort, and encouragement was higher. When the participant's partner reported greater accessibility, the actor did not report any changes in their own connected availability. This suggests that the accessibility to connected availability is within the person, rather than across dyads. The positive linear relationship between multimedia frequency and accessibility supports H9 and H13, but not H11 in that there was not association with multimedia disclosure.

Indirect effects of media multiplexity to SWB. As displayed in Figure 1, connected availability is theorized as the mechanism for why media multiplexity can impact SWB. Determining the viability of this theory requires a test of an indirect effect of media multiplexity to connected availability to SWB. Here I use the test of joint significance to establish this indirect effect. The potential indirect effects include actor-actor, partner-partner, partner-actor, and actor-partner (Ledermann et al., 2011). All of these models have been run in previous parts

of the results, but I bring each step of the indirect effect test together in this section to determine the existence of the predicted indirect effect to understand the process by which use of media multiplexity can influence SWB.

Number of media. The first anticipated indirect was from the number of media to connected availability to SWB (H8). To simplify the interpretation of the numerous indirect effects, no media in the last hour is used as the reference category here.

Positive affect. For the indirect effect, these results presented in Table 16 suggest that connected availability serves as a mediator between the number of media used and positive affect for both actor and partner effects. Using the test of joint significance, number of media significant predicts connected availability, and connected availability is associated with greater positive affect, controlling for the number of media. All indirect effects for actor-partner mediation were significant. The actor-actor indirect effect suggests an intrapersonal process, with actors who reports more media use also reporting greater connected availability, and then ultimately greater positive affect. The partner-partner indirect effect suggests an interpersonal process, with people who report more media use in the last hour have partners who report greater connected availability. In turn, they report greater positive affect from their partner's connected availability. The partner-actor report follows that people who report more media use have partner's who experience more connected availability with them, and those partners report more positive affect. The actor-partner effect continues in this trend: people who report using more media also experience more connected availability, and their partners in turn have greater positive affect. As number of media is not a significant predictor of positive affect after controlling for connected availability, the conclusion of this test supports H8. The degree to

which the number of media were associated with positive affect is explained by the sense of connected availability generated by the use of media.

Table 16. *Test of Joint Significance for Media Multiplexity*

Indirect Effects	X → M <i>b(se)</i>	M → Y <i>b(se)</i>	X → M <i>b(se)</i>	M → Y <i>b(se)</i>	X → M <i>b(se)</i>	M → Y <i>b(se)</i>
Number of Media						
Actor-Actor	.52(.03)	.28(.03)	.52(.03)	-.27(.03)	.52(.03)	.16(.02)
Partner-Partner	.11(.05)	.07(.03)	.11(.05)	-.07(.03)	.11(.05)	.05(.01)
Actor-Partner	.52(.03)	.07(.03)	.52(.03)	-.07(.03)	.52(.03)	.05(.01)
Partner-Actor	.11(.05)	.28(.03)	.11(.05)	-.27(.03)	.11(.05)	.16(.02)
Multimedia Frequency						
Actor-Actor	.06(.01)	.46(.05)	.06(.01)	-.44(.05)	.06(.01)	.28(.03)
Partner-Partner	.02(.01)	.10(.05)	.02(.01)	-.12(.01)	.02(.01)	n.s.
Actor-Partner	.06(.01)	.10(.05)	.06(.01)	-.12(.01)	.06(.01)	n.s.
Partner-Actor	.02(.01)	.46(.05)	.02(.01)	-.44(.05)	.02(.01)	.28(.03)
Multimedia Disclosure						
Actor-Actor	n.s.	.46(.05)	n.s.	-.44(.05)	n.s.	.28(.03)
Partner-Partner	n.s.	.10(.05)	n.s.	-.12(.01)	n.s.	n.s.
Actor-Partner	n.s.	.10(.05)	n.s.	-.12(.01)	n.s.	n.s.
Partner-Actor	n.s.	.46(.05)	n.s.	-.44(.05)	n.s.	.28(.03)
Accessibility						
Actor-Actor	.02(.01)	.46(.05)	.02(.01)	-.44(.05)	.02(.01)	.28(.05)
Partner-Partner	n.s.	.10(.05)	n.s.	-.12(.01)	n.s.	n.s.
Actor-Partner	.02(.01)	.10(.05)	.02(.01)	-.12(.01)	.02(.01)	n.s.
Partner-Actor	n.s.	.46(.05)	n.s.	-.44(.05)	n.s.	.28(.03)

Note. M = Connected Availability. n.s. = non-significant. Number of media = 1.

Negative affect. The indirect effect of number of media through connected availability was predicted to extend to negative affect (H8). I found a similar pattern of indirect effects for negative affect as I did for positive affect, see Table 16. Again, all actor-partner paths were significant, according to the test of joint significance. Actor number of media predicted more actor connected availability, which less negative affect, the actor-actor indirect effect. Partner reports of number of media predicted greater connected availability, and people's connected availability predicted less negative affect in their partners, the partner-partner indirect effect.

Actor reports of number of media predicted greater actor connected availability, and connected availability was associated with partner's reporting less negative affect, the actor-partner indirect effect. Finally, people's reports of number of media predicted greater connected availability in their partners, and those partners reported less negative affect, the partner-actor indirect effect. Therefore, the number of media used for communication may help to reduce negative affect because of connected availability for both actor and partner effects.

Life satisfaction. The final test of H8 was to establish the indirect effect of number of media on life satisfaction through connected availability, see Table 16. The same pattern of indirect effects for positive and negative affect held in life satisfaction: (1) actor number of media to actor connected availability, (2) partner number of media to partner connected availability, (3) partner number of media to actor connected availability, and (4) actor number of media to partner connected availability. Overall, this pattern of results suggests a dynamic indirect effects process between media multiplexity and life satisfaction through connected availability is within a member of a romantic couple and between the members of the couple. Also, note that number of media had a negative relationship with life satisfaction, controlling for connected availability. Taken together, this series of indirect effect support H8.

Multimedia frequency. The second anticipated indirect was from multimedia frequency to connected availability to SWB (H10). All models of multimedia frequency controlled for multimedia disclosure, accessibility, and the number of media.

Positive affect. For positive affect, I predicted that multimedia frequency as associated with positive affect because of connected availability. As both actor and partner multimedia frequency were positively associated with connected availability and actor and partner connected availability were positively associated with positive affect, there was evidence was all four actor-

partner indirect effects (Table 16). People who reported more multimedia frequency also reported more connected availability, and in turn, they reported more connected availability, the actor-actor effect. People who reported more multimedia frequency had romantic partners who reported more connected availability, and their partner's connected availability predicted their own higher positive affect, the partner-partner effect. The actor-partner effect follows with people who reported more multimedia frequency predicted more connected availability and in turn their partner's reported more connected availability. The partner-actor effect completes all possible indirect effects: people who reported higher multimedia frequency had partners who reported higher connected availability and those partners went on to report more positive affect. Overall this supports H8 because media multiplexity predicted positive affect through connected availability. However, there remained a positive actor effect on multimedia frequency, which suggests there is more to the relationship between the frequency of communication across media and positive affect than connected availability.

Negative affect. I also hypothesized that negative affect would be negatively associated with multimedia frequency via the mechanism of connected availability (H10). Table 16 displays four indirect effects for negative affect: (1) actor multimedia frequency to actor connected availability, (2) partner multimedia frequency to partner multimedia frequency, (3) actor multimedia frequency to partner connected availability, and (4) partner multimedia frequency to actor connected availability. This suggests that the effect of multimedia frequency and accessibility on negative affect is explained by the sense of ambient availability offered by generated by this frequent communication. Actor multimedia frequency was significant after entering connected availability into the model, this points to more than connected availability underlying this relationship. This pattern of results offers support for H10, as multimedia

frequency was negatively indirectly associated with negative affect through connected availability.

Life satisfaction. The final element to testing H10 was to determine the relationship between multimedia frequency and life satisfaction through connected availability. I predicted the connected availability would mediate the relationship between multimedia frequency and life satisfaction. The test of joint significance suggests two significant actor-partner indirect effects (Table 16). First, actor-actor indirect effect is present. People who reported more multimedia frequency tended to also report greater connected availability, which predicted greater life satisfaction. Second, partner-actor indirect effect was significant. Partners of people who reported high multimedia frequency also reported high connected availability. Those people in turn showed a positive association between connected availability and life satisfaction. As partner connected availability is non-significant, partner-partner, and actor-partner fail the test of joint significance. There was no independent effect of either actor or partner multimedia frequency on life satisfaction after controlling for connected availability, indicating an indirect effect. This supports H8 regarding the indirect effect of multimedia frequency on SWB via the perception of immediate access to a partner for support or comfort.

Multimedia disclosure. H12 predicted that connected availability would mediate the relationship between multimedia disclosure and SWB. The first step in the test of joint significance is a significant relationship between the predictor variable, multimedia disclosure, and the mediator variable, connected availability. However, this relationship was non-significant, which means that multimedia disclosure is not indirectly associated with positive affect, negative affect, nor life satisfaction through the perception of having an attachment figure always near and responsive (Table 16). There was one direct effect of multimedia disclosure in this entire

study: multimedia disclosure was positive associated with negative affect after controlling for connected availability. Therefore, the amount of self-disclosure across media was negatively related to SWB regardless of the availability of their romantic partner.

Accessibility. H14 the final hypothesis proposed in this study was that connected availability mediated the relationship between accessibility, i.e., the ease of communicating with a partner on a medium, and SWB. Accessibility was modelled, controlling for the other various forms of media multiplexity.

Positive affect. First, I posited an indirect effect between accessibility to connected availability to positive affect. The mediation test starts by establishing a significant relationship between accessibility and connected availability. Table 16 shows that the actor accessibility to connected availability was significant but not partner accessibility. Second, there needs to be a significant relationship between connected availability and positive affect, and there is for both actor and partner connected availability. Bringing these two significant effects together results in two significant indirect effects: actor-actor, and actor-partner. The actor-actor indirect effect suggests that a person's report greater accessibility is associated with greater connected availability, which predicts more positive affect. The actor-partner indirect effects extends to include that accessibility is associated with the positive affect of a partner through connected availability, and accessibility had no independent effect on positive affect after accounting for connected availability.

Negative affect. The next predicted association was an inverse relationship between accessibility and negative affect because of connected availability (H14). Following the indirect effect of accessibility on positive affect, there were two significant indirect effects. The actor-actor indirect effect was significant, which means that accessibility predicted less negative affect

through connected availability through when looking at the reports of only member of the dyad (Table 16). The actor-partner indirect effect was significant, which demonstrates an across dyad effect. When a person reports ease connecting with their partner, they perceive a greater sense of availability from their romantic partner. This heightened availability in turn is associated with less negative affect for their romantic partner. Partner-actor and partner-partner indirect effects were non-significant. The two significant indirect effects offer support for H14 because there was evidence that connected availability was the mechanism, but actor accessibility continued to have a negative relationship with negative affect after controlling for connected availability. Therefore, a person's reports their ability to easily reach their partner is associated with less negative affect in a way that is unexplained by connected availability.

Life satisfaction. Accessibility was predicted to share an association with life satisfaction through connected availability (H14). As displayed in Table 16, actor-actor indirect effect was the only significant indirect effect, according to the test of joint significance. People who reported ease communicating with their partner in the last hour reported higher connected availability. Connected availability in turn was associated with more life satisfaction. As actor-actor only models the within-person effect, there was no evidence of dyadic indirect effects for accessibility. Without partner effects, the effect of accessibility on life satisfaction through connected availability was an intrapersonal process, not an interpersonal process. This indirect effect does suggest that accessibility contributes to life satisfaction via connected availability, which support H14. There also remained the positive partner effect of accessibility to life satisfaction; connected availability only explained part of the relationship between accessibility and life satisfaction at a dyadic-level.

Research Questions

There were two research questions related to accessibility proposed in this study, to help better understand how this affordance is perceived. The first research question asked how much variability in accessibility is attributable to the medium (or media) used for communication, after controlling for dyad, individual, and time. The second research question aimed to answer which media are perceived to offer the greatest accessibility, when accessibility is contextually bound within a cohabitating romantic relationship.

For RQ1, I also ran Model 1 on the reported accessibility of a partner via media, to separate out the variance in accessibility from dyad, individual, and time. Model 1 is the unconditional growth curve model with three random intercepts, intercept, slope, and residuals, and the five covariance constraints.

For RQ2, participants were asked in the presurvey about perceived accessibility for all available media, whereas in the ESM they were only asked about accessibility for media used within the last hour. Because many dyads did not report all possible media for interpersonal communication, use of presurvey reports is the most effective test of this research question. Using the reports from presurvey, I created a final multilevel model that differed in structure from the other models presented here because the data answering RQ2 were cross-sectional. In this model, Level 3 was dyad, Level 2 was person, and Level 1 was report of accessibility. The outcome variable was accessibility and the predictor variable each medium.

Accessibility over time. RQ1 asked how much variability is there in accessibility, after controlling for dyad and time of day. I ran a final indistinguished growth curve model (Model 1) with accessibility as the outcome variable. Because variability is the central question in RQ1, Model 1 was the only type of model run. The estimate of random intercept was significant;

therefore, participants varied in their accessibility during the initial report for each day. The estimate for random slope was non-significant which suggests that there was little variability in how accessibility changed throughout the day. Covariances of the partner's intercepts were significantly correlated, $r_{ii} = .54, z = 2.01, p < .05$. If one partner was easy to reach through their media multiplexity, then the other people likely also reported accessibility. All other estimates of covariance correlations were non-significant for accessibility nor was time of day a predictor of accessibility, $F(1, 96) = .00, p > .05$.

The amount of variability in the data set after estimating the baseline growth model was significant ($\sigma^2 = 4.94, z = 26.70, p < .001$). The residuals unexplained by the growth model are correlated among romantic partners, $r_{ee} = .14, z = 4.32, p < .001$, see Table 17. The interpretation of this variability estimates of a growth model suggests that the total variability in the model is $\sigma^2 = 5.50$, and that a large majority of the variability of accessibility occurred from signal-to-signal, 89.81%. With this large amount of variability as the level of ESM signal, there is evidence that accessibility of media was situational.

Table 17. *Variance of Accessibility*

Dyadic Growth Curve Model		
Random Effects	Estimate	Z
Variances		
Intercept	.58(.15)	3.90***
Slope	.01(.01)	.60
Residuals	4.93(.18)	26.70***
Covariances		
Intercept-intercept	.58	2.01*
Slope-Slope	.01	.81
Within Intercept-Slope	-.03	-.72
Between Intercept-Slope	-.02	-.53
Between Residuals	.70	4.32***

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Accessibility by medium. RQ2 asked which media offer romantic partners the greatest accessibility. For descriptive purposes, Table 18 displays the within and between dyad correlations for the medium accessibility reported in the presurvey. Several notable findings exist in this correlation table: (1) accessibility is not inversely correlated among any of the media at a between or within dyad level, (2) accessibility of text messaging and cell phone calls were the highest correlated media between- and within- dyads, and (3) the majority of the significant correlations are medium to small correlations.

The dyad random effect in the MLM was non-significant ($z = .04, p > .05, ICC = 1.15\%$). Thus, there was little clustering within the dyad reports of overall accessibility. In other words, members of a dyad were quite dissimilar in their reports of accessibility over all media. The person nested in dyad random effect was significant, $z = 5.52, p < .001, ICC = 21.92\%$. Although there was no significant clustering within-dyad, there was significant clustering for within-person for repeated measures of accessibility. The reported accessibility from medium-to-medium was similar within-person.

Answering RQ2, the fixed effect of medium was significant, $F(9, 1998) = 163.80, p < .001$. Table 19 displays the estimated means from this model. Face-to-face was significantly higher in accessibility than all other media, except for text messaging. In turn, text messaging was not significantly different than cell phone calls for accessibility. Face-to-face communication, text messaging, and cellphone calls offered the most accessibility of a partner. The remainder of the media were ranked in accessibility in the following order: email, video chat, social networking sites, desktop instant messaging, mobile messaging apps, Snapchat, and landline telephone. Most media were significantly different from one another in this ordering, but there were several exceptions. Desktop instant messaging and social networking sites were

not significantly different, and social networking sites were not significantly different from video chat. Mobile messaging applications and Snapchats were not significantly different in terms of accessibility. Landline telephones offered the least amount of partner accessibility via media of the numerous media reported on in the presurvey. Perceptions of accessibility offered from email, video chat, and social networking sites were moderate within the dyad's media ecology.

Table 18. *Between- and Within-Dyads Correlations of Accessibility by Medium*

	1	2	3	4	5	6	7	8	9	10
Text Message	-	0.19**	0.61***	0.05	0.42***	0.24***	0.21**	0.30***	0.23***	0.37***
Face-to-Face	0.13	-	0.22***	0.03	0.15*	0.20**	0.19**	0.05	0.14*	0.22**
Cellphone										
Calls	0.49***	0.35***	-	0.10	0.52***	0.27***	0.21**	0.27***	0.2**	0.47***
Landline										
Telephone	-0.02	-0.04	0.01	-	0.17*	0.41***	0.15*	0.41***	0.35***	0.09
Email	0.28**	0.05	0.29**	0.20*	-	0.34***	0.33***	0.36***	0.27***	0.35***
DIM	0.01	-0.05	-0.05	0.40***	0.25**	-	0.34***	0.29***	0.47***	0.26***
SNS	0.25**	-0.03	0.11	0.27**	0.07	0.30**	-	0.47***	0.38***	0.25***
Snapchat	-0.03	0.19*	0.15	0.27**	0.06	0.26**	0.36***	-	0.39***	0.28***
MMA	0.11	0.01	0.10	0.44***	0.29**	0.39***	0.24*	0.18	-	0.32***
Video Chat	0.21*	-0.01	0.28**	0.27**	0.29**	0.25**	0.31***	0.20*	0.16	-

Note. Correlations above the dashed diagonal line represent within-dyad correlations obtained from multi-level analyses. Correlations below the dashed diagonal line represent between-dyad correlations. DIM = Desktop Instant Messaging. MMA = Mobile Messaging Apps.

* $p < .05$.

** $p < .01$.

*** $p < .001$

Table 19. *Estimated Least Squares Means of Accessibility by Medium*

	<i>M(SE)</i>
Text Message	5.76(.11) _{ab}
Face-to-Face	5.97(.11) _a
Cellphone Calls	5.63(.11) _b
Landline Telephone	2.63(.11) _c
Email	4.59(.11) _d
DIM	3.53(.11) _e
SNS	3.78(.11) _{ef}
Snapchat	2.98(.11) _g
MMA	3.18(.11) _g
Video Chat	4.01(.11) _f

Note. DIM = Desktop Instant Messaging, SNS = Public Social Networking Site, MMA = Mobile Messaging Apps. Accessibility was reported on a Likert scale, 1 = strongly disagree, 7 = strongly agree.

CHAPTER 6: DISCUSSION

The overarching goal of this dissertation was to address the consequences for SWB of being almost constantly connected to others via mobile phones and social media. This goal was motivated by the public concern that the integration of communication technologies into nearly every aspect of everyday life is harmful to SWB: positive affect, negative affect, and life satisfaction (Turkle, 2015; Twenge, Martin, et al., 2018). Despite concerns about digital media, there are many mixed results related to the effects communication technologies on SWB (Verduyn et al., 2017). The most consistent research findings related to this topic was that the use of these communication technologies in close relationships appeared to determine many of the effects (Burke & Kraut, 2016; Valkenburg & Peter, 2007). Therefore, one answer to the confusing set of findings about communication technologies and SWB is to understand the relational processes taking place because of the near constant use of mobile phones and social media (Jiang, 2018). I referred to this as a relational perspective on communication technologies and well-being, see Figure 1 (Taylor & Bazarova, 2018b).

There are three primary contributions of this dissertation to the study of communication technologies and well-being from a relational perspective. The first contribution is the study of interconnected interpersonal communication media and SWB, rather than studying media as disconnected communication islands. This work advances MMT as a theoretical framework (Haythornthwaite, 2005) for understanding why the diverse portfolio of media used for interpersonal communication impacts SWB. The second contribution of this study advances connected availability, derived from a combination of attachment theory (Bowlby, 1969) and connected presence (Licoppe, 2004), as the underlying mechanism explaining why the use of communication technologies in close relationships is consequential for SWB. A third

contribution is conceptualizing communication across the media ecosystem as a dyadic process, which means that effects of media use are dependent upon both the person and their partner (Kashy & Donnellan, 2012).

An overview of the results of this dissertation suggest that there is no single relationship between interpersonal communication across the multimedia landscape and SWB, even when taking into account offline and online interactions (Orben & Przybylski, 2019a). The results revealed a multifaceted relationship between communication technology and SWB where each element of media multiplexity related to SWB in a unique way. Number of media appeared to have dimensioning returns on SWB. Multimedia frequency was positively linearly associated. Yet, multimedia disclosure was negatively associated. Accessibility predicted SWB of the person as well as had an independent contribution to their partner's reports of SWB. These findings advance MMT in the direction of predicting outcomes outside of the quality of social relationships (Ledbetter, 2015). The original notion of MMT was that there is a positive linear relationship between the number of media used and relational closeness (Haythornthwaite, 2005), but this simple linear relationship does not extend into well-being quite as well because there were multiple positive and negative relationships.

This study provided evidence that the positive association between media multiplexity and SWB is driven by the comfort received from believing that a partner is immediately ready for contact and willing to respond, which is connected availability. However, connected availability did not predict any of the negative associations between media multiplexity and SWB when considered at a dyadic level, as expected. The number of media and multimedia disclosure continued to predict negative consequences of SWB even after controlling for

connected availability. Connected availability can explain some but not all the well-being outcomes of living in a constantly online world.

In this remainder of this chapter, I review of the effects of media multiplexity on SWB. Following this review, I unpack accessibility as a media affordance in a media multiplexity framework. Then I move onto evaluating the mechanism of connected availability. For each section, I discuss the implications for interpersonal communication, and what these results mean for concern of the health consequences of being always connected through digital devices.

The Effects of Media Multiplexity on SWB

This study is one of the first studies to consider the effects of being almost constantly connected to digital media as interpersonal communication across the media landscape, or media multiplexity. The value of taking a multiplexity approach to interpersonal communication is that it helps to understand the use of an individual medium within the broader, more complicated, media ecology, which can fundamentally change interpersonal communication processes (Parks, 2017). Furthermore, it provides a theoretical lens to understand the frequent use of communication technology in everyday life. The experience sampling method employed in this study shows that the media diet of a cohabitating romantic couple is a hybrid of offline and online throughout a week. Perhaps unsurprisingly, communication technology use in these couples was rooted in their face-to-face communication, as face-to-face communication was most common but face-to-face was also most commonly combined with another medium within a single hour.

When studies focus exclusively on digital traces of communication (Burke & Kraut, 2016) or on one communication technology (Taylor, Hutson, et al., 2017), a large portion of interpersonal communication is omitted. This is not to say that the use of communication

technologies was minimal or unimportant. Approximately one-third of all communication in long-term romantic couples took place via some type of communication technologies, but these media are regularly mixed with other media. Text messaging was second most common form of communication in these dyads, and participants often reported talking face-to-face and text messaging with their partner within an hour, and especially within a single day. By capturing these fluctuations throughout a dyad's media use, this study offers a different lens for approaching the question of how communication technologies are implicated in our happiness. These descriptive data of communication in romantic couples suggests that MMT offers an imperative perspective on the study of human communication.

The first major advancement of MMT in this study was extending the predictive power of the theory towards well-being and health, which helps to address the growing concern about being constantly tethered to digital media. This contribution is highlighted by the findings related to number of media, multimedia frequency, and multimedia disclosure with SWB. Whereas I hypothesized the various aspects of media multiplexity would have a positive relationship SWB, the results suggested that media multiplexity predicted both improvements and deterioration of SWB through the day. The effect of communication technologies on SWB is not either good or bad, it is both. Next, I go through the effects of media multiplexity on SWB and explain how these results extend this theory.

Number of media. In terms of number of media, or the tally of media used for communication in the last hour, the relationship between SWB was not straightforward. Affective well-being, both positive and negative, was greater when a person reported using one medium with their partner, as opposed to none. However, when two media were used in the last hour, affective well-being was lower, compared to one medium. Life satisfaction exhibited a

partner effect for number of media. That is, people reported higher life satisfaction when their partner indicated one form of communication. There was not an effect on life satisfaction the person's own reports of media use. Affective well-being did not exhibit an effect across dyad like life satisfaction did.

Connecting with a partner on one medium in the last hour, rather than no connection whatsoever, was associated with improved SWB. This finding is consistent the propositions of media multiplexity, which states greater connectivity improves a person's life and relationship. This finding suggests that maintaining some contact with a romantic partner—through one medium—at various time points has beneficial outcomes for emotional state and satisfaction with life. Yet, this connectivity had a rapid tipping point for affective well-being. Using more than one medium was associated with less affective well-being. This result suggests that if communication is happening over more than one medium in an hour, this may compromise the affective state of a person. This is consistent with a growing evidence that media multiplexity is not a linear effect. Rather, there is a threshold of diminishing returns for the amount of media used for interpersonal communication (Caughlin & Sharabi, 2013; Taylor & Bazarova, 2018a). The use of more than one medium in the previous hour may signal that there is more going on than connectivity.

These results extend media multiplexity beyond social networking and internet connectivity effects to demonstrate that the use multiple media does more than connect. Because of the integrating of multiple media into close relationships, there are many potential explanations for this negative relationship beyond only establishing connection with a partner. Communication over multiple media in a short timespan may signal that a person is stressed and reaching out to their partner. For instance, mobile phone data log show that traffic increases

during times of crisis (Sundsoy, Bjelland, Canright, Engo-Monsen, & Ling, 2012). Conflict management is another one of purposes for using greater than one medium in an hour, although switching into more media may escalate conflict (Caughlin, Basinger, & Sharabi, 2016; Scissors, 2012). Eden and Vesksler (2016) offered a series of reasons why the use of multiple media in geographically collocated relationships may harm affective well-being: (1) purposefully creating psychological distance from a partner, (2) self-presentation concerns, (3) privacy violations, (4) violation of an implicit relational communication rules, (5) perception of that the medium is inferior. The mixing of media is how contemporary relationships are maintained (Parks, 2017), and incorporating more of these relational dynamics into the theoretical perspective of MMT is necessary to understand how and why people talk with their partners across multiple media through any given day.

Multimedia frequency. Multimedia frequency addresses the total frequency of communication across media. Frequent of communication across all media in the last hour was associated with greater SWB across all three subdimensions. Engaging in more media use with a partner in the last hour predicted with more positive emotional experiences, less negative emotions, and better evaluations of one's life. There was not a partner effect for multimedia frequency. Interpreting these results suggest that engaging in frequent communication across media with a romantic partner may benefit the overall SWB of a person, but frequency of media use did not affect the SWB of a partner.

Overall, these results are consistent with Chan's (2015) results that the frequent use of multiple platforms among strong ties promotes well-being. Going against public concern about the deleterious consequences of texting or emailing a romantic partner (Turkle, 2015), keeping in frequent contact with a partner was associated with improved affective well-being and also

predicted greater life satisfaction. Rather than undercutting interpersonal communication, the frequent blending of face-to-face with other types of media is associated with positive outcomes. When the unit of analysis is outside of the close relationships, such as weak tie or employer-worker relationships then the association may differ. The difference between individual media use and media use in a relationship is a critical difference that motivated the original formation of MMT, but the use of media in a relationship represents a boundary condition of the theory. Many critiques of being almost constantly connected are that people sacrifice frequent face-to-face communication with romantic partners and family members for frequent screentime with online friends or smartphone applications, and these results do not speak directly to those consequences. By looking at only communication within a dyad, these data do not offer evidence that people are communicating less with their partners because of their time spent on mobile phones and social media. To address such a question would require comparisons between a dyad's media ecology with the larger media ecology of each individual. Furthermore, taking a media multiplexity approach to communication technologies leaves these data unable to resolve debates about the types of social media use (e.g., passive browsing) or the effects of on media specific media (e.g., Instagram) on SWB because the goal was to capture media use holistically.

Multimedia disclosure. This project also looked at the totality of self-disclosure over media between dyads in the last hour, or multimedia disclosure, as a way of understanding the content of communication happening across media. Whereas previous studies have looked at disclosure (Choi & Bazarova, 2017) or perceived quality of communication (Gonzales, 2014) in relation to SWB, this project considered this disclosure in combination, rather than as separate parts, to identify the degree of intimate talk integrated over media. In fact, the pattern of results for multimedia disclosure and SWB were the most distinct from other aspects of media

multiplexity. First, multimedia disclosure was positively related to negative affect, or the more people reported sharing with their partner over media in the last hour was associated with more negative emotions, such as sadness, fear, or anger. Second, multimedia disclosure was not associated with positive affect or life satisfaction, nor were there any dyadic effects for multimedia disclosure.

The implication of this finding is keeping disclosure on less total disclosure over all media may help keep negative emotions away, although this result could also be due the possibility that people with more negative affect reported sharing more disclosure with their romantic partner across media. The lack of partner effect suggests that the amount of self-disclosure reported from a partner did not increase or decrease negative emotional experiences. These findings on multimedia disclosure run counter to theory that self-disclosure is part of a dyadic process that helps to reduce negative emotions, and requires some explanations of why multimedia disclosure may differ from previous models of self-disclosure (Reis & Clark, 2013; Reis & Shaver, 1988).

One reason for the why multimedia disclosure may differ from the previous studies is that looking at communication across the landscape allowed to this project to capture the interdependence self-disclosure across media. The use of multiple media for self-disclosure may signal that something is wrong, as there was a need for disclosure to continue across multiple media within an hour time span (Caughlin & Sharabi, 2013). These results are consistent with the curvilinear relationship between multimedia disclosure and subsequent experiences of relational closeness in romantic relationships (Taylor & Bazarova, 2018a). This growing body evidence about self-disclosure in close relationships across media has the implications for thinking about the process of self-disclosure in everyday digital life. One implication is that

comparison of self-disclosure between different media may serve different goals and motivations than when self-disclosure over those same media is considered holistically (Bazarova & Choi, 2014). Although the amount of self-disclosure is fundamental to relational closeness (Laurenceau, Barrett, & Pietromonaco, 1998), sharing a lot over several media may signal problems or distress in that moment. The theoretical implications are that previous theory of self-disclosure may have the boundary condition of communication on one medium, but there is room to develop what disclosure means for across media.

Unpacking Accessibility through Media Multiplexity

The effect of accessibility on SWB. A novel contribution is in thinking about the consequences of accessibility on SWB, within media multiplexity framework, and demonstrating that effects of accessibility on SWB are interdependent across members of a dyad. Accessibility was conceptualized as the affordance of the perceived ease of reaching a communication partner over a medium or various media (Fox & McEwan, 2017). Other studies have found that being easily reachable to weak ties promotes quality interactions but immediate access to strong ties does not (Trieu et al., 2019). Yet, close partners are often the people most reachable via communication technologies (Ling, 2012; Sundsoy, Bjelland, Canright, Engo-Monsen, & Ling, 2012). The security offered from intimate relationships is frequently described as the reason for this discrepancy, and these data tested this logic.

The findings suggested that accessibility—the perceived ease of reaching a romantic partner via media—promoted more positive affect, less negative affect, and more life satisfaction. Not only was accessibility associated with a person’s well-being, the extent to which a person perceived their romantic partner as easily reachable predicted more SWB in their romantic partner. Thus, the perceived affordances of one person has dyadic consequences. This

extends current theory on media affordances because the consequences of affordances not only determine the outcomes of the person but also their romantic partner. The dyadic process underlying affordances in interpersonal communication has been noted before. For instance, previous work has suggested that the high intimacy of self-disclosure witnessed online was attributable to the low-cue environments (Tidwell & Walther, 2002). However, experimental evidence found that the intimacy of self-disclosure was not determined by low-cue computer-mediated environment; only under conditions of interpersonal self-disclosure reciprocity did intimacy in computer-mediated environments increase (Jiang, Bazarova, & Hancock, 2013). As such, the need to recognize that media affordances are operating and utilized in specific relational contexts is needed (Ruppel, 2015).

The dyadic regulation of SWB through accessibility can be explained as part of the relational obstacles and assistance to everyday goal pursuit of a person. Negative emotions in relationships are promoted by goal interference (Knobloch & Theiss, 2010). If reaching out to a partner is considered a goal oriented act (Taylor, Ledbetter, & Mazer, 2017), then if a partner is inaccessible, they are likely impeding on the completion of a goal. When partners are able to facilitate the completion of goals, such as running to the grocery store for milk, then there is a positive emotional response (Solomon, Knobloch, Theiss, & McLaren, 2016). In terms of dyadic effects, when a person reports that their partner is accessible, there is likely reciprocal goal facilitation. Future research could consider interference from a partner as a reason for the observed dyadic effects, and this could build communication technology use more directly into relational turbulence theory.

Understanding the media affordance of accessibility. The actor and partner effects of accessibility on SWB left lingering questions about accessibility as a media affordance. Studying

affordances, such as accessibility, provides an avenue to understand the actions that people receive from the various media used for communication, but understanding affordances through the lens of media multiplexity was complicated by (1) the broader media landscape, (2) relational context, and (3) situational factors (Humphreys et al., 2018; Rice et al., 2017; Zhao et al., 2016). In this dissertation, I was able to explore initial questions about each of these (1) comparing the perceived accessibility for each medium across a dyad's media ecology, (2) determining how much similarity there is in reports of accessibility at the dyad-level, and (3) assessing how much variability there is from context-to-context in accessibility.

The affordances of media are dependent upon the other media in the media ecology (Zhao et al., 2016). By surveying the perceived accessibility of all available media, I was able to gain some understanding of this dependency. At the start of the study, participants reported greatest accessibility of their partner via face-to-face communication and text messaging. There was no observed difference in the ease of reaching a partner face-to-face or via text message, when media were globally conceived. Their reports over the next week of communication with their partner reflected this initial report of accessibility with the frequency of face-to-face communication and text messaging over the next week. These two media were the media where the large majority of interpersonal communication happened for the romantic couples in this sample. Furthermore, these two media were also most likely combined with one hour to try and communicate with a partner. Cellphone calls were not too far behind in their facilitating an easy connection with a partner. Other mediated communication channels, such as, email, SNS, video chat, and desktop instant messaging, appeared to have some degree of accessibility but to a lesser extent than face-to-face, text messaging, and cellphone calls. Other work on accessibility that is not focused on the breadth of the media ecosystem within a dyad that finds face-to-face

communication has one of the lowest levels of accessibility (Fox & McEwan, 2017) or accessibility is attributable primarily to mobile communication (Bayer, Campbell, & Ling, 2016). These results challenge this understanding of media because in the context of cohabiting romantic relationships the perceived accessibility from media was different than more general conceptualizations of accessibility found in previous research.

A media multiplexity perspective on affordances offers a different understanding of affordances than current thought on the subject (Evans et al., 2017). These data support the argument the perceived affordances of any one medium is understood in relation to the other media available for communication, as the present findings on face-to-face communication challenge previous conceptualizations of accessibility. This supports the notion that affordances of communication technologies are understood in the context of all available media, rather than what one specific medium allows them to do (Zhao et al., 2016). One way to understand affordances in the MMT framework is to measure the perceived affordances (e.g., anonymity, persistence, and visibility) across all available media for a dyad. When focusing on communication for the dyad, the affordances may change because of how that dyad uses media for communication. Moving forward, research interested in affordances likely needs to ask about the all available media within a dyad to understand what is afforded by one particular media.

If a dyad's media ecology determines the perceived accessibility of any one particular media, then the next question to follow is how much dyads agree in their perceptions of accessibility. The inconsistency of perceived accessibility of media within dyads was striking. In both survey and the ESM reports, the similarity in reports of perceived accessibility for dyads was very low. This result suggests that one member of a dyad could perceive high accessibility to their partner on cellphone calls, while the other perceives cellphone calls as a hard place to

access their partner. These data are the second confirmation that dyads do not necessarily understand media in similar ways (Ledbetter, 2014). One understanding of these results is that to establish and maintain a healthy long-term romantic relationship does not require the same understanding or orientation to communication media. This stands in contrast to work on “technoferece” or “phubbing” which assumes that a mutual orientation to how media should be used for interpersonal communication is important for the health of close relationships (McDaniel & Coyne, 2016; Sbarra et al., 2019). In contrast, there was some clustering within person in the perceived accessibility, which supports the notion that accessibility may reflect a personality trait or be influenced by personality traits (Trieu et al., 2019).

The last question related to accessibility was the extent to which accessibility was static or varying over time. The data suggested that reports of the ease of connecting with a romantic partner in the last hour via a medium was highly variable over the course of one week. Nearly 90% in the variability of reports in these data were at the moment-to-moment level. Whereas it is often common to consider the affordances of a medium as quite static (Evans et al., 2017), there are clearly situational factors that change the perceived actions available from a particular medium. This supports recent theoretical arguments about affordances suggesting that affordances are situational, such as location (Humphreys et al., 2018). The next step in understanding accessibility is to understand the situations that cause flux in accessibility perceptions. The distinction between at home versus out of the home is a reasonable place to begin asking these questions (Bayer, Ellison, Schoenebeck, Brady, & Falk, 2018). However, the results of the model testing accessibility showed the level of accessibility does not change over the course of a day. This ends in the complicated interpretation that the accessibility of a medium can vary, but when the broader media landscape is considered a partner remains accessible at

approximately the same level throughout the day. Future research needs to plot the dynamic flow of accessibility by medium.

The results the accessibility and media multiplexity and predictors of SWB paint a detailed but messy picture about communication technologies. Unfortunately, these results do not clarify why the frequent use of communication technologies impact SWB in the variety of ways observed here. In line with the relational perspective on communication technologies and SWB, I suggest that maintaining proximity via digital media is a relational dynamic that has changed in the almost constantly online world, and that this changed relational dynamic explains the consequences of SWB. In the next section, I move beyond the direct effect of media use and affordances on SWB to understanding the communication processes that brings about those consequences.

The Mechanism of Connected Availability

The next goal of this dissertation was to provide a theoretical mechanism for why communication technologies use in close relationships is implicated in the wellness of a person (Burke & Kraut, 2016). Understanding the mechanisms of (1) the number of media (2) multimedia frequency, (3) multimedia disclosure, and (4) accessibility advances MMT into the realm of SWB because there was a complicated positive and negative relationship between these media use variables and SWB observed in these data. As MMT provided little guidance on this question, I turned to attachment theory to understand how people use their attachment figures to regulate their affect and promote a better life (Bowlby, 1969). Pulling work on attachment into MMT helps to build the relational perspective on media used offered by this theory by detailing the psychology of close relationships

The basic idea of the attachment behavioral system is regulating proximity of attachment figures, such as parents or romantic partners, to offer security. Regulating proximity, once out of infancy, is better understood as maintaining availability, the accessibility and quick responsiveness, of an attachment figure (Bowlby, 1973). My thesis is that the process of maintaining availability has changed in adult attachments as a result of the integration of multiple communication technologies into interpersonal relationships. Drawing from connected presence through mobile phones (Licoppe, 2004), I hypothesized that communication across the diverse portfolio of media available for interpersonal communication, including face-to-face communication, creates a sense of connected availability in attachment relationships.

Connected availability—the perception that an attachment figure is immediately accessible and responsive to contact anytime, anywhere—represents a new theoretical aspect of media multiplexity advanced in this dissertation. In turn, connected availability was reasoned to explain the positive relationship between media multiplexity, accessibility, and SWB. However, connected availability is a dyadic process in close relationships. Dyadic connected availability suggests that the perception of immediate responsiveness from a romantic partner influences their SWB too. I tested the interdependence of connected availability using a longitudinal actor-partner interdependence model. This allowed me to disentangle the consequences of having a romantic partner always available for oneself and for one's romantic partner, in the form of actor and partner effects (see Figure 2). This dissertation investigated the antecedences, consequences, and mediation of connected availability.

The Antecedents of Connected Availability

Building upon previous work on media multiplexity (Ledbetter, 2015) mobile communication research (Campbell, 2019), media multiplexity and accessibility were

hypothesized as the primary predictor of connected availability, and the results of the dyadic data analysis generally support this hypothesis. Furthermore, the findings of this study suggest that connected availability is a mutually influential process across dyads. The number of media used for communication in the last hour was associated with greater connected availability. Using one, two, three, or four media in the last hour predicted more connected availability than no communication in the past hour. However, when a person reported using two media, rather than only 1, their reports in connected availability tended to reduce. Reports of the number of media used from the target person also predicted greater connected availability in their partner. The number of media suggests that communicating over any medium helps to keep the perception of constant availability of attachment figures alive for both partners, but the reports were highest for face-to-face communication. Beyond the number of media, there were additional predictors of connected availability. The frequency of communication across the interpersonal media landscape was associated with a greater sense of connected availability in that person and their partner, but the amount of self-disclosure across media was unrelated to connected availability at all. The actor effect for accessibility was significant but not the partner effect. Therefore, the extent to which people perceived that their partner was easy to reach was associated with a greater connected availability, but perception of accessibility did not predict their partner's connected availability.

Connected availability is a consequence of short, frequent interactions between partners because these brief but frequent interactions generate a continuous conversation (Licoppe, 2004). In fact, Ling (2008) argues that it is the steady stream of text messages and voice calls that build the sense of psychological togetherness when separated, and this communication is routine and mundane, rather than intimate conversations. Beyond the type of communication, the

accessibility afforded by mobile phones is also considered one of the main drivers of connected availability (Bayer et al., 2016). The results in this dissertation support these predictions of the antecedents of connected availability.

The goal of brief, lightweight interpersonal communication is less about deep intimate conversation and more about making sure that attachment figures are available, should the occasion arise where such instances are needed. Indeed, mobile data records show that when those stressful occasions do arise, we contact those intimate ties for comfort (Sundsoy et al., 2012). Perceiving accessibility from media also appears to produce greater perceptions of that a partner is immediately available for support and help anytime, anywhere. These results are also consistent with the attachment behavioral system because the comfort and personal growth facilitated from the availability of an attachment figure stems from knowing that the person is readily accessible for protection (Bowlby, 1973).

Although the quick, mundane text message exchanges that happen in long-term romantic relationships may appear like subpar connection (Turkle, 2015) or as though it is displacing important face-to-face interactions (Twenge et al., 2019), this type of talk has critical psychological functions (Duck et al., 1991). The frequency and ease of interpersonal communication across media seem to help provide the security of attachment. These data suggest people living the digital age try to keep their attachment figures available, and this is done through communication across the interpersonal media landscape. Restated succinctly, media multiplexity has enabled a new strategy for maintaining availability to attachment figures. However, the finding that using more than one medium was associated with less connected availability challenges the fundamental proposition of MMT: a positive linear relationship between the number of media and relational connectivity. This is more consistent with the idea

that media multiplexity can have dimensioning returns for relationships. Counterintuitive to MMT, the number of media connections does not predict more connection in the relationship.

For research on media, one contribution of this project is focusing on connected availability as a consequence of the whole interpersonal technoscape (Licoppe, 2004). This interpersonal technoscape includes face-to-face communication, and these data suggest that offline communication is imperative to the notion of establishing an interpersonal relationship that is always on and always available. Connected availability was greatest after face-to-face communication. Mobile phone communication was also a contributor to connected availability, but previous work tends to argue that being always available is associated is the result of the taken for grantedness of mobile phones (Bayer et al., 2016). As described, the idea of constant availability in social relationships, although it appears completely revolutionary to the digital age (e.g., Christensen, 2009), can also be witnessed in the face-to-face communication of parent-infant bonds. Because connected availability is part of attachment, the need to consider how availability is maintained through offline communication appears critical.

The Consequences of Connected Availability

Intrapersonal connected availability. Guided by the logic of attachment theory, I predicted that maintaining an always available, always on relationship with a romantic partner would improve the SWB of the person. This prediction was supported. Connected availability was consistently related to the momentary experiences of affective well-being and life satisfaction. Actor effects represent the intrapersonal effect of connected availability, or a person's perception of partner's availability for connection on their own SWB. The reports of connected availability were associated with feeling more positive affect, less negative affect, and higher satisfaction with life in that moment. As demonstrated across the field of attachment

research (Mikulincer & Shaver, 2017), knowing that a partner is available appears to help the emotional state and satisfaction of a person, which is likely the explanation for this finding.

One way to consider the regulation of SWB through connected availability is a manifestation of attachment behavioral system in adulthood. There is little question of whether or not attachment continues to adulthood (Hazan & Zeifman, 1999), but there is a question of what keeping an attachment figure available in adulthood means in the digital age. Bowlby (1969) stated that as a child develops the nature of what constitutes maintaining availability to attachment figures shifts from geographic propinquity to symbolic representations of the attachment figure. Previous studies have documented that the sense of security offered by attachment figures can come from physical contact (Coan et al., 2006), mental representations of (Selcuk et al., 2012), and subtle cues of attachment security (Mikulincer & Shaver, 2015). I argue that the attachment behavioral system follows people into their online interactions to give them a similar sense of security. As a result, the apparent attachment to communication technologies (e.g., Matassi, Boczowski, & Mitchelstein, 2019) is more likely attachment to pair bonds on the other side of the screen.

The evidence provided in this dissertation suggests that constant connection to mobile phones and social media, that is at the center of concerns about communication technologies and well-being, may serve attachment functions that help keep people happy. One way to improve affect through attachment bonds is through maintaining actual partner availability via the media ecology, whether that be offline or online, rather than relying on symbolic representations. The maintenance of connected availability is a baseline assumption of present day attachment relationships, and although the underlying attachment behavioral system has not changed, how

such comfort is found has changed, just as attachment theory predicted it would change over the developmental course of a person's life (Bowlby, 1969).

Ling (2012) discusses the everyday assumption of availability at a sociological scale. He argues sociality of contemporary relationships is fundamentally different because of the digitally connected nature of society. One published study corresponds with this societal level a shift in attachment. In a large-scale national sample, adult attachment anxiety appeared to have reduced after the integration of cellphones into everyday life (Chopik & Peterson, 2014). Rather than seeing this shift in communication technology use as the deterioration of intimacy and love (e.g., Sbarra et al., 2019), these data suggest that it is a new and healthy way of keeping attached to loved ones. Furthermore, staying constantly connected to a few close partners should be seen as less of a radical shift in social relationships, but an evolutionarily engrained way to keep oneself safe and secure from potential dangers.

At a more general level, these data advance a relational perspective on communication technologies and SWB (Taylor & Bazarova, 2018b), which is a conceptual model of how the use of communication technologies influences SWB through close relationships, see Figure 1. The goal of this dissertation is to demonstrate that one of the main reasons for why communication technologies can influence SWB is due to the close relationships that inhabit them. These data advance this perspective by showing that interpersonal affect regulation dynamics of established close relationships (e.g., attachment bonds) happen in digital media. Several studies have shown that engaging in mobile phone (Trieu et al., 2019) and social media communication (Burke & Kraut, 2014) do not influence the level of relational closeness or intimacy of close friends and family. As described by Taylor and Bazarova (2018b), this lack of change in relational closeness does not mean that there are no well-being consequences for this communication. Established

close relationships can take a different route to regulating well-being because of the tight coupling between relationships and well-being (Holt-Lunstad et al., 2015). Connected availability represents one of those routes of communication in established relationships to SWB.

Interpersonal connected availability. Interpersonal connected availability refers the effect of one member of a dyad's connected availability on their partner, or the partner effect in the actor-partner interdependence model. The permanent connection of close relationships, generated by the integration of communication technologies into everyday life, is considered both a blessing and a curse. Although several others have observed the reciprocal forces of what I have termed 'connected availability' in romantic partners, friends, and family (Licoppe, 2004; Ling, 2008), this study was one of the first to empirically tease apart the extra burden of being always available for support to romantic partners. The results did not support the negative effects of reciprocal connected availability in that there was no evidence of the negative duality of connected availability, across positive affect, negative affect, or life satisfaction. The extent to which people think that they are able to contact their partner for support, did not predict worse SWB for their partner. Contrary to expectations, the partner effect of connected availability was positively related to the presence of positive emotions. A person's negative affect shared a negative relationship with their partner's perception of connected availability to them. A person's life satisfaction was unrelated to their partner's connected availability. Thus, the partner effect of connected availability mirrored the *intrapersonal* effect of connected availability. These findings suggest that people's emotional states are better when their partner believes that they are immediately available for connection to them. Rather than a burden or a stress, the partner effect of connected availability appears to improve happiness.

There are several potential reasons why there the results of the partner effect of connected availability were inconsistent with previous work. When a person believes their attachment figure is digitally connected to them, this may offer improvements in affect without much effort on the part of the romantic partner. The burden of constant availability is often discussed in the negotiation of attention and responsiveness, such as having to immediately respond to text messages or social media posts (Fox & Moreland, 2015; Ling, 2012). Because connected availability is the perception of availability, connected availability may offer interpersonal affect regulation without the continuous phatic communication between partners, as described by connected presence research (Licoppe, 2004; Ling, 2016). Understanding differences in perceptions versus behaviors of constant availability may better explain these findings, and this difference is hinted at in this data with several negative effects of the media use, after controlling for connected availability.

Another reason for the difference is the unique nature of the attachment bond compared to the other types of social relationships typically investigated in studies of being always on. It has been empirically demonstrated that attachment is different than other forms of close relationships (Hazan & Zeifman, 1999). By limiting the investigation to reciprocal attachment bonds, I anticipated that the comfort and maintenance of connected availability would be most evident, and this was apparent because the felt security of the couples in this study was very high, to begin with. This sampling decision could have limited instances where the burden of being always available was observable because the security and closeness of the relationship was very high. Making oneself almost constantly available to an attachment figure is quite different than making oneself available to an entire social network. Trieu et al. (2019) documents differential effects for weak tie availability than strong tie availability. The stress of being almost

constantly connected to social relationships through Facebook and other social media may come from social pressure and the fear of missing out on content posted by friends (Fox & Moreland, 2015). Taken together, these findings and other literature suggest that connected availability is quite different than networked availability. Constant tethering to every Facebook friend or Instagram follower may have different effects than the findings in this study, as people are biopsychologically designed to keep such constant availability to only a small minority of close relationships.

A third explanation is that the negative consequences of being always available is an intrapersonal process rather than an interpersonal one. I studied connected availability as a dyadic phenomenon because the mutual availability of partners was repeatedly argued as one of the reasons for negative emotional experiences (Ling, 2012; 2016). Whereas the interpersonal perception of connected availability may improve affective well-being, the intrapersonal expectation of having to maintain availability to their partner may have negative consequences of SWB. Members of a dyad perceiving one another as always available is different than each member of that couple feeling responsible to remain always available to their partner. For instance, the expectation a person believes their partner has for maintaining availability via communication technologies was negatively associated with relational well-being (Hall & Baym, 2012). Therefore, the extent to which a person feels pressure to remaining available compared, as opposed to their partner's perception of their availability, may help to address the differences between this study and other work on availability. Again, the negative relationship between some parts of media multiplexity and SWB after controlling for connected availability show the potential such an effect to exist.

More broadly, the results for the interpersonal consequences of connected availability suggest that the growing body of research at the intersection of interpersonal communication and communication technologies needs to consider more closely dyadic processes. As interpersonal communication requires two people, dyadic understanding of communication technologies is vital to the understanding the phenomenon of interest in most of these studies. Liao, Bazarova, and Yuan, (2018) recently argued missing these dyadic processes can mask the unique contribution communication technologies to interpersonal communication. If communication technologies affect relationship processes, then dyadic uniqueness and reciprocity should be accounted for to reveal the true media effect. Although thinking and researching dyadically is complex, statisticians in this area are working to make this type of analysis accessible (Ackerman & Kenny, 2016). Importantly, studying communication technologies dyadically can reveal or overturn current theory regarding the effects of these technologies, as demonstrated in this dissertation.

Connected Availability as a Mediator

MMT was extended to SWB, but there was little understanding of why this use of multiple media for everyday communication would predict SWB. Based on the logic that media multiplexity predicted connected availability, I proposed that connected availability will mediate the relationship between the number of media, multimedia frequency, multimedia disclosure, and accessibility on SWB. Such an extension of media multiplexity helps to unpack a black box regarding what about media multiplexity having effects on people's well-being.

There was evidence that availability of close partners is a mediator of five aspects of media multiplexity: actor number of media, partner number of media, actor multimedia frequency, partner multimedia frequency, and actor accessibility. Affective well-being regulation

from media multiplexity through connected availability was a notably dyadic process. Actor and partner reports for number of media and multimedia frequency contributed to both a person and their partner's reports of connected availability. In turn, the person and their partner mutually influenced one another's experience of positive affect and negative affect (see Table 15).

Partners appear contingent upon one another for the frequency and intensity of their emotions.

Not only does a person's media use influence their own affective well-being through connected availability, it independently influences their partner's affective well-being as well.

Contributions to life satisfaction from media multiplexity through connected availability was an intrapersonal indirect effect. Although all five elements of media multiplexity predicted connected availability, a person's own report of connected availability tended to predict their evaluations of their life satisfaction. Therefore, I conclude that the dyadic process of media multiplexity influences a person's own life satisfaction primarily to the extent that it is associated with that person's perception of the constant availability of their partner.

This extension of MMT is important for understanding interpersonal communication in general because it calls for not only studying multiple media but also gives a framework for understanding the effects of communication across multiple media. Many scholars have called for studies on the integration of interpersonal communication across media or studying the interconnections of those media (Caughlin & Sharabi, 2013; Parks, 2017). Despite the recognition of the importance, there remained very few direct tests of why mixed-media interpersonal communication would have consequences for the health and wellness of a person and their relationships. By placing connected availability at the heart of the most comprehensive theory of mixed-media relationships, this work moves interpersonal communication in the direction of explaining the why spreading communication across multiple media matters.

Furthermore, establishing the mechanisms of media multiplexity calls out to interpersonal communication scholars that there are critical interpersonal communication processes being overlooked when the object of inquiry is interpersonal communication on one medium only. Understanding communication technologies is not a niche question for interpersonal communication scholars, these data suggest that it represents the everyday experience of interpersonal communication.

Despite the promise of connected availability as a mechanism explaining the consequences of media multiplexity, these data suggest that there are more mechanisms of media multiplexity at work than just connected availability. Connected availability did not explain all of the consequences of media multiplexity on SWB. In fact, all types of media multiplexity retained a direct effect on at least one type of SWB. This direct effect means that connected availability did not explain the entire relationship between media multiplexity and SWB. Other processes not captured by knowing partner is available for comfort or encouragement are also likely taking place simultaneously, such as developing intimacy, perceived partner responsiveness, engaging in conflict, or social comparison. Developing these additional mechanisms of how the use of communication technologies in close relationships impacts SWB is needed in future research.

Future Research

Connected availability needs theoretical development to determine the strength of this mechanism in explaining consequences of being almost constantly connected. There are several pathways moving forward for connected availability. First, connected availability needs to be mapped across the lifespan. I theorized that connected availability is a manifestation of the attachment behavioral system, and one benefit of theorizing about technology use from an attachment perspective is that behavior should track throughout a lifetime. Understanding the

lifespan development of connected availability could help to answer questions about teens and technology, such as why they tend to use mobile media at much larger rates than at other points in time (Ling, Bertel, & Sundsøy, 2012). It may also be interesting to map connected availability onto when teens receive their own mobile phone, personal computer, or other communication technology, as this could signify a functional change in attachment (boyd, 2014). The concept could, however, also explain the use of older adult populations too.

Second, connected availability was presumed as an attachment behavior, but this was not directly tested in this dissertation, as all romantic couples reported a reciprocal attachment bond. This assumption of the current theory needs testing to determine the boundaries of what types of relationships connected availability can offer comfort through. It is optimal for SWB to maintain connected availability with only a few select individuals, or can keeping up with many weak ties provide similar interpersonal emotion regulation (Ellison et al., 2014). Understanding networked availability with weak ties is a most pressing future direction because smartphone technologies are now seen as tools for building weak ties connections as well (Schrock, 2016). Testing these boundary conditions may help to explain why the results of this project differ from other work on suggesting that maintaining constant availability is exhausting and stressful (Fox & Moreland, 2015). In the end, thinking about the connectedness of multiple media into the interpersonal relationships could stand as a theoretical contrast to more individualistic networked approaches to digital media (Rainie & Wellman, 2012).

Third, connecting and contrasting the concept of connected availability to other work on attachment figure availability will help to integrate the idea into attachment theory. As mentioned throughout the theoretical explication of connected availability, numerous studies have found that interpersonal affect regulation can happen by having an attachment figure's

copresence and physical touch, symbolically represented through memory or photographs, as well as priming attachment security (Beckes & Coan, 2011; McGuire et al., 2018). Does the same hold true for having an attachment figure available through communication technologies? If so, this may provide theoretical explanations for studies finding that removal of smartphones and other communication technologies causes stress (Ling, 2012; Markowitz, Hancock, Bailenson, & Reeves, 2017). To move in this direction, measurement of connected availability needs improvement. Validated scales are necessary. One key aspect of this will be to clearly delineate connected availability from the perceived affordance of accessibility because these terms commonly are intermingled although they represent conceptually different psychological processes.

Future work needs to consider the role of time in media multiplexity. Scholars have measured media multiplexity with moment-to-moment, day-to-day (Ruppel, Burke, & Cherney, 2018), week-to-week (Taylor & Bazarova, 2018a), at the beginning and end of an academic semester (Haythornthwaite, 2001), in sixth month intervals (Dienlin et al., 2017), and cross-sectionally (Ledbetter et al., 2016). These different levels of measurement provide noticeably different results that have not been resolved. This raises questions about what and why does the integration of multiple media have different effects at different units of time. Perhaps talking to a partner via multiple media within an hour communicates differently than using multiple media for communication over the last six months, and these differences need to be understood.

Limitations

This study has several limitations related to the sampling strategy and study design. The romantic couples sampled reported a very high felt security in their relationships, and romantic couples who dropped out of the study were tended to report less felt security. Thus, completion

of the study was not at random, which means there was a selection bias in the study. The couples do not represent many long-term romantic attachment relationships, especially those with more uncertainty. Although efforts were made to reach a diverse sample, the sample was largely white, heterosexual, and educated couples. It is unclear how media multiplexity or connected availability may generalize to other populations. Additionally, the sample of this study was young-to-middle aged adult romantic couples, but most of the previous research and public concern about communication technologies relates to teens (Orben & Przybylski, 2019a). National samples find that people young-to-middle adulthood exhibit high levels of mobile phone and social media connectedness (Jiang, 2018), but these data are unable to answer questions about teens and technology.

The data are longitudinal, but lack evidence of causality because of limitations with survey design. It is possible that additional factors that were not captured through the ESM that were associated with the fluctuations in SWB. Mostly notably are the gaps when participants did not talk with their romantic partner in the last hour. Focusing on the dyad's media ecology overlooks a person's larger media ecology. Because I only sampled on communication with a romantic partner, it is unclear how the sample was communicating outside of the dyad. Most notably, in these data is the very small amount the social networking site use reported by participants, although it was my intention to capture this type of media use. There was little evidence that social networking sites were used for any interpersonal communication in cohabitating romantic relationships. Some argue that it is the communication outside of close relationships is the troubling aspect of digital media (Sbarra et al., 2019). Future work needs to study media multiplexity within a person's larger media ecology to understand the meaning of "*all available media*" (Haythornthwaite, 2005, p. 126, emphasis in original).

The intensive longitudinal methods come with an inherent disadvantage of survey fatigue. The use of ESM should help to reduce memory recall bias, but the number of surveys may have promoted individuals to report on less media to avoid having to answer additional questions (Boase & Ling, 2013). If sampling participants using ESM operated as any sort of intervention on SWB, then the assumptions of the growth curve model are violated (Kashy & Donnellan, 2012). ESM requires a delicate balance of sampling enough to capture meaningful changes but not sampling too often that it harms the quality of the data. Traces of technology could help remove some elements of this problem, but digital traces have their own limitations because researchers are largely at the mercy of technology companies for this type of data collection.

Conclusion

This dissertation investigated one of the largest concerns related to the high level of digital connection present in modern society: how does being constantly connected to the mobile phones and social media influence people's happiness? I addressed this question by taking a relational perspective (Taylor & Bazarova, 2018b). This project was motivated by the consistent research suggesting that it is social relationships on communication technologies that influence SWB. By combining media multiplexity theory and attachment theory, this study contributes to a growing body of research on communication technologies and SWB by (1) looking at interpersonal communication in long-term romantic relationships across the broader media landscape, rather than only focusing on one medium, (2) providing connected availability in romantic relationships as one mechanism for why the use of media might affect SWB, and (3) demonstrating that the momentary experience of SWB is interdependent upon the media use and perceived affordances of close partners.

The results of this dissertation show that the idea that using communication technologies either undermines or improves SWB is an artificial debate because there are both positive and negative ways that communication technologies are linked to SWB. In addition, the dyadic data analysis found that the affective well-being of an individual is not only determined by their own perception if their partner is immediately available, but also influenced by their partner's perception of connected availability. The always available nature of mixed-media relationships explains many of the positive consequences but none of negative consequences. Rather than undermining well-being, being always available to a partner appeared to improve positive and negative affect. The comfort received from having a close partner ready to respond via digital media represents a digital transformation of attachment processes.

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APPENDIX A

Study Preregistration

Posted: **January 25, 2019** at osf.io/4hw97

CONNECTED ROMANTIC RELATIONSHIPS

Preregistration

adapted from AsPredicted.org

PURPOSE

This study is about why the use of mobile and social media in close relationships impacts subjective well-being. A series of previous studies have consistently documented that the use of mobile and social media in close relationships predicts greater well-being (Burke & Kraut, 2016, Chan, 2015). Although this helps clarify the relationship between mobile and social media use and subjective well-being, this does not explain why these media matter for subjective well-being.

One mechanism explaining why mobile and social media influence well-being is the accessibility of others afforded by these media (Licoppe, 2004; Trieu et al., 2017). Despite the benefit of accessibility, relational partners often report increased stress-levels because of the burden of having to be always available to their intimate partners (Ling, 2018).\

The first goal of this project is to test *connected availability*, the degree of confidence a person has that their partner is always available to provide aid or support regardless of time or location constraints, as the mechanism explaining why the use of mobile and social media in close bonds can bolster subjective well-being. The second goal of this project is to understand the factors that contribute to the accessibility afforded by media. The third goal of this project is to test whether or not the demands of connected availability negatively impact the subjective well-being of a partner.

DATA COLLECTION

No data have been collected at this point in time.

HYPOTHESIS

H1: Media multiplexity is positively associated with subjective well-being.

H2: Media multiplexity is positively associated with connected availability.

H3: Accessibility is positively associated with connected availability.

H4: Connected availability is positively associated with subjective well-being and negatively associated with partner subjective well-being.

H5: Accessibility moderates the association between media multiplexity and connected availability, such that the positive association between media multiplexity and connected availability is strongest at higher levels of accessibility.

H6: Connected availability mediates the association between media multiplexity and subjective well-being.

H7: Accessibility moderates this mediating effect, such that the indirect effect is strongest at higher levels of accessibility.

RESEARCH QUESTIONS

RQ1: How much variance in accessibility is explained by media, after controlling individual and day of week variations?

RQ2: Which media are associated with the greatest accessibility?

DEPENDENT VARIABLES

Three key dependent variables in this study are related to subjective well-being: positive affect, negative affect, and life satisfaction. Felt security in the relationship is also included as an additional indicator of well-being.

- **Affect** will be measured with two questions, “How positive do you feel right now?” and “How negative do you feel right now?”, 1 = Not at all, 10 = Very much. Positive and negative affect will be treated as separate variables.
- **Life satisfaction** will be measured using one question, “How satisfied are you with your life right now?” on a 10 point Likert-Scale, 1 = Very dissatisfied, 10 = Very satisfied.
- **Felt security** will be measured using two questions “My partner loves me unconditionally” and “I know my partner is really committed to making our relationship work.” Responses for felt security will be solicited on a (1) strongly agree to (7) strongly disagree scale.

INDEPENDENT VARIABLES

- Media multiplexity is an aggregated construct representing different types of media use and communication over multiple media. Media multiplexity will be operationalized using self-report data. Participants will be asked to if they have used any of the following media with their partner in the last hour: (1) Face-to-face, (2) text messaging, (3) cellphone calls, (4) landline telephone calls, (5) desktop instant messaging, (6) email, (7) Snapchat, (8) Facebook, (9) Twitter, (10) Instagram, (11) mobile messaging apps (e.g., WhatsApp), (12) video chat, or (13) other media.
 - Number of media used in the last hour with partner
 - A total count of the number of media used from the previous list.
 - Frequency of media used in the last hour with partner
 - In the last hour, how much did you communicate with your partner using [medium]?. The scale is (1) a great deal to (5) not at all.
 - Responsiveness on each medium
 - When communicating via [medium] in the last hour, my partner responded to me right away. The scale is (1) strongly agree to (7) strongly disagree scale.
 - Perceived quality of communication across media with partner in the last hour. All questions are in reference to their communication with their partner.
 - “How satisfied are you with your communication via [medium] in the last hour?” (1 = extremely dissatisfied and 10 = extremely satisfied) and “How pleasant was your [medium] communication in the last hour?” (1 = very unpleasant to 10 = very pleasant).
- Connected availability will be measured using three questions representing that idea that they can contact their partner at any moment in time regardless of time or location constraints for support, encouragement, help, etc. The questions are “If I needed my partner right now, he or she would be available to help” and “At this moment, I know that my partner is available to offer me support” on a (1) strongly agree to (7) strongly disagree scale. The final question is “If you contacted your partner right now, what is the likelihood that your partner would immediately respond?” on a scale of (1) extremely likely to (7) extremely unlikely.
- Accessibility will be measured using the question “In the last hour, it was easy for me to reach my partner through [name of medium]” (1) strongly agree to (7) strongly disagree in the ESM data. If they did not use that medium to communicate, the question was phrase “In the last hour, it would have been easy for me to reach my partner.” To gather between-subject reports on all media, we will ask in the pre-survey for participants to report on accessibility using three 3 Likert-scale (1 = strongly disagree and 7 = strongly agree), “My partner is always available via [medium],” “My partner is easy to reach through medium ,” and “My partner responds right way to [medium].”

CONTROL VARIABLES

Age of participants, length of relationship in years, gender, physical presence of partner, and attachment style (ECR-Short Version, Wei, Russell, Mallinckrodt, & Vogel, 2007) are included in the survey data as potential control variables.

STUDY SAMPLE

sample size

Based on a power analysis using APIM Power, we will need 123 dyads to complete our study to detect an effect of .15 at the between-subjects level with .3 correlation between actor and partners. We will recruit 130 dyads.

participants

We will recruit a community sample of dyads to participate in the study. We will recruit participants through online recruitment, flyers, and snowball sampling. Couples will be screened based on the WHOTO scale, which is designed to determine attachment figures (Hazan & Zeifman, 1999). If couples do not report a reciprocal attachment bond, then we will exclude them from our final sample.

Two additional factors will be considered when recruiting dyads: the length of the relationship and the age of the participants. We hope to get a range of couples who have been together for less than 5 years, 5 to 15 years, and 15+ years. We aim to have a diverse age sample in our study. Same-sex and opposite-sex couples are invited for participation.

STUDY DESIGN

This study is a dyadic experience sampling study (ESM). Both members of the dyad will do a pre-study survey, 7 days of ESM with 5 surveys per day, and a post-study. Participants cannot advance to the ESM until their partner has also completed the pre-study. Both members of the dyad will report subjective well-being using the ESM and on communication that has happened in with their partner in the last hour. The ESM will consist of 7 days with 5 assessments per day. The 5 ESM surveys will happen at random intervals from 8 AM to 10 PM with a minimum of 60 minutes between each ping.

DATA ANALYSIS PLAN

Before data analysis, each of the variables be subjected to scale analysis (e.g., alpha, CFA). We will adapt composite variables according to these descriptive analyses.

To test hypotheses, H1 to H5, we will use multilevel modeling to control for account for non-independence in the data structure. There are four levels in this data, Level 1 = momentary assessment, Level 2 = day of the week, Level 3 = individual, and Level 4 = dyad. We will use this data structure to conduct a growth curve model.

For H6 and H7, we will use multilevel structural equation modeling to test for the moderated mediation and the indirect effect between media multiplexity and subjective well-being.

For the RQ, we will conduct an MLM to determine what factors, dyadic, individual, medium, or temporal factors, determine accessibility. Post-hoc Tukey tests will be used to test for significant differences between media. Time of day and day of the week will be included in the model to test fluctuations in the temporality of accessibility within-subjects.

We will additional exploratory analysis on predicting media multiplexity in close relationships across time.

ANYTHING ELSE

data exclusions, variables collected for exploratory purposes, unusual analyses planned

Variables collected for exploratory purposes: relational closeness, perceived partner responsiveness, intimacy of self-disclosure, and relationship satisfaction.

APPENDIX B

Survey Materials

Presurvey

WHOTO

Below you are asked to list people who are significant in your life.

Rather than providing names, please write your relationship with this person (e.g., spouse, mother, boyfriend, sister). If you write in more than one person, list them in order of significance starting with the most significant.

Note:

- 1. Please do not use terms like "family" or "friends" that refer to more than one person.*
- 2. If you are including more than one "friend," "sister," etc. please specify which individual you are referring to (i.e., friend1, friend2, friend3).*
- 3. There is no need to fill in all of the boxes.*

1. Person(s) you make sure to see or talk to frequently.
2. Person(s) you seek out when worried or upset.
3. Person(s) whose absence makes your feel like something is not quite right.
4. Person(s) you know will always be there for you.

Affective Well-Being (PANAS, Watson, Clark, & Tellegen, 1988)

Indicate the extent you have felt this way over the past week. (1 = very slightly or not at all, 5 = extremely)

Positive Affect

1. Interested
2. Excited
3. Strong
4. Enthusiastic
5. Proud
6. Alert
7. Inspired
8. Determined
9. Attentive
10. Active

Negative Affect

11. Distressed
12. Upset

- 13. Guilty
- 14. Scared
- 15. Hostile
- 16. Irritable
- 17. Ashamed
- 18. Nervous
- 19. Jittery
- 20. Afraid

Life Satisfaction (Satisfaction with Life Scale, Diener et al., 1985)

Below are five statements that you may agree or disagree with. Using the scale below, indicate your agreement with each item by filling in the appropriate bubble after that item. Please be open and honest in your response. (1 = strongly disagree, 7 = strongly agree).

- 1. In most ways my life is close to my ideal.
- 2. The conditions of my life are excellent.
- 3. I am satisfied with my life.
- 4. So far I have gotten the important things I want in life.
- 5. If I could live my life over, I would change almost nothing.

Felt Security (Marigold, Holmes, & Ross, 2007)

Please consider how you feel about your relationship with your romantic partner when you answer the following questions. (1 = completely disagree, 7 = completely agree)

- 1. I am confident that my partner will always want to look beyond my fault and see the best in me.
- 2. My partner loves and accepts me unconditionally.
- 3. I have found that my partner is a thoroughly dependable person, especially when it comes to things that are important.
- 4. Though times may change, and the future is uncertain, I know my partner will always be ready and willing to offer me strength and support.
- 5. Based on my past experience I cannot, with complete confidence, rely on my partner to keep promises made to me. *reverse coded
- 6. I am never concerned that unpredictable conflicts and serious tensions may damage our relationships because I know we can weather any storm.
- 7. I feel close to my partner.
- 8. My partner and I are strongly connected to each other.
- 9. My partner knows me extremely well.
- 10. I feel very much understood by my partner.
- 11. I am confident my partner will always want to stay in our relationship
- 12. Sometimes I wonder whether my partner is really committed to making our relationship work. *reverse coded

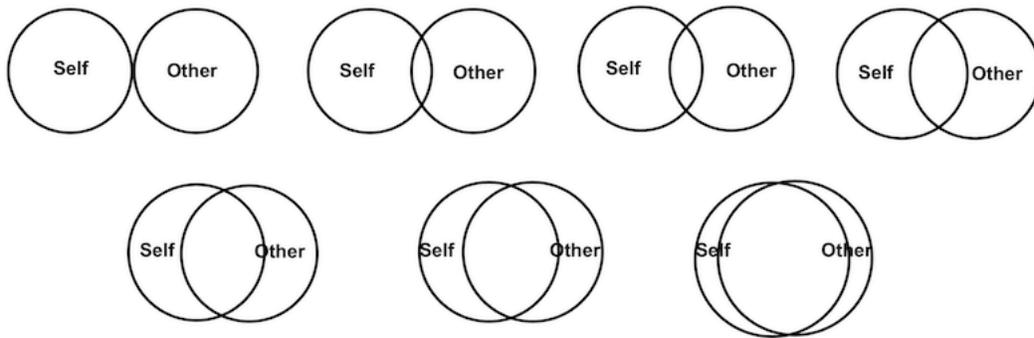
Relationship Satisfaction (Adapted from Norton, 1983)

Indicate how much you agree with the following statements about your relationships with your romantic partner. (1 = strongly disagree, 7 = strongly agree).

1. We have a good relationship.
2. My relationship with my partner is very stable.
3. Our relationship is strong.
4. My relationship with my partner makes me happy.
5. I really feel like part of a team with my partner.
6. Everything considered, I am happy with my relationship with my partner.

Relational Closeness (IOS, Aron et al., 1992)

Please indicate which of the following pictures best describes your current relationship with your romantic partner.



Accessibility (Trieu et al., 2019)

Answer the following regarding your [name of medium] with your partner. (1 = strongly disagree to 7 = strongly agree). *This item was asked for 10 different media: (1) text messaging, (2) face-to-face, (3) cellphone calls, (4) email, (5) landline telephone, (6) desktop instant messaging, (7) social networking sites, (8) Snapchat, (9) mobile messaging apps, and (10) video chat.*

1. My partner is always available via [name of medium].
2. My partner is easy to reach through [name of medium].
3. My partner responds right away to [name of medium].

Experience Sampling Surveys

Subjective Well-Being (Choi & Bazarova, 2017)

1. How positive do you feel right now? (1 = not at all positive to 10 = extremely positive)
2. How negative do you feel right now? (1 = not at all negative to 10 = extremely negative)

3. How satisfied are you with your life right now? (1 = not at all satisfied to 10 = extremely satisfied)

Connected Availability (Self-Developed)

4. If I needed my partner right now, he or she would be available to help. (1 = strongly disagree to 7 = strongly agree)
5. At this moment, I know that my partner is available to offer me support. (1 = strongly disagree to 7 = strongly agree)
6. If you contacted your partner right now, what is the likelihood that your partner would immediately respond? (1 = extremely unlikely to 7 = extremely likely).

Felt Security (Marigold et al., 2007)

7. My partner loves me unconditionally. (1 = strongly disagree to 7 = strongly agree)
8. I know my partner is really committed to making our relationship work. (1 = strongly disagree to 7 = strongly agree)

Number of Media (Taylor & Bazarova, 2018b)

9. Did you communicate with your romantic partner in the last hour? (1 = Yes, 2 = No)
10. Where have you communicated with your romantic partner in the last hour? *Check all that apply.*
 - a. Face-to-Face
 - b. Text Messaging
 - c. Cellphone Calls
 - d. Desktop Instant Messaging
 - e. Email
 - f. Snapchat
 - g. Facebook
 - h. Twitter
 - i. Instagram
 - j. Mobile Messaging Apps
 - k. Video Chat
 - l. Other media not listed above

Answer the following questions about your [name of medium] communication with your partner in the last hour.

Multimedia Frequency (Taylor & Bazarova, 2018b)

11. In the last hour, how much did you communicate with your partner via [name of medium]? (1 = Not at all to 5 = A great deal)

Accessibility (Trieu et al., 2019)

12. In the last hour, it was easy for me to reach my partner through [name of medium] (1 = Strongly Disagree to 7 = Strongly Agree)

Multimedia Disclosure (1 = Not at all to 10 = Very Much) (Taylor & Bazarova, 2018b)

13. When communicating via [name of medium] with my partner in the last hour, I shared...
(1 = very little to 10 = a great deal).

Post-Study

Attachment Figure Availability (Self-Developed)

Please indicate how often you have felt or thought a certain way regarding your relationship. (1 = never, 5 = Always)

1. My partner is available to offer me support when I need it.
2. My partner is available to help me during stressful situations.
3. My partner is available to help me reach my goals.
4. My partner is available to provide comfort.
5. I am available to offer support to my partner when he or she needs it.
6. I am available to help my partner when he or she is stressed.
7. I am available to help my partner reach his or her goals.
8. I am available to provide comfort to my partner.

Perceived Stress (Cohen, Kamarck & Mermelstein, 1983)

The questions in this section ask about your feelings and thoughts during the last week. In each case, you will be asked to indicate by marking how often you felt or thought a certain way. (1 = Never, 5 = Very Often)

1. In the last week, how often have you been upset because of something that happened unexpectedly?
2. In the last week, how often have you felt that you were unable to control the important things in your life?
3. In the last week, how often have you felt nervous and "stressed"?
4. In the last week, how often have you felt confident about your ability to handle your personal problems?
5. In the last week, how often have you felt that things were going your way?
6. In the last week, how often have you found that you could not cope with all of the things you had to do?
7. In the last week, how often have you been able to control irritations in your life?
8. In the last week, how often have you felt that you were on top of things?
9. In the last week, how often have you been angered because of things that were outside of your control?
10. In the last week, how often have you felt difficulties were piling up so high that you could not overcome them?

Holmes-Rahe Life Stressor Inventory

Please check the box next to any of the following events that happened to you in the **past week**.
(1 = Yes, 2 = No)

1. Death of spouse
2. Divorce
3. Marital Separation from mate
4. Detention in jail or other institution
5. Death of a close family member
6. Major personal injury or illness
7. Marriage
8. Being fired at work
9. Marital reconciliation with mate
10. Retirement from work
11. Major change in the health or behavior of a family member
12. Pregnancy
13. Sexual Difficulties
14. Gaining a new family member (i.e. ... birth, adoption, older adult moving in, etc.)
15. Major business readjustment
16. Major change in financial state (i.e. ... a lot worse or better off than usual)
17. Death of a close friend
18. Changing to a different line of work
19. Major change in the number of arguments w/spouse (i.e. ... either a lot more or a lot less than usual regarding child rearing, personal habits, etc.)
20. Taking on a mortgage (for home, business, etc. ...)
21. Foreclosure on a mortgage or loan
22. Major change in responsibilities at work (i.e. promotion, demotion, etc.)
23. Son or daughter leaving home (marriage, attending college, joined mil.
24. In-law troubles
25. Outstanding personal achievement
26. Spouse beginning or ceasing work outside the home
27. Beginning or ceasing formal schooling
28. Major change in living condition (new home, remodeling, deterioration of neighborhood or home etc.)
29. Revision of personal habits (dress manners, associations, quitting smoking)
30. Troubles with the boss
31. Major changes in working hours or conditions
32. Changes in residence
33. Changing to a new school
34. Major change in usual type and/or amount of recreation
35. Major change in church activity (i.e. ... a lot more or less than usual)
36. Major change in social activities (clubs, movies, visiting, etc.)
37. Taking on a loan (car, tv, freezer, etc.)
38. Major change in sleeping habits (a lot more or a lot less than usual)
39. Major change in number of family get-togethers

40. Major change in eating habits (a lot more or less food intake, or very different meal hours or surroundings)
41. Vacation
42. Major holidays
43. Minor violations of the law (traffic tickets, jaywalking, disturbing the peace, etc.)

APPENDIX C

Code for Indistinguishable Dyadic Growth Curve Model

*Covariance Matrix from Kashy et al. (2008)

```
DATA CovMatrix;
INPUT PARM ROW COL VALUE;
DATALINES;
1 1 1 1
1 2 2 1
2 1 2 1
3 3 3 1
3 4 4 1
4 3 4 1
5 1 3 1
5 2 4 1
6 1 4 1
6 2 3 1
;
```

*time only model;

*model 1;

```
PROC MIXED COVTEST METHOD = ML DATA = esm2;
CLASS dyad DAY SIG;
MODEL outcome = time / SOLUTION DDFM=SATTERTH;
RANDOM p1 p2 p1*time p2*time / G SUBJECT=dyad TYPE=LIN(6)
LDATA = Covmatrix;
REPEATED / TYPE=CS SUBJECT=dyad*DAY*SIG;
RUN;
```

*number of media;

*Model 2;

```
PROC MIXED COVTEST METHOD = ML DATA = esm2;
CLASS dyad DAY SIG number (ref ="0") Partnumber (ref ="0");
MODEL outcome = time age number Partnumber / SOLUTION DDFM=SATTERTH;
RANDOM p1 p2 p1*time p2*time / G SUBJECT=dyad TYPE=LIN(6)
LDATA = Covmatrix;
REPEATED / TYPE=CS SUBJECT=dyad*DAY*SIG;
LSMEANS num/pdiff cl;
LSMEANS Partnum/pdiff cl;
RUN;
```

*Media Multiplexity;

*Model 3;

```
PROC MIXED COVTEST METHOD = ML DATA = esm2;
CLASS dyad DAY SIG number_control (ref="1") Partnumber_control (ref="1");
MODEL outcome = time age freq_ctr Partfreq_ctr easy_ctr Parteasy_ctr dis
Partdis number_control Partnumber_control / SOLUTION DDFM=SATTERTH;
RANDOM p1 p2 p1*time p2*time / G SUBJECT=dyad TYPE=LIN(6)
LDATA = Covmatrix;
REPEATED / TYPE=CS SUBJECT=dyad*DAY*SIG;
RUN;
```

```

*number + connected availability;
*Model 4;
PROC MIXED COVTEST METHOD = ML DATA = esm2;
CLASS dyad DAY SIG number (ref ="0") Partnumber (ref ="0");
MODEL outcome = time age number Partnumber
connect_ctr Partconnect_ctr / SOLUTION DDFM=SATTERTH;
RANDOM p1 p2 p1*time p2*time / G SUBJECT=dyad TYPE=LIN(6)
LDATA = Covmatrix;
REPEATED / TYPE=CS SUBJECT=dyad*DAY*SIG;
RUN;

```

```

*media multiplexity + connected availability;
*Model 5;
PROC MIXED COVTEST METHOD = ML DATA = esm2;
CLASS dyad DAY SIG number_control (ref="1") Partnumber_control (ref="1");
MODEL outcome = time age freq_ctr Partfreq_ctr easy_ctr Parteasy_ctr dis_ctr
Partdis_ctr connect_ctr Partconnect_ctr number_control Partnumber_control/
SOLUTION DDFM=SATTERTH;
RANDOM p1 p2 p1*time p2*time / G SUBJECT=dyad TYPE=LIN(6)
LDATA = Covmatrix;
REPEATED / TYPE=CS SUBJECT=dyad*DAY*SIG;
RUN;

```

APPENDIX D

Example Data Structure for Indistinguished Dyadic Growth Curve Model

dyad	partner	P1	P2	time	SIG	DAY	connect	Part_connect	number	Part_number
1	1	1	0	0	1	1	6.3	5.4	1	1
1	1	1	0	1	2	1	5.8	5.8	2	1
1	1	1	0	2	3	1	6.8	6.3	0	2
1	1	1	0	3	4	1	6.4	4.5	1	0
1	1	1	0	4	5	1	7.0	6.5	1	1
...
1	1	1	0	0	1	7	5.8	4.5	0	0
1	1	1	0	1	2	7	5.5	6.3	1	2
1	1	1	0	2	3	7	6.3	6.8	1	0
1	1	1	0	3	4	7	7.0	7.0	1	1
1	1	1	0	4	5	7	6.5	7.0	2	1
...
1	2	0	1	0	1	1	5.4	6.3	1	1
1	2	0	1	1	2	1	5.8	5.8	1	2
1	2	0	1	2	3	1	6.3	6.8	2	0
1	2	0	1	3	4	1	4.5	6.4	0	1
1	2	0	1	4	5	1	6.5	7.0	1	1
...
1	2	0	1	0	1	7	4.5	5.8	0	0
1	2	0	1	1	2	7	6.3	5.5	2	1
1	2	0	1	2	3	7	6.8	6.3	0	1
1	2	0	1	3	4	7	7.0	7.0	1	1
1	2	0	1	4	5	7	7.0	6.5	1	2