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PRETEENS' ENGAGEMENT WITH INTERACTIVE TECHNOLOGY: IMPLICATIONS FOR FACE-TO-FACE INTERACTIONS AND SOCIAL DISTANCING

by

MAHYA RAHIMIAN MASHHADI

DISSERTATION

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Approved By:

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Advisor   Date

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DEDICATION

To my loving husband, Sina, for his endless support that made this work possible, and to my parents, Maryam and Hamid, who have been a constant source of encouragement and wisdom.

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CHAPTER 1: INTRODUCTION

Sally is a 6th grader. When she returns home from school, she eats snacks in the company of the "Pretty Little Liars" series on TV. Next, she connects with her laptop for a couple of hours to do schoolwork and play games. Sally keeps the hyperconnectivity going even when her family takes a visit to their friend's house. She hardly looks up to say hi to the host, and doesn't play with their same-aged daughter, because she is immersed in the world she created in "Minecraft".

What do you think of Sally's competency in initiating spontaneous face-to-face interactions? What effects will frequent technology use have on Sally's social skills in 10 years' time? Will she be able to hold smooth and reciprocal conversations in unstructured (peer-peer) or formal (e.g., job interview) settings?

From a socioemotional perspective, extensive exposure to technology is concerning because it may imply that children are missing out on other potentially developmentally important opportunities, such as engaging in face-to-face interactions (Putnam, 1995a). According to the childhood social development literature, social competencies are learned in the context of in-person interactions, during which one has to practice skills such as perspective taking, cooperation, empathy, and self-regulation (Eisenberg, Eggum, & Edwards, 2010; Whiting & Whiting, 1973; Barber & Olsen, 1997). Today's technologies seem to be limiting these opportunities by occupying most of children's time, which can negatively affect their social skills. Engagement with technology may also have situational social consequences that are not yet evident.

In a 2008 report by the Pew Research Center, American households with more communication technologies had fewer dinners together as a family, and were less satisfied with their leisure time (Kennedy, Smith, Wells, & Wellman, 2008). The same study found that these families were networked through their gadgets and seemed to be communicating in a *new* way. While technology-mediated communications appear to be replacing face-to-face communications

with no harmful consequences, new research shows otherwise. Scarcity of face-to-face interactions, due to increased use of screens, may in fact alter our genetic expression and take a toll on our "biological capacity to connect with other people" (Fredrickson, 2013, p. SR14). The concern about technology's effect on the proper social development of children has also been echoed by teachers across all grades. A majority of teachers believe that entertainment media has increased children's engagement in anti-social behaviors such as hitting or yelling, and has not served to promote their prosocial behaviors (Rideout, 2012). Internet experts and stakeholders have also voiced their concern, arguing that technology use has led to loss of patience and an exceeding need for instant gratification in today's youth (Anderson & Rainie, 2012). These concerns and findings highlight the importance of studying the implications of technology use for children's socioemotional development, specifically understanding whether and how interactive technologies are responsible for the deficiencies voiced by parents and teachers.

To my knowledge, researchers studying the repercussions of technology consumption have primarily centered on specific entertainment activities such as video game playing, and harmful online practices such as sexting and cyber-bullying. Less attention has been given to consequences of technology use for children's willingness to interact with others in a face-to-face manner. Additionally, while preteens spend significant portion of their time with technology, empirical research investing the impact of technology on this population is relatively scarce. The present research will address these gaps by examining: 1) familial and environmental factors that are associated with the amount of preteens' technology use and 2) the extent to which the amount of preteens' technology use is associated with the amount of their face-to-face interactions. Furthermore, using an experimental design, this study will investigate the situational social consequences of engagement with interactive devices. Specifically, it will explore the hypothesis

that using an interactive device brings about a sense of self-sufficiency in the user which can lead to feelings of social distancing, and hence reduce willingness to engage in face-to-face interactions.

Definition of Key Concepts

In this study, the terms "interactive technology/ies" are used to refer to devices that work on computer-based systems and which respond to users' commands by showing text, image, audio, or video. Hence, they are differentiated from devices that broadcast information, such as television and radio. Furthermore, among the range of interactive technologies, the study's focus is on the devices that have numerous and diverse functions (for instance, ability to connect to internet, take pictures, work with apps, accept user-generated content, etc.). Examples include smartphones, tablets, laptops, desktop computers, and small personal computers such as iPod touch. When referring to a wider range of devices, not just the ones that are interactive or multifunctional, the terms "media technology/ies" and "technology/ies" are used. In addition to the devices mentioned above, this category includes television, radio, and music playing devices (i.e., MP3 players).

CHAPTER 2: LITERATURE REVIEW

Technology Use among Preteens

Every day, American 'tweens (ages 8-12) spend about 6 hours with entertainment media (Rideout, 2015). This is close to the daily amount of time that most adults spend at work, except that media use happens *seven* days a week. According to Rideout (2015), Television sets, video game consoles (such as Xbox or Wii), tablets, smartphones, and laptop computers are respectively the top five devices available in at least 73% of tweens' homes. In addition to the technologies available to children at home, many children now have their own personal gadgets. On a national level, 53% of 'tweens have their own tablet and 24% have their own smartphone (Rideout, 2015). Also popular are hand-held video game devices, which are personally owned by 42% of 'tweens, and 32% of teens (Rideout, 2015). Interestingly, in a study of middle-class families, even some three-year olds (four in a sample of 101) had their own cellphone (Vittrup, Snide, Rose, & Rippy, 2014).

An in-depth analysis of 'tweens' media activities indicates that the majority of their media time is dedicated to personal entertainment, rather than social communication. Specifically, four and half hours of tweens' daily media time goes into watching television content, playing electronic games, and listening to music, whereas only 22 minutes is spent social networking and video chatting (Rideout, 2015).

This ratio changes slightly as children grow up to become teenagers, when their social communication time almost triples that of 'tweens (Rideout, 2015). Furthermore, although average scores are helpful in providing a quick window into technology use patterns, they fail to capture the diversity of 'tweens' technology and media diets. Rideout (2015) identified six different types of media users among 'tweens: light users (27%), readers of print and online material (11%), mobile gamers (those whose gaming happens on smartphone, tablet or iPod touch; 14%), heavy

viewers (10%), video gamers (those whose gaming takes place on handheld or console devices; 23%), and social networkers (15%). Except for readers, television and video viewing still dominate media time of all categories of preteen users. Also, in general, social networkers spend the most time with media (almost 10 hours a day), followed by video gamers (almost 8 hours) and heavy viewers (slightly over 7 hours). These numbers indicate that at least a third of American 'tweens are heavy technology users (spending about 7 or 8 hours a day with technology), but their online interactions are not social, suggesting that they may be at risk of impaired social skills due to reduced opportunities for social interaction - online and offline.

Factors Affecting Amount of Technology Use among Preteens

Prior research has identified a number of factors that impact amount of technology use, including the user's personality (Amichai-Hamburger, & Ben-Artzi, 2003), parents' attitudes and rules toward technology use (Vandewater, Park, Huang, & Wartella, 2005), socioeconomic status (Rideout, Foehr, & Roberts, 2010), and race/ethnicity (Rideout, 2015). The present research focuses on relatively less-explored but quite important factors, namely the number of siblings a child has, and availability of technology at home. Together, these factors helps us better understand the familial and environmental factors that are likely to be linked with high technology use and can help families develop healthier technology habits that are supportive of the family's connectedness, and children's development of social competencies.

Number of siblings. Very few studies have examined how the presence of siblings may impact children's media technology habits. Early research on this topic has found that presence of a younger sibling encourages educational television viewing in 3-7-year olds, whereas the presence of an older sibling discourages it (Pinon, Huston, & Wright, 1989). More recently, researchers studying 5- to 6-year-olds and 10- to 12-year-olds reported greater television viewing among only-child teens, compared to teens in multiple-child families (Bagley, Salmon, & Crawford, 2006). A

similar result was observed by Davies and Gentile (2012), who demonstrated that teens' engagement in activities other than screen media is significantly higher if they have siblings. The media diet of families with siblings was also healthier (i.e., had more educational content). Contrasting results were reported in a study of Australian early adolescents. In this study, preteens who had siblings were significantly more likely to watch more than 2 hours of television per day (Hardy et al., 2006) compared to preteens without siblings. The present study will address these inconsistencies by exploring whether and how having siblings relates to the amount of time that children engage with technology. This endeavor will increase parents understanding of factors that are associated with technology use and can help them set media rules that are supportive of their families' connectedness and warmth.

Availability of technology at home. In order to understand how availability of technology at home may be related to children's technology use, it helps to take a holistic approach. More technology availability at home, even if not personally owned by the preteen child, signals that the family members are heavy technology users. This can mean many things. First, according to Bandura's social learning theory, family members' immersion in media technologies may increase children's engagement with these devices through modelling (Bandura, 1971). Children copy their caregivers' behaviors from a very early age and continue to do so as they grow up. With the escalating integration of technology with parents' and older siblings' work, education, entertainment, and social communications, screen-free time has become quite scarce among older family members. According to Bandura, families' greater involvement in technology may send children the message that it is acceptable to be engaged with technology day and night.

Second, parents and older siblings' technology use implies that engagement with technology is an adult behavior. This is especially meaningful for preteens who are at a

developmental point when taking adult roles becomes significantly salient and attractive. For them, spending time with a tablet can take them one step closer to adulthood.

Lastly, households in which family members are preoccupied with media technologies, opportunity for social interaction with parents and siblings is reduced. Reduced opportunity for social interactions may encourage children to gravitate towards technology to keep themselves busy and entertained. In fact, several studies have demonstrated a relationship between social isolation and increased technology use (e.g., Morahan-Martin & Schumacher, 2003; Amichai-Hamburger, & Ben-Artzi, 2003; Caplan, 2006; Yao, & Zhong, 2014). Also, recent studies have found a high correlation between the amount of time parents spend on media and their children's media use (Vittrup et al., 2014; Lauricella, Wartella, & Rideout, 2014). Although these correlational findings do not indicate causality, they provide evidence that technology use in the family environment as a whole relates to children's screen time.

The Importance of Face-To-Face Interactions for Children's Socioemotional Development

With the proliferation of technology-mediated interactions, some argue that face-to-face interactions may not be as vital for today's generation as they were in the past. These individuals believe that in a world where technology is so tightly linked to people's daily life, being technologically literate is more important than having excellent face-to-face communication skills. The present study argues against this, as face-to-face interactions are highly related to children's social competencies. Although it is not clear whether face-to-face interactions impact social skills in a causal manner, the literature on social skills development suggests that face-to-face interactions create the building block, or foundation for, the development of social skills (Tronick, Brazelton, & Als, 1978). Below is a brief chronological review of this literature, starting from infancy.

From the very first months of life, engagement in face-to-face interactions facilitate social communication between infants and their caregivers. Exposure to the human face elicits three major behaviors in infants (looking, smiling, and vocalizing, Wolf, 1969; Fogel et al., 1997; Hsu, Fogel, Messinger, 2001), all of which strengthen the emerging infant-caregiver bond. As evident from early research on this topic, the degree to which the infant and the parent are able to maintain dyadic coordination on various levels of engagement (e.g., gaze patterns, emotional expressions, vocalizations) is tightly related to infants' acquisition of social skills and conventional forms of communication (Brazelton, Koslowski, & Main, 1974; Csibra & Gergely, 2006; Feldman, 2012; Guellai & Streri, 2011; Schaffer, Collis, & Parson, 1977; Stem, 1985; Tronick, 1980; Tronick, Brazelton, & Als, 1978).

These findings also imply that infant-parent interactions that are largely unsynchronized or which undergo many interruptions could negatively impact socioemotional development. Past research has identified some factors that may disrupt early interactions; for instance, chronic caregiver mental health problems (e.g., depression) or difficult child temperament (Cohn, Campbell, Matias, & Hopkins, 1990; Cohn et al., 1986; Feldman, Greenbaum, & Erlich, 1997). With the introduction of television into homes, researchers started to explore whether background television or the content of television programming disrupts parent-child interactions. Research on background television demonstrates that quality and quantity of parent-child interaction is diminished when the television is on, even if nobody is watching it (Kirkorian, Pempek, Murphy, Schmidt, & Anderson, 2009; Vandewater, Bicham, & Lee, 2006). This is the case even when the television content is infant-directed (Pempek, Demers, Hanson, Kirkorian, & Anderson, 2011).

Advancements in technology have introduced new distractions and interruptions for parent-child interactions, such as smartphones and tablets. Alarmingly, technology users (including mothers) are so accustomed to using their cellphones that they fail to realize how this

seemingly harmless behavior could spoil the interactive synchrony they are able to achieve with their child. Results of a recent study, conducted on rodents, indicates that pups who experienced interrupted and unpredictable maternal care early in life were not able to enjoy pleasurable sensations in adolescence, which made them prone to depression (Molet et al., 2016). The authors extended their research to the human domain, and warned mothers to avoid using their cellphones when caring for infants, noting that a simple text conversation or phone call could cause a disconnection, and send a message of parental "unreliability" to the child ("Put the cellphone away", 2016).

Although engaging in face-to-face interactions with parents affords infants and toddlers many opportunities for learning social skills (see Parke & O'Neil, 2000), peer socialization becomes an additional important learning context for children during the preschool and school years (see Rubin, Bukowski, & Parker, 1998). Direct social interactions with peers enable, if not compel, children to take others' perspectives (Chalmers & Townsend, 1990; Krevans & Gibbs, 1996) - a skill that is critical for emergence of prosocial behaviors (Eisenberg & Morris, 2004; Eisenberg & Miller, 1987). Face-to-face interactions with peers also provide children with opportunities to practice mutual sharing, negotiation, and comforting behaviors (Grusec, Davidov, & Lundell, 2002). The importance of practice was elucidated in a study by Peterson (1983) which reported that children who received training in specific helping behaviors were more helpful with others than their non-trained counterparts in the control group. Younger siblings also provide a context for children's practicing of positive social behaviors. For instance, in one study, children who had the responsibility of taking care of younger siblings exhibited a greater frequency of prosocial behaviors with peers (Whiting & Whiting, 1973). These findings highlight the importance of engaging in direct face-to-face interactions with family and peers to develop and practice more advanced social competencies.

Another important byproduct of engaging in face-to-face interactions with others is learning about and understanding the nonverbal communicative signals of others, which is a critical social skill. Social information is not always communicated through language, therefore the ability to decode others' nonverbal cues, such as facial expressions, direction of gaze, tone of voice, and physical distance is extremely important for establishing and maintaining effective human interactions (Knapp & Hall, 2010). People who are better in reading others' nonverbal social and emotional cues often develop superior social skills and are more competent with social relationships (Blakemore, 2003; Bosacki & Astington, 1999).

Today's computer-mediated communications fail to provide children with the opportunity to engage in direct social interactions with others, which can limit their ability to identify and respond to nonverbal cues appropriately. In fact, a recent study showed that preteens who stayed screen-free for five days at an educational camp had higher nonverbal emotion-cue recognition than children who had normal (usual) screen exposure (Uhls et al., 2014). Together these studies suggest that engaging in face-to-face interactions is important for the proper development of interpersonal skills throughout childhood and the preteen years. They also imply that use of interactive technologies may create disruptions in face-to-face interactions and may limit children's opportunities to engage in these interactions, which can adversely affect children's social development. The next section reviews the association between technology use and face-to-face interactions in more detail.

Technology Use and Reduced Time in Face-to-Face Interactions

Since the advent of media technologies, there has been a heated debate over whether the amount of time children spend using these devices displaces other important activities. Several studies support this claim, showing that increased interaction with digital devices reduces time spent in imaginative play (e.g., Calvert, 2015; van der Voort & Valkenburg, 1994), physical

activity (e.g., Babey, Haster, & Wolstein, 2013; Cox et al., 2012), and sleep (e.g., Adam, Snell, & Pendry, 2007). However, perhaps one of the most common concerns is whether engagement with technologies displaces children from engaging in direct face-to-face interactions with others (see Bindley, 2011; Giedd, 2012; Turkle, 2011).

The first theorist to propose that media technologies negatively impact social connectedness through a time displacement process (i.e., displacement hypothesis) was Robert Putnam. He blamed television for the significant decline in America's social capital (defined as features of social life that help individuals effectively reach their objectives; Putnam, 1995a, 1995b). In his view, television privatizes and individualizes people's leisure time, causing a disruption in social-capital formation (Putnam, 1995b).

Even though Putnam's displacement hypothesis was initiated with an emphasis on television, researchers soon expanded it to other forms of technological advancements. Kraut and colleagues (1998) examined whether the internet had a similar effect by investigating changes in the social involvement of U.S. families during their first and second years on-line. Even though the participants in their sample used the internet mainly for communication purposes, researchers still observed negative effects of internet use on the participants' social interactions with family members, and their social network size.

A similar pattern of results was observed in another study which reported that more time spent on the internet was associated with less time spent with family and friends (whether in-person or talking on the phone), and less engagement in social events outside of home (Nie & Erbring, 2000). More recently, investigators report that engaging in activities such as online video game playing is correlated with smaller offline social circles and lower-quality social interactions (Kowert, Domahidi, Festl, & Quandt, 2014).

Researchers on the other side of the debate argue that interactive technologies, and internet specifically, have improved social connections (e.g., Antheunis, Schouten, & Krahmer, 2014; Ducheneaut, & Moore, 2005; Koutamanis, Vossen, Peter, & Valkenburg, 2013; Valkenburg & Peter, 2007a). In fact, they argue that many adolescents' primary motivation for going (and being) online is to maintain and extend their social contacts (Brandtzæg, Heim, & Kaare, 2010), as evidenced by a dramatic increase in activities such as social networking, texting, and instant messaging over the last couple of years (Lenhart, 2012; Lenhart, Purcell, Smith, & Zickuhr, 2010). Although these social interactions are technology-mediated, rather than face-to-face, there is evidence that they are advantageous to children's social skills development. For instance, children who are active in creating online content and who are constantly reviewing viewers' feedbacks on personal posts, potentially have a greater opportunity to learn respect and tolerance for others' viewpoints (O'Keeffe, & Clarke-Pearson, 2011). Social networking sites and other online channels also provide youth with the opportunity to find out about their unique social skills, and their individual identity (Boyd 2007, 2008; O'Keeffe, & Clarke-Pearson, 2011).

As one carefully reviews the literature on the social consequences of technology use and the contradictions that exist in the findings, two specific patterns emerge that may help explain the inconsistency in the results. First, as noted above, the majority of studies reporting negative social consequence for technology use (for instance, Kraut et al., 1998 and Nie & Erbrirng, 2000) are relatively outdated (i.e., they were published more than 15 years ago) and stem from a time when internet and mobile communication devices were not as commonplace as they are today, and when most of the individuals comprising one's social network were not yet online. This suggests that even if individuals used the internet for social communications, they did not use it to strengthen existing social ties. Rather, individuals used the internet to establish new (often weak) ties with strangers, such as those formed in chatrooms (Subrahmanyam, Greenfield, Kraut, & Gross, 2001;

Wellman et al., 1996). More recent research (Blais, Craig, Pepler, and Connolly, 2008) suggests that the social implications of internet use are considerably more positive for individuals who use it to reinforce existing connections than those who use it to create new, often poor, bonds with strangers. In the past decade, internet and communication technologies have become ubiquitous, and it is likely that more individuals use them as an opportunity to stay connected with family and friends (Subrahmanyam & Greenfield, 2008; Valkenburg & Peter, 2007b; Williams & Merten 2008). This may be one reason why more recent studies find mostly social benefits for technology use.

The second possible reason for the inconsistent findings regarding the social consequences of technology use concerns the age of the individuals in different samples. Studies that report positive effects for technology use primarily utilized samples of adolescents (ages 12 - 18) or college students, who are more heavily involved in online social activities than younger children, according to national reports (Rideout, 2015; Rideout, Foehr, & Roberts, 2010). Preteens' media activities are less likely to be social in content (Rideout, 2015); therefore, the positive effects that are reported in studies with older adolescents and college students may not apply to them. In other words, teenagers and young adults may be more likely to replace their face-to-face interactions with technology-mediated communications, whereas preteens may only experience the displacement. Furthermore, one must also take into account that certain social skills (for instance, non-verbal emotion-cue recognition), which are crucial for effective face-to-face communications, are learned primarily in direct social contexts, and computer-mediated interactions fall short of supporting the development of such skills (Uhls et al., 2014).

Finally, although there seems to be merit to the displacement hypothesis, the direction of the relationship between technology use and diminished face-to-face interactions remains unclear, due to the correlational nature of studies evaluating it. A scarcity of social interactions (i.e., more

time spent alone) may be what increases the appeal of spending time with technology. These studies and some researchers in the field call for a greater use of research designs that address causality (Pea et al., 2012). In the next section, the present study utilizes an experimental framework to shed light on the directionality of the relationship between technology use and children's tendency to engage with others face-to-face. It will also explore other underlying processes, in addition to displacement, that may be leading to children's increased preference for solitude, and hence reduced face-to-face interactions, as a result of technology use.

Self-Sufficiency Hypothesis

Up to this point, my review of the literature has centered on the social correlates of preteens' technology use. Here, I turn the focus to situational consequences and concentrate on *interactive* technologies. I propose that preteens' exposure to interactive devices is likely to increase social distance. I call this the "self-sufficiency hypothesis" and explain the premises of this viewpoint below.

The multi-functional nature of today's interactive technologies encourages their users to be independent of other people and/or other devices. For instance, people with a smartphone have less need to ask others for information (e.g., directions to a particular location), thanks to their smartphones' direct online access to search engines and other information tools such as a GPS navigation system. The need to have physical phonebooks, calendars, photo albums, and notebooks, is also substantially diminished now that there is an app for each of these. In a sense, one could argue that these multi-functional devices have become symbols of independence in users' eyes. Based on this argument, I hypothesize that engagement with interactive technologies brings about a self-sufficiency mindset. According to work by Lammers, Galinsky, Gordijn, and Otten (2012), increased sense of self-sufficiency leads to social distance. Taken together, the self-sufficiency hypothesis proposes that exposure to interactive technologies reduces the appeal of

engaging in face-to-face interactions by boosting a sense of self-sufficiency in users. Empirical evidence that supports the assumptions of this hypothesis is explained below.

Interactive technologies as symbols of independence. Evidence from qualitative studies on young children's engagement with interactive technologies repeatedly highlights that technology enables children to undertake tasks that they would not be able to do otherwise. For instance, preliterate 3- and 4-year olds, who need adult assistance to accomplish many of their daily activities, are able to use smart devices to communicate with others using emoticons (Plowman & McPake, 2013), or keep themselves entertained using their favorite game and cartoon apps. In other words, interactive devices such as smartphones, tablets, and laptops empower children to reach their goals, most often with strokes of a finger, and therefore their use increases children's sense of independence and self-sufficiency.

Once children reach adolescence, they tend to report that technology plays a critical role in their everyday activities, including information gathering, creation of innovate work, and even personal areas such as building self-confidence and relationships (Fitton, Ahmedani, Harold, & Shifflet, 2013; Wei & Lo, 2006). Without their smart devices, adolescents have to rely on help from parents, older siblings, and other individuals in their lives. Digital devices may also serve emotional and psychological purposes. In fact, many adolescents and young adults use their smartphones (sometimes excessively) to reduce loneliness, anxiety, and isolation (Ha, Chin, Park, Ryu, & Yu, 2008; Caplan, 2006). Given these findings, it is not surprising when adolescents refer to their phones as their "whole life" (16-year old girl, Oksman and Turtiainen, 2004, p. 332). Based on this evidence, it is hypothesized that the many functional, personal, and relational applications of interactive gadgets make them symbols of independence and autonomy for their users.

Self-sufficiency and increased social distance. The concept of self-sufficiency traditionally refers to "economic self-sufficiency" rather than psychosocial self-sufficiency. For

the purpose of this study, self-sufficiency is defined as the psychological state of feeling in control of one's behavior, emotions, and general situation, without reliance on help from external sources; in other words, a sense of individual adequacy. The control component in my definition of self-sufficiency makes it tightly related to the construct of power, and there is ample evidence that demonstrates that powerful individuals are less dependent on and less constrained by others (Fiske, 1993; Galinsky, Magee, Inesi, & Gruenfeld, 2006; Keltner, Gruenfeld, & Anderson, 2003; Lammers, et al., 2012; Overbeck, Tiedens, & Brion, 2006). To my knowledge, the only study to investigate the relation between self-sufficiency and social distance directly is that of Lammers and colleagues (2012). These scholars show that individuals who experienced higher levels of self-sufficiency had a stronger preference for working independently (versus with another individual). Vohs, Mead, and Goode (2006, 2008) also referred to this association in a study of the psychological consequences of money. They showed that holding money leads to increased social distance, as evidenced by fewer requests for help, fewer offers of help, and a greater preference for playing and working alone. Vohs et al. (2006) argue that individuals' increased social distance stems from the fact that money brings about "a self-sufficiency orientation" (p. 1154).

Because research on self-sufficiency in preteens is nonexistent, it helps to look into related constructs to get a comprehensive understanding of how this concept can be related to social distance. A construct that has great overlap with self-sufficiency, and is widely studied in developmental psychology, is autonomy. In the Merriam Webster dictionary, autonomy is defined as "the state of existing or acting separately from others." and "the power or right of a country, group, etc., to govern itself" (Merriam-Webster's online dictionary, n. d.). The sense of control and independence that lies at the core of self-sufficiency is also evident in the definition of autonomy. However these two elements, i.e., agency and separation, have historically been known to form two dimensions of autonomy: reactive autonomy and reflective autonomy (Koestner &

Loiser, 1996). Reactive autonomy is interpersonal and emphasizes separation and independence from others (Gough & Heilburn, 1983; Murray, 1938). Reflective autonomy is intrapersonal and capitalizes on agency and personal control (Deci & Ryan, 1991; see also Wiggins 1991 & 1997 for similar conceptualization). Some empirical evidence suggests that autonomy, especially reactive autonomy, is related to incompetence and disinterest in social situations. For instance, individuals who scored high on autonomy motivation reported feelings of dissatisfaction from work that involved teamwork (O'Reilly, Chatman, & Caldwell, 1991). Koestner and Loiser (1996) also found reactive autonomy to be associated with social maladjustment.

Findings from the studies that examined self-sufficiency suggest that heightened feelings of self-sufficiency increase social distance (e.g., Lammers et al., 2012). Empirical evidence on autonomy, reviewed above, also supports this association. So, if I am right in hypothesizing that engagement with interactive technology makes children feel more self-sufficient, then we may expect it to also lead to increased social distance.

Moderating role of self-construal. So far the study has argued that interactive technology use may bring about a sense of self-sufficiency in children, which could potentially lead to distancing oneself from others. This claim is not complete without acknowledging the differential impact of individuals' cultural backgrounds on this relationship. Individuals from Western backgrounds are known to have independent self-construal (Markus & Kitayama, 1991), meaning they view the self as autonomous, separate, and egocentric. These individuals value independence, and the feeling of being unique. On the other hand, people from Eastern cultures hold interdependent self-construal which is often collective and sociocentric in nature. For them, the focus is on group cohesion and harmony. Individuals' self-construals are known to be influenced by their respective cultural backgrounds, but situational primes can also alter them (Stamatogiannakis & Chattopadhyay, 2015; Zampetakis, Kafetsios, Lerakis, & Moustakis, 2015).

In the current study, only children with interdependent self-construal are expected to exhibit a significant increase in self-sufficiency following exposure to interactive devices, because there is a substantial difference between their predominant cultural worldview and the situational prime. The self-sufficiency impact of interactive technology on children with independent self-construal may not be found due to a ceiling effect. In other words, considering that independence and autonomy lie at the core of independent self-construal, there might not be any room for interactive technologies to make these children even more autonomous and self-sufficient. This argument is supported by findings of Gardner, Gabriel and Lee (1999) who found that the Americans in their sample were strongly affected by an interdependent self-construal prime (inconsistent prime), but not by an independent self-construal prime (consistent prime). The exact same pattern of results was also observed with Chinese participants in that study.

Moderating role of familiarity with interactive devices. Recall that the argument for why interactive technologies may increase self-sufficiency is rooted in the idea that these devices have several functions and serve numerous purposes. A person who has little or no experience with interactive devices would not have knowledge of these functionalities, therefore exposure to interactive devices might not impact that individual's sense of self-sufficiency. For this reason, it is predicted that the extent of children's familiarity with interactive devices should moderate the degree to which they feel self-sufficient following being exposed to these devices.

Summary

Preteens spend several hours per day engaging with a range of media devices, and the extent of their technology consumption may be influenced by certain familial and environmental factors. Also, according to the displacement hypothesis, excessive engagement with technology may be associated with fewer face-to-face interactions with family and peers. That said, it is not clear whether technology takes time away from face-to-face interactions or whether fewer

opportunities for face-to-face communications compel children to entertain themselves with screens. Studying the consequences of technology use experimentally can shed light on the direction of this relationship, and also help identify other reasons for why technology can create social distance. In this regard, the present study proposes the self-sufficiency hypothesis and argues that interactive devices may increase social distance by boosting children's sense of self-sufficiency. Children with different cultural backgrounds, and different levels of familiarity with smart devices, may also be differentially impacted by the self-sufficiency impact of interactive technologies.

The Present Study

The goal of the present research is to understand the social (i.e., familial and environmental) correlates, and immediate consequences of technology use among preteens. To meet these objectives, the study utilized survey and behavioral experimentation.

The survey portion of the study (referred to from here on as part 1), was completed by both caregivers and their preteen children to address the correlates of technology use. The aims of part 1 are twofold. The first aim is to assess the prevalence of technology use in this sample and investigate the familial and environmental factors that are associated with increased technology use among preteens. The second aim is to examine whether the amount of time children spend on technologies is associated with fewer face-to-face interactions with family and peers. In order to better understand whether technology use is actually responsible for the possible reduction in face-to-face interactions, the study also utilized an experimental design, which is described below.

Using a priming technique in the experimental part of the study (from here on referred to as part 2), the current study explored the situational implications of interactive technology use. Specifically, it tested whether exposure to interactive technologies creates social distance. Research over the past 80 years has demonstrated that priming is a well-established and promising

method of understanding causal links between mental representations and social, emotional, and behavioral patterns of responses, both in adults and children (see Stupica & Cassidy, 2014 for review). The present study examined whether priming the mental representations associated with interactive devices - specifically, smartphones and tablets - has an immediate impact on preteens' perceived interpersonal closeness with a friend (dependent variable #1) and willingness to engage with another child (dependent variable #2). In order to uncover the underlying mechanisms, the study also explored whether thinking about interactive technologies leads to an increase in self-sufficiency. The moderating role of self-construal and familiarity with smartphones and tablets was also evaluated. See Figure 1 for a visual demonstration of the study's experimental model.

Aims and Hypotheses

Aim 1(Part 1): Examine the prevalence, content, and amount of technology use in this sample.

- Hypothesis 1: This aim is descriptive and therefore no specific hypotheses were made for this aim.

Aim 2 (Part 1): Examine the familial factors that may be associated with technology use, specifically, the number of siblings and the presence of extended family members.

- Hypothesis 2: It was hypothesized that children with no siblings and no extended family living in their household would spend more time with technology, compared to those who have siblings and who live with extended family.

Aim 3 (Part 1): Examine the environmental factors that are correlated with preteens' technology use.

- Hypothesis 3: Children who live in houses where social isolation is supported by house structure (i.e., high technology accessibility) are more likely to be heavy technology users.

Aim 4 (Part 1): Examine whether children who spend more time with technology have fewer face-to-face interactions with family members and friends and whether the content of their technology use makes a difference.

- Hypothesis 4: Children who spend more time with technology will have fewer face-to-face interaction with their family and friends. It was also expected that the content of children's technology use would moderate this association. Specifically, high technology users would have more face-to-face interactions, if their technology consumption was socially oriented, (i.e., frequent texting and social networking, less video game playing and video watching). Recent studies that report improved social connections as a result of social use of technology support this hypothesis.

Aim 5 (Part 2): Assess whether priming the different functions of interactive devices (specifically, smartphones and tablets) increase social distance.

- Hypothesis 5: It was hypothesized that priming interactive devices would increase social distance, as evidenced by less perceived interpersonal closeness with an existing friend, and less willingness to engage with another child.

Aim 6 (Part 2): Examine whether the association between interactive technology prime and social distance is mediated by self-sufficiency.

- Hypothesis 6: Based on the work of Lammers and colleagues (2012), it was expected that self-sufficiency would mediate this relationship.

Aim 7 (Part 2): Assess whether the relationship between tablet use and improved self-sufficiency is moderated by self-construal (independent vs. interdependent orientation).

- Hypothesis 7: It was hypothesized that self-construal would moderate the association between interactive technology prime and self-sufficiency, such that only children with

an interdependent self-construal would exhibit high self-sufficiency scores following being primed.

Aim 8 (Part 2): Assess whether children's familiarity with interactive devices moderates the relationship between the interactive technology prime and self-sufficiency.

- Hypothesis 8: It was expected that only children who report that they are highly familiar with smartphones and tablets (the two devices used in the prime) would exhibit increased levels of self-sufficiency, because this relationship is rooted in experience and knowledge of the multitude of functionalities that these devices afford.

CHAPTER 3: METHODS

Participants

Analyses in this study were based on data collected for 80 parents and their 5th or 6th grade children. Participants were primarily recruited at Creekside intermediate school, located in Dexter, Michigan. Considering that this school was ethnically homogenous (95.9% of the children were European-American), an additional ethnically diverse sample was recruited outside the school, in Southeast Michigan. Responses of one of the child participants and his parent were excluded from the analyses, because the child had low-functioning Autism, and his parent completed the experiment and survey portions on his behalf. Hence, the final sample included 79 participants. See Table 1 for sample characteristics.

Procedures

Recruitment. To attract interested participants, multiple strategies were used. A short description of the study was included in Creekside School's newsletter. Additionally, a team of researchers informed parents about the study on the school's open house day. Interested parents signed up to be contacted by the study's principal investigator to schedule an in-person meeting with the parent and child participant. Study flyers were also posted in greater Detroit area public libraries, ethnic supermarkets, churches and mosques. Interested participants e-mailed the study's principal investigator and an in-person meeting was scheduled.

Meetings with interested families primarily took place at Creekside School (after hours) or at local public libraries. Special efforts were made to ensure that child participants were not exposed to any form of interactive devices as they entered the building or at the time they completed the study. All electronic devices that could potentially be visible when participants arrived were fully covered prior to participants' arrival.

During the in-person meeting, parents first provided written informed consent and children provided written assent to participate in the study. The recruited parent and child were then instructed to continue with a packet of questionnaires. Parents and their children were asked to work independently on their respective packets. Children were encouraged to let the researcher know if they had questions about any parts of the packet, and were instructed to go through the tasks in order.

In the beginning of the child's packet were the experiment questions (i.e., the prime, the mediator, and the two dependent variables). The self-construal questionnaire and the survey items followed the experimental questions. Half of the child packets instructed children to write about the different functions of interactive devices (tech condition), and half of the packets instructed children to write about something neutral, specifically, their plans for that day (non-tech condition). Following the prime, children's self-sufficiency, interpersonal closeness, and their willingness to engage with another child were measured using questionnaires. Measures of the dependent variable, i.e., interpersonal closeness and willingness to engage with another child, were counterbalanced. Each parent-child dyad received a $10 Amazon gift card to thank them for their participation. In addition, the child received a decorative certificate of participation, and the parent's names were entered in a raffle for chance of winning a $100 Visa gift card.

Measures (for Part 1)

Parents' survey. The parents' survey asked about the child's frequency of technology use, the availability of technologies at home, the amount of the child's face-to-face interactions with family and peers on weekdays and on weekends, the child's social network size, the child's sociability, and family demographics. Parents also reported the degree to which they were concerned about the social impacts of technology. A detailed description of the measures used in

the present study, which were contained in the parents' survey, is provided below. Please see Appendix A for a copy of the parents' survey.

Availability of technology at home. Parents reported how many of the following devices were actively used in their household: smartphones, small personal computers, tablets, laptops or computers, handheld game-playing devices (e.g., PSP, Nintendo 3DS), video game consoles (e.g., Xbox), TV, DVD, VCR, Blu-Ray players, Digital TV recorders such as TiVo, and MP3 player devices. For each device, an example was provided. These responses were added together to create a single measure of the availability of technology at home.

Amount of face-to-face interactions. Parents reported the amount of time their children typically spent in face-to-face interactions with family and friends on weekdays (after school), and on weekends. This measure was adapted from Pea and colleagues (2012).

Child sociability. To evaluate children's natural tendency toward warmth and closeness with others, parents completed the affiliation subscale of the Early Adolescence Temperament Questionnaire (EATQ-short form; Ellis & Rothbart, 1999). This is a 6-item subscale and a sample item is: "My daughter/son likes taking care of other people". Parents rated each item on a scale of 1 (*almost always untrue*) to 5 (*almost always true*). To derive a single score for child sociability, parents' responses to the 6 items were averaged and this value was used in all relevant analyses. The subscale's alpha in the present sample was .84. The EATQ has excellent reliability and validity (Ellis & Rothbart, 1999), and is a widely used measure of temperament in the child development literature.

Children's survey. Children answered questions pertaining to the amount and nature of their own technology use. They also reported on their familiarity with smartphones and tablets and the number of interactive devices they personally owned.

Amount of interactive technology use. Children were asked to indicate the amount of time they spent with the following devices combined, on a typical day: smartphones, small personal computers, tablets, laptops or computers, handheld game playing devices, and video game consoles. Examples of each device were also provided to ensure correct understanding of the device category. The answer choices went from *no time* to *5 hours or more*.

Social vs. non-social content of interactive technologies. Children were asked to indicate the frequency of their social use of technologies, specifically frequency of texting, social networking, and technology-mediated talking (including video chat). For texting and social networking, answer choices ran from *every day* to *I have never engaged in this activity*. Answer choices for the amount of technology-mediated talking ran from *less than 5 minutes* to *more than 3 hours*. Responses to these three questions were first standardized and then averaged to derive a single score for child's social use of technology. Higher numbers indicate greater social use of technology.

Measures (for Part 2)

Interactive technology manipulation. Children were randomly assigned to a tech or non-tech condition. Children in the tech condition were asked to write a paragraph about five things that can be done with smartphones or tablets. Children in the non-tech condition were asked to write a paragraph about five things that they planned to do that day, which is a neutral concept. This manipulation was meant to activate the mental representations associated with interactive devices for children in the tech condition. In two cases, children in the non-tech condition essentially self-primed themselves by only writing about technology-related activities including playing video games, listening to music on their iPod, watching Netflix, etc. These two cases were marked as being in the tech condition, given that the mental representation associated with technology was inadvertently activated for them.

Self-sufficiency. A 7-item questionnaire, adapted from Lammers et al. (2012) was used to measure children's self-sufficiency. Items on this questionnaire include: "I think I can deal with most problems myself", "I currently feel that I do not really need the help of others.", "I could use some help by others, at the moment (R)", "Right now, I think that I can gain most things by myself", "At this moment, I don't feel very confident of my abilities (R)", "Right now, I feel that I can be as good as what I expect of myself", "I feel that I'm in control of things". The first four items exactly matched that of Lammers and colleagues (2012). All items were rated on a scale of 1 (*disagree strongly*) to 9 *(fully agree)*. In the Lammers study, the alpha for the measure (with four items) was .67, and in the present research the alpha for the measure (with 7 items) was .80. Children's responses to the 7 items were averaged to derive a single score for self-sufficiency. This self-sufficiency total score was used in the statistical analyses.

Interpersonal closeness. The Inclusion of Other in Self scale by Aron, Aron, and Smollen (1992) was used to measure interpersonal closeness. This is a single-item pictorial measure which consists of seven Venn-like diagrams with escalating degrees of overlap between the two circles. The circles are supposed to represent relationship closeness. Responses on this measure ranged from 1 to 7 and higher numbers indicated more closeness. In this study, participants were instructed to choose the diagram that best described the relationship with their *second* best friend. The reason for choosing second best friend (instead of best friend) was to maximize variability in responses. This measure has high reliability and validity (Aron, Aron, & Smollen, 1992), and has been widely used with participants of various ages, including preteens (e.g., Cameron, Rutland, Brown, & Douch, 2006; Verkuyten, 2007).

Willingness to engage with others. Child participants were told to imagine that they were going to engage in four activities: doing a jigsaw puzzle, playing an Xbox game, creating a collage, and building a mini robot. Next, they were instructed to indicate the extent to which they preferred

to undertake each activity alone or with another child using a 9- point scale (0 = *definitely alone,* 9 = *definitely with another child*). To help children better understand the 9-point scale, one stickman was used on the far left side to indicate preference for engaging in the task alone and two stickmen were used on the other side of the spectrum to indicate preference for engaging with another child. Higher numbers on this measure reflected more willingness to engage with another child. In choosing the activities for this measure, an effort was made to select activities that were comparable in terms of excitement and difficulty/easiness level when done alone and with someone else. A similar method was used by Lammers and colleagues (2012). Because the alpha of this measure was low ($\alpha = .39$), the four tasks were examined separately, rather than being combined in a composite variable.

Self-construal. Self-construal was measured using a short version of the Twenty Statement Test (TST; Kuhn & McPartland, 1954). Children were instructed to describe themselves by completing ten statements that start with "I am ..…". They were asked to write the sentences as they occurred to them, without worrying about the order or importance of each statement. Responses to the "I am" completions were coded by two independent raters who were blind to conditions (ICC = .89). Discrepancies between coders were resolved prior to running the analyses. The coding scheme was based on a modification of Brewer & Gardner's (1996) coding system. Self-descriptions that described a personal belief, physical characteristic, trait, or attitude were coded as personal. Examples of personal statements include: "I am intelligent", or "I am a chocolate-lover". Statements that referred to one's membership in a group (e.g., I am a student at Creekside School"), or relationship to others (e.g., "I'm a sister") were coded as collective. The number of children's *personal* statements as a percentage of their total statements was used as the measure of self-construal. Thus, higher numbers on this measure indicate independent self-construal and lower numbers signal interdependent self-construal. The TST has been widely used

to measure self-construal (e.g., Agrawal & Maheswaran, 2005; Markus & Kitayama, 2010; Somech, 2000; Trafimow, Triandis, & Goto, 1991) and as a manipulation check for it (e.g., Gardner, Gabriel, & Lee, 1999; Swaminathan, Page, & Gürhan-Canli, 2007).The short version of this test was used because some research with adults indicates that individuals often start repeating themselves after the 10th statement or start giving trivial answers, for instance "I'm hungry" (Bochner, 1976; Bochner & Perks, 1971). Considering the age of the present study's participants, it was decided to limit the statements to ten to ensure high quality responses. The short version of the TST has also been utilized in prior research (e.g. Bochner, 1994).

Familiarity with smartphones and tables. Children indicated their degree of familiarity with smartphones by answering the following question: "Overall, how familiar are you with the different uses of smartphones (like iPhone, Nexus, Galaxy Note)?". A similar question was asked about tablets. Answer choices went from *not at all* to *extremely*. Responses to these two questions were averaged to create a single score for children's familiarity with smartphones and tablets. This aggregated score was used in the analyses and higher scores mean more familiarity.

Power Analysis

Results of the initial power analysis using the Gpower 3.0.10 software indicated that for a confidence level of 95% and a one-tailed significance level, a sample size of 121 is required. The effect size was set at 0.6, which is slightly higher than a medium effect size (Cohen, 1992).

Planned Analyses

All study variables were first checked for normality, nonlinearity, heteroscedasticity, skewness, kurtosis, univariates and multivariate outliers (see chapter 4 for details). The assumptions for the proposed analyses were checked prior to running the statistical tests.

Hypothesis 1**.** Descriptive statistics were used to examine the sample's characteristics.

Hypothesis 2**.** To find out whether preteens' technology use is related to familial factors such as the number of their siblings and whether or not they lived with extended family, bivariate correlations were utilized.

Hypothesis 3**.** Bivariate correlations were conducted to examine whether availability of technology at home is associated with amount of preteens' interactive technology use.

Hypothesis 4. Multiple hierarchical linear regression was conducted to test whether there is an interaction between children's amount of technology use and the content of their technology use (i.e., social vs. non-social), in predicting the amount of their face-to-face interactions with family members and friends. The two predictors were entered in the first step and the interaction term was entered in the second step of the model.

Hypothesis 5. It was proposed that priming interactive technologies would increase social distance, as measured by interpersonal closeness with one's second best friend and willingness to engage with another child on four tasks. This hypothesis was examined using independent sample *t*-tests that evaluated the main effect of condition (tech vs. non-tech) on each of the two dependent variables (i.e., perceived interpersonal closeness with a friend, and willingness to engage with another child).

Hypothesis 6. In order to examine whether self-sufficiency mediated the above relationship, a bootstrap analysis based on 5000 samples was tested using SPSS AMOS version 24.

Hypothesis 7 and 8. In order to examine whether children's self-construal (hypothesis 7), and their familiarity with smartphones and tablets (hypothesis 8) impact how self-sufficient they feel following exposure to interactive devices, a moderated mediation was tested.

CHAPTER 4: RESULTS

Data Screening

Prior to analysis, the data were examined to ensure variables met the normality assumptions of the statistical tests used in hypothesis testing. The data were also cleaned in the following order. First, variables were checked for missing values. Descriptive statistics indicated that a few of the variables had random missing values; however, the number of missing values in each variable was negligible and therefore the mean of the corresponding variables were used to replace the missing scores (Tabachnick & Fidell, 2011). Next, the data were analyzed for skewness and kurtosis. Using a confidence level of 99.9%, values larger than ±3.30 were marked for correction. Willingness to engage with another child on an Xbox game had negative skew and positive kurtosis. Analyses were conducted with the transformed and non-transformed version of this variable yielded similar results; therefore, results for the non-transformed variable are reported here for ease of interpretation.

Lastly, there was a small positive skew (3.54) on children's number of siblings. Given the small magnitude of deviation from the cutoff point and the fact that transformation of the variable would complicate interpretation, the variable was not transformed. All other variables were normally distributed.

Study variables were also assessed for the presence of potential univariate and multivariate outliers. In order to detect univariate outliers, study variables were first converted to standardized scores (i.e., z-scores). Using a confidence level of 99.9%, variables with z-scores beyond the ±3.29 cutoff were marked as univariate outliers. The following variables had one outlier each: number of siblings, self-construal, number of media devices at home, and child sociability. The outliers for each of the first three variables were only slightly above the cut-off point and the responses fell

within a reasonable range for the variable in question, so they were kept in the analyses. The outlier on the sociability variable had a significantly low score and was deleted from the analyses.

Mahalanobis distance scores were used to detect multivariate outliers. Considering that the two parts of this study (i.e., the survey and the experiment) were quite independent, two separate analyses were conducted for detecting multivariate outliers. In the analyses conducted on the survey variables, no multivariate outliers were found. In the analyses conducted with the variables used in the experiment, one multivariate outlier was found on the self-construal variable. This may be because all of the self-descriptive statements of this child participant were interdependent statements, so his score on the self-construal measure was a zero (out of 1). Considering that using interdependent traits to describe oneself is completely normal - and even expected for people from collectivist backgrounds-, this subject was not excluded from the analyses.

The possibility of multicollinearity and singularity was also evaluated. Results did not show any instance of multicollinearity, as the tolerance levels for all variables were higher than 0.10. Moreover, the variance Inflation Factor (VIF) scores for all variables were less than 10, and the condition indexes were all below 30. Bivariate correlations between the variables of interest ranged from 0 to (.76), indicating that none of the variables were redundant.

Hypotheses Testing

Hypothesis 1. *Overview of sample characteristics.* The first aim was to describe the nature of preteens' engagement with technology by examining the amount of interactive technology use, the number of devices personally owned by children, children's familiarity with tablets and smartphones, and children's experience with social uses of technology, including texting, social networking, and talking. Descriptive statistics portraying the technology profile of preteens in this sample are presented in Table 2.

Considering that one of the main foci of this research was to examine children's social characteristics and preferences, children's social profiles were also carefully assessed. Table 3 depicts preteens' general interest in social interactions, the amount of their face-to-face interactions with family and friends on a typical weekday and weekend day, and the number of their peers.

Hypothesis 2. *Children with no siblings will spend more time with technology, compared to children who have siblings.* In order to examine whether the number of people in the household is related to the amount of time that children spend with technology, two bivariate correlations were conducted using Pearson's product-moment correlation. In the first analysis, the association between children's amount of interactive technology use and the number of their siblings was examined. Contrary to study's hypotheses, results indicated a significant *positive* relationship ($r[77] = .240, p < .05$), meaning that preteens who had more siblings also had higher levels of daily interactive technology use.

A follow-up analysis was conducted to explore the role of siblings' age. Specifically, analyses were conducted to see whether preteens who had older siblings had significantly more interactive technology use than preteens who had younger siblings. To do this, first children were coded as 1 if they had any same-aged or older siblings. Considering that the youngest children in this sample were 10 years old, this age was used as the benchmark. Children whose siblings were younger than 10 years old were coded as 0. The four children in the sample who did not have siblings were excluded from this analysis. Independent samples *t*-test results indicated that preteens who had older siblings spent significantly more time with interactive technologies ($M = 4.37, SD = 1.67$) than preteens who had younger siblings ($M = 3.27, SD = 1.04, t[74] = 3.50, p < .005$).

The second correlation analysis evaluated the relationship between children's daily interactive technology use and the presence of extended family in their household. Lower numbers

on the extended family measure indicated the presence of extended family. Results indicated that the presence of extended family members is not significantly associated with the amount of children's interactive technology use ($p > .1$).

Hypothesis 3. ***Children who live in houses with high technology accessibility are more likely to be heavy technology users.*** To test the hypothesis, the study investigated whether the availability of technology at home is associated with the amount of children's interactive technology use. Results indicated a significant positive correlation ($r[77] = .328$, $p < .01$). Specifically, children living in households that were more technologically rich, spent more time with a range of devices than children living in less-technologically saturated homes. As expected, the number of devices personally owned by children also positively correlated with the amount of their daily interactive technology use, $r(77) = .341$, $p < .01$. The magnitude of the correlation between the number of children's personal devices and the number of devices available at home was statistically significant but did not suggest collinearity, $r(77) = .266$, $p < .05$.

In separate analyses, the association between household income and the amount of children's interactive technology use was explored. It was expected that higher income would be positively correlated with the total number of media devices at home, and more daily interactive technology use. Results supported the first hypothesis that income was positively correlated with the total number of devices at home, $r(77) = .237$, $p < .5$. However, income negatively correlated with children's daily interactive technology use, $r(77) = -.192$, $p = .09$, although this association was only marginally significant.

Hypothesis 4. ***The interaction between amount of technology use and the content of technology (social vs. non-social) will predict the amount of preteens' face-to-face interactions.*** Acknowledging that content can play a role in how children are influenced by interactive devices, the frequency of children's social uses of technology, specifically frequency of texting, social

networking, and amount of talking was evaluated. The interaction between children's daily interactive technology use and the social content of technology was examined using hierarchical linear regression. The regression model was structured such that children's daily interactive technology use and the composite measure for content were entered in the first block of the model, and the interaction term was entered in the second block of the model. Considering that face-to-face interactions during weekdays and weekends were measured separately, two regression analyses were conducted, one for each dependent variable.

Results revealed that the main effect of daily interactive technology use on the amount of children's face-to-face interactions on weekdays was significant, with a medium effect size, $\beta = -.244$, $t(76) = -2.164$, $p < .05$; $d = .48$. This finding indicates that children who spend more time with interactive devices, spend less time engaging with others face-to-face, on weekdays, as hypothesized.

The main effect of content on the amount of weekday face-to-face interaction was also significant with a medium effect size, $\beta = .225$, $t(76) = 1.995$, $p < .05$; $d = .45$. This finding shows that, as hypothesized, the social use of interactive technologies, for instance social networking or texting, has the potential to encourage children's daily face-to-face interactions. Contrary to expectations, the interaction between content and amount of daily interactive technology use in predicting weekday face-to-face interactions was statistically non-significant, $\beta = .372$, $t(75) = 1.206$, $p > .1$.

The main effect of daily interactive technology use on the amount of children's face-to-face interactions on weekends was also significant with a medium effect size, $\beta = -.240$, $t(76) = -2.095$, $p < .05$; $d = .47$. This finding indicates that children who spend more time with interactive devices, spend less time engaging with others face-to-face, on weekends.

Contrary to expectations, the main effect of content on amount of weekend face-to-face interaction was not statistically significant, $\beta = .032$, $t(76) = .284$, $p > .5$. This suggests that the social use of interactive technologies is not associated with the amount of children's weekend face-to-face interactions. Similar to the findings for weekday face-to-face interactions, the interaction between content and amount of daily interactive technology use in predicting weekend face-to-face interactions was also non-significant, $\beta = .265$, $t(75) = .841$, $p > .05$. Together, findings for both the weekday and weekend face-to-face interactions support our original hypothesis that preteens' greater use of interactive technologies is associated with fewer face-to-face interactions with family and friends, especially if the content of their interactions is not social.

Hypothesis 5. Priming interactive technologies will increase social distance, as measured by interpersonal closeness with one's second best friend, and willingness to engage with another child on four tasks. Prior to running the respective analyses for this hypothesis, it was important to evaluate whether there were order effects in the data. Recall that the order that the two dependent variables (interpersonal closeness and willingness to engage with others) were presented to children was counterbalanced. To test for order effects, child participants were coded as 1 if they received the willingness to engage with others variable first, and 0 if they received the interpersonal closeness variable first. Next, children's responses to the dependent variables were compared across these two groups. Results indicated that the order of tasks did not make a meaningful difference in participants' responses to any of the dependent variables (all $ps > .05$). Whether children's sociability made any difference in outcomes when comparing the tech and non-tech condition was also explored. The results of this analysis were statistically non-significant. Therefore, child sociability was not included as a covariate in the subsequent analyses.

In order to examine the impact of the interactive technology prime on social distance, five independent sample *t*-tests were conducted. Results indicated that the manipulation significantly

predicted children's willingness to engage with another child on the collage task with a medium effect size, $t(78) = -2.117$, $p < .05$; $d = .47$. The direction of the association was also in line with our hypothesis. That is, children who were primed with interactive technology were significantly less likely to indicate that they wanted to engage with another child ($M_{tech} = 5.32$, $SD = 2.82$), compared to children who did not receive the interactive technology prime ($M_{non-tech} = 6.55$, $SD = 2.36$).

The priming effect was statistically non-significant for interpersonal closeness ($M_{tech} = 5.12$, $SD = 1.25$, $M_{non-tech} = 5.21$, $SD = 1.49$, $t[78] = -.285$, $p > .5$.), willingness to engage in puzzle ($M_{tech} = 6.17$, $SD = 2.74$, $M_{non-tech} = 6.16$, $SD = 2.65$, $t[78] = -.021$, $p > .5$.), willingness to engage in Xbox ($M_{tech} = 7.27$, $SD = 2.24$, $M_{non-tech} = 7.39$, $SD = 2.12$, $t[78] = -.256$, $p > .5$.), and willingness to engage in building a mini robot ($M_{tech} = 5.80$, $SD = 3.21$, $M_{non-tech} = 6.42$, $SD = 2.74$, $t[78] = -.912$, $p > .1$). Because significant effects of condition was only found on the collage task, for the remaining hypotheses, the results of only this dependent variable are reported.

Hypothesis 6. Self-sufficiency will mediate the effect of the interactive technology prime on social distance. As described in the measures section, responses to the 7-item self-sufficiency questionnaire were averaged to derive a single score for perceived sense of self-sufficiency. The study examined whether self-sufficiency mediated the effect of the interactive technology prime on children's willingness to engage with others on the collage task. The effect of the prime remained significant ($\beta = -0.233$, $p < .05$) when self-sufficiency was added to the model, but self-sufficiency did not predict social distance ($\beta = 0.001$, $p > .5$). A bootstrap analysis showed that the 90% bias-corrected confidence interval for the size of the indirect effect included zero ([−0.057, 0.074]), suggesting no indirect effect. These results show that there was not a significant difference between the self-sufficiency scores of children in the tech and non-tech condition, and that self-sufficiency did not mediate the effect of interactive technology prime on social distance.

Hypothesis 7. Children's self-construal will moderate the association between the interactive technology prime and self-sufficiency, such that children with interdependent self-construal who are primed with interactive technology would exhibit higher levels of self-sufficiency than children with independent self-construal. To test this hypothesis a moderated mediation was posited, whereby the magnitude of the mediation effect would vary by children's self-construal (moderator). As seen in the previous analysis, there was no evidence that self-sufficiency was a significant mediator of the association between the interactive technology prime and social distance. Therefore, instead of running a moderated mediation analysis, two moderation analyses were carried out. The first examined the moderating role of self-construal in the relationship between the interactive technology prime and self-sufficiency. The second examined the moderating role of self-construal in the relationship between the interactive technology prime and willingness to engage in collage.

Results of the first moderation analysis indicated that the main effect of condition on self-sufficiency was not statistically significant, $\beta = .100$, $t(78) = .877$, $p > .1$. The main effect of self-construal on children's self-sufficiency was also not statistically significant, $\beta = -.106$, $t(78) = -.924$, $p > .1$. The interaction term also was non-significant, ($\beta = -.532$, $t[78] = -1.242$, $p > .1$), suggesting that children's self-construal did not moderate the association between the interactive technology prime and self-sufficiency.

Results of the second moderation analysis demonstrated that there was a significant main effect of the interactive technology prime on children's willingness to engage with others in the collage task, with a medium effect size, $\beta = -.235$, $t(78) = -2.092$, $p < .05$; $d = .47$. In contrast, the main effect of self-construal on children's willingness to engage with others was not statistically significant, $\beta = .015$, $t(78) = .134$, $p > .5$. Lastly, the interaction term was statistically significant with a medium effect size, ($\beta = -.825$, $t[78] = 1.992$, $p < .05$; $d = .45$), suggesting that children's

self-construal made a difference in whether they were impacted by the interactive technology prime in response to the collage task.

To further uncover how the interaction between self-construal and the interactive technology prime impacted children's willingness to engage with others on the collage task, spotlight analyses were conducted. These analyses were utilized because self-construal was a continuous variable. In the spotlight analyses, the difference between the two conditions were compared at one standard deviation above and one standard deviation below the mean of the moderator, i.e., self-construal. Self-construal was centered prior to running spotlight analysis, therefore positive numbers represent children with independent self-construal and negative numbers represent children with interdependent self-construal.

Results of the spotlight analysis at one standard deviation above the mean of self-construal indicated a significant effect of condition on children's willingness to engage with others on the collage task. This finding suggests that children with independent self-construal were significantly less willing to engage with another child on the collage task when they were in the tech condition, compared to their counterparts in the non-tech condition, with a large effect size (M_{tech} = 7.13, $M_{non\text{-}tech}$ = 4.71), $F(1, 75)$ = 8.506, $p < .005$; $d = .65$.

A similar spotlight analysis at one standard deviation below the mean of self-construal showed no significant difference in children's willingness to engage with others (M_{tech} = 6.09, $M_{non\text{-}tech}$ = 6.05), $F(1, 75)$ = .002, $p > .5$. This finding suggests that children with interdependent self-construal were not affected by the manipulation.

Examination of the slopes also confirms these results; the slope of self-construal was positive for children in the tech condition, b = 2.93, R^2 = 0.044, p = .188; whereas the slope of self-construal was negative for children in the non-tech condition, b = -3.77, R^2 = 0.061, p = .136. See Figure 2 for visual representation of these results. These findings show that children with

independent self-construal are more susceptible to the negative impacts of interactive technologies, than children with interdependent self-construal.

Hypothesis 8. Children with a higher degree of familiarity with smartphones and tablets will feel more self-sufficient following the interactive technology prime, compared to children who are not familiar with these devices. It was expected that interactive technologies would increase children's sense of self-sufficiency because these technologies have several functions and because they serve many purposes, thus, increasing children's independence from other devices and people. Specifically, it was expected that the degree to which children were familiar with the different functions of tablets and smartphones - the two devices mentioned in the prime- should impact how self-sufficient they become following the interactive technology prime. Given that the mediation of self-sufficiency was not significant, two separated moderation analyses were conducted. The first examined the moderating role of familiarity in the relationship between condition and self-sufficiency. The second examined the moderating role of familiarity in the relationship between condition and willingness to engage in the collage task.

Results of the first moderation analysis indicated that there was a non-significant main effect of condition on self-sufficiency, $\beta = .089$, $t(78) = .777$, $p > .1$. There also was a non-significant main effect of familiarity on children's self-sufficiency, $\beta = .058$, $t(78) = .507$, $p > .5$. Similarly, the interaction term was non-significant, ($\beta = .129$, $t[78] = .326$, $p > .5$). These findings indicate that children's familiarity with smartphones and tablets did not moderate the association between the interactive technology prime and self-sufficiency.

Contrasting results were found in the second moderation analysis. There was a significant main effect of condition on children's willingness to engage in the collage task, $\beta = -.234$, $t(78) = -2.101$, $p < .05$. However, the main effect of familiarity on children's willingness to engage with another child on the collage task was not statistically significant, $\beta = .053$, $t(78) = .474$, $p > .5$. The

interaction term was also statistically non-significant, $\beta = .038$, $t(78) = .098$, $p > .5$. These findings indicate that children's familiarity did not make a meaningful difference in whether they were impacted by the interactive technology prime in response to the collage task.

CHAPTER 5: DISCUSSION

The purpose of this study was to investigate whether there are associations between preteens' technology use - specifically, their interactive technology use - and their social behavior. The study had two primary goals: 1) to examine familial and environmental correlates of preteens' interactive technology use, and the association between the amount of time children spend on interactive devices and the amount of their face-to-face interactions with family members and friends; 2) to examine the situational consequences of interactive technologies and investigate whether it associated with social distance. It was hypothesized that self-sufficiency would be the mechanism underlying this association. The moderating roles of children's self-construal and their level of familiarity with interactive technologies in the association between interactive technology prime and self-sufficiency were also explored.

With regard to social correlates, results demonstrate that having siblings is associated with more interactive technology use (not less). Furthermore, consistent with expectations, children living in homes with a greater variety of electronic devices spend more time using these technologies. Also, as expected, more time spent using interactive devices is associated with less time spent in face-to-face interactions with family and peers.

Findings from this study also provide support for the hypothesis that exposure to interactive technologies can have negative immediate effects on children's social choices. Specifically, priming the different functions of smartphones and tablets bolsters children's social distance on a hypothetical collage task. Self-sufficiency did not appear to mediate this relationship; however, children's self-construal moderated it. Below, these findings are discussed in more detail, along with speculations regarding possible reasons for the unexpected findings that were observed.

Prevalence, Content and Context of Technology Use

A few findings regarding the sample's characteristics warrant discussion here. First, the child participants in the current sample were relatively low tech users, in comparison to the children described in national reports. An average child in our sample spends about 2 hours with interactive technologies on a typical day. In contrast, according to Common Sense Media (Rideout, 2015), the average American tween (ages 8-12 years old) spends about 6 hours with entertainment media only (i.e., excluding time spent on technology at school or for homework). A possible reason for this discrepancy is that, in the current study, analyses focused on children's use of interactive technologies, whereas in the Common Sense Media's report, children's use of a wider range of devices, including television and radio, was evaluated.

Another finding is that the vast majority of the preteens (84.4%) in the present sample prefer face-to-face interactions over computer mediated interactions, according to parent reports. This is of course different from the pattern that is observed in teenagers and young adults. Research on the contemporary mobile youth culture suggests that teenagers prefer text-based communications (Ling, 2005, Ling & Yttri, 2002, 2006; Abeele, 2015) over face-to-face ones. Interestingly, about 42% of the children in the present study also reported that they communicated with their friends through technology. The ersatz theory (Green & Brock, 1998; Green et al., 2005) may help explain why there is a gap between preteen's preferred method of interaction and their actual interaction type. According to this theory, interactions that are technology-mediated require less effort, and are less risky, less intimidating, and faster (i.e., require less delay of gratification), than face-to-face interactions. These features make ersatz interactions more appealing than in-person communications, at least in the short term (Green & Brock, 2008). Thus, the ease of using these technologies and their increased availability in households go hand-in-hand in contributing

to children's technology-mediated interactions, despite the fact that face-to-face interactions are more favored.

Another notable finding is that the children in the current sample engaged in very little *social* use of technology. Specifically, only about 7% of the preteens visited social networking websites every day, and only about 27% texted on a daily basis. These findings highlight the fact that preteens' technology use is not yet heavily invested in social communications.

A closer look at the descriptive analyses of the data also highlighted a discrepancy between parents' and children's reports regarding the number of devices in their household. To obtain a clear picture of the number of media devices at home, parents were asked to mark all the devices available in their home from a comprehensive list. Child participants were also asked to indicate the devices they personally owned. For the majority of the media devices, there was a discrepancy between what was endorsed by parents and what was endorsed by their children. The highest discrepancy was for the number of handheld game playing devices (e.g., Nintendo 3DS), and console games (e.g., Xbox), with 10.12% of children in the sample reporting owning at least one of these devices when their parents reported that these devices were not available in the home. A parent-child mismatch in the number of small personal computers (such as iPod) and MP3 players was 7.6% and 6.3% respectively. Mismatches for other devices were negligible.

The reason for inconsistency between parent and child reports is not clearly understood. It may be that parents and their children did not categorize media devices in the same way, despite the researcher's efforts to clearly explain each media category by providing concrete examples. To note is that our data allowed us to identify only the number of cases in which the child reported owning a device, but the parent denied that the device was present in their home, so concordance rate may be lower had we asked children to report the exact number of media devices in their households. These discrepant findings draw attention to the shortcomings of relying solely on self-

report data from single reporters and highlight the importance of utilizing multiple reporters. For more details on methodological challenges associated with studying technology availability and technology use, see the "future research" section of this paper.

Number of Siblings, and Technology Availability at Home Positively Related to Preteens' Amount of Technology Use

It was hypothesized that children with siblings would spend less time with interactive devices because the presence of more children in the home would provide increased opportunities for non-technology based social activities. The data do not support this hypothesis and in fact support the opposite conclusion; namely, that the number of siblings children have is positively correlated with children's daily use of interactive technology. Although the literature is split on this topic, our findings are consistent with those of Hardy et al. (2006) and others, who also report that the number of siblings a child has is positively correlated with the amount of children's technology use. Other scholars have found evidence for our original hypothesis (e.g. Bagley, Salmon, & Crawford, 2006; Davies & Gentile, 2012). In the present study, only 5% of the children had no siblings, and this could have impacted our findings. Moreover, given the ubiquity of technology use among family members, perhaps siblings are also preoccupied with screens, as opposed to being available to play, talk, or do other activities. In other words, siblings might have lost their practicality in initiating screen-free time, because they too, are busy with technology. Siblings also set a norm by behaving this way and may contribute to the creation of a technology-heavy home atmosphere where not being busy with a screen is an anomaly. This finding also supports Bandura's (1971) and Bronfenbrenner's (1979) notions on how family dynamics and norms impact children's social behaviors.

Regarding technology availability, the current study found support for the hypothesis that preteens are more likely to spend time using interactive technologies when more electronic devices

are available in the child's home. Also, the higher the number of child's personal devices, the more the child's daily consumption of interactive technology. This pattern is also observed in prior studies. For instance, Williams and Merten (2011) report that in technology-saturated households parents spend significantly more time on the internet. Of course, neither the present study nor Williams and Merten's (2011) study allows for a causal interpretation of the data, so the direction of effects are unclear. Does more technology at home lead to more technology use among preteens? Or is it the case that families who spend more time on technology tend to purchase more interactive devices?

Daily Tech Use Negatively Correlates with Quantity of Face-To-Face Interactions; Preliminary Evidence for the Role of Content

The present study provides evidence for the displacement hypothesis by showing that children who spend more time with interactive devices also spend less time in face-to-face communications. As discussed in chapter 2, there is controversy in the literature regarding whether engagement with technology supports or disrupts face-to-face social interactions. Researchers such as Park and colleagues (e.g., Park, Han, & Kaid, 2012; Park & Lee 2012) report improved social capital as a result of using smartphones to engage in social networking sites. Our findings support the arguments that technology individualizes and privatizes people's leisure time (Putnam, 1995b), and corroborate more recent research findings on technology's impact on quality and quantity of face-to-face interactions. For instance, in a study of Korean preteens, the more students spent time on the internet, the more limited was the amount of time they interacted with family members (Lee & Chae, 2007). Other scholars including Ling and Yttri (2006), and Turkle (2011) posit that using mobile technologies diminishes the salience of shared family activities, such as family meals, leading to their reduced effectiveness in promoting family bond and connection.

The real consequence of a reduction in face-to-face interactions becomes evident when we examine the costs of impaired social skills. Research by Brown (2013) shows that college students who have a stronger preference for online communications, exhibit less socially appropriate behaviors (i.e., less nodding, less encouragement, more inappropriate volume, poor affective signs) during their face-to-face interactions, and also score lower on other measures of social skills. According to the literature on social skills development, preteens still need opportunities for social interactions to learn and practice social competencies, and reduced face-to-face interactions, with little or no online social substitutes, can impair their social skills.

Notably, some studies in the extant literature provide evidence that content plays a role in how children are impacted by technology. For instance, Park and colleagues (e.g., Park, Han, & Kaid, 2012; Park & Lee 2012) reported that engagement with social networking sites promotes interpersonal closeness and social capital. The present study demonstrates mixed findings regarding the role of content. Specifically, our data shows that social use of interactive technologies is associated with more face-to-face interactions on weekdays, but it is unrelated to the amount of weekend face-to-face interactions. So, while there is some evidence supporting the role of social content in promoting face-to-face communications, it is not very strong. Future research is needed to scrutinize the role of content in greater detail, to identify its implications for the quantity of in-person interactions and development of social skills.

Lastly, realizing that technology is here to stay and that some research suggests that it has the potential to promote family closeness (William & Merten, 2011), it is important to find out how we can embed the face-to-face component in technology-oriented activities and promote healthy technology habits. In doing so, it is essential to follow the guidelines of the American Academy of Pediatrics (AAP), which advises, for instance, that there be no technology use around dinner table, and no technology use in children's bedrooms (Hill et al., 2016). In addition to

limiting technology time, perhaps a more effective way is to use technology explicitly to promote family time. Many console games that involve physical movement of the players (such as Xbox Kinect games) are compatible for play with more than one player and they provide great opportunities for families to spend time together and have fun. In addition to promoting family time, these games promote executive function skills in children (Best, 2012), therefore, they have the potential to support children's cognitive and social development at the same time.

Priming Interactive Technologies Created Social Distance

Results of the experiment in part 2 of this study provides preliminary support for the idea that interactive technologies may have unintended social consequences; that is, they may encourage children's social distance. Our findings show that children who are primed with the different functions of smartphones and tablets are significantly less willing to engage socially with another child on a hypothetical collage task. Contrary to our hypotheses, children's interpersonal closeness with a friend (the other dependent variable) is not impacted by the interactive technology prime. This may be because this measure taps a trait-like characteristic and may therefore be resistant to situational influences. This being said, the measure has been used successfully in some priming studies in the past (e.g., Gardner, Gabriel, Hochschild, 2002).

Notably, our finding regarding the effect of technology priming on children's social distancing is limited to the collage task. This association is not observed in the other three activities, namely solving a jigsaw puzzle, playing an Xbox game, or building a mini robot. One possible reason for why the findings for these tasks contrasted our hypotheses is that the three tasks have a right and wrong way of being performed, so adding a teammate (i.e., being willing to engage with someone else) could mean losing power and control over the task's outcomes. The collage task, on the other hand, is completely opinion-based and subjective. For this reason, the collage task may be a more appropriate task for capturing the influence of interactive technologies on

children's social behavior. Another possibility is that children may be more familiar with doing puzzles, playing Xbox games and building mini robots, and thus may have had a predetermined preference regarding how they would like to engage with each (individually or in collaboration with another child). The collage task, on the other hand, may have been novel to them and they may not have had a specific preference for it. This flexibility may help explain why the collage task is more sensitive to situational influences, in this case the impact of interactive technology priming.

In line with findings from the priming experiment, prior research has demonstrated that individuals' use of smartphones negatively impacts the quality of their social interactions by distracting the user, removing eye contact, provoking feelings of irritation and disrespect, and essentially obstructing the social exchange (Duran, Kelly, & Rotaru, 2011; Tertadian, 2012). Some romantic partners even report feelings of jealousy toward their partner's smartphone due to the partners' constant engagement with their device (Krasnova, Abramova, Notter, & Baumann, 2016). However, these studies have analyzed only the subjective feelings of the persons in the conversation, rather than objectively examining whether exposure to the interactive device makes people prefer to withdraw from or engage in a social interaction.

In the emerging literature on the social consequences of interactive technology use, very few studies have *empirically* tested the influence of exposure to interactive devices. Among the few that have experimentally investigated this, Przybylski & Weinstein (2013) examined the impact of mere exposure to cellphones and report that dyads who conversed with a cellphone in their peripheral view, report lower interaction quality and perceive the partner as less trustable and empathetic, compared to their counterparts who conversed without cellphones in their view. Misra and colleagues (2016) report similar results when testing the same constructs using tablets and computers. The reasoning provided by these investigators is that mobile communication devices

are representations of one's social network, therefore when they are present during interpersonal interactions, they take attention away from the conversation and direct it toward the person's virtual social network. This divided attention consequently takes a toll on the quality of the conversation by not allowing the pair to focus their available resources on the conversation.

In line with the arguments of Przybylski and his colleague (2013), and Misra et al., (2016), other researchers report that mere exposure to a cell phone diminishes attention and results in lower task performance, especially when the task is cognitively demanding (Thornton, Faires, Robbins, & Rollins, 2015). Notably, all three studies tested their hypotheses with adults and young adults, who are known to be highly involved in online social communications (Brenner & Smith, 2013; Lenhart et al., 2010). Although the attention hypothesis may be plausible for adults, it may not hold for most preteens. That is because the association between smart devices and preteens' social networks may not be fully formed yet, due to their lower *social* use of interactive technologies. Furthermore, Przybylski and Weistein (2013), and Misra et al. (2016) evaluated the social consequences of interactive technologies while another social interaction was taking place (i.e., a face-to-face conversation). Our findings extend these results by showing that thinking about interactive devices can increase social distance in a preteen sample, even when there is not a social interaction competing for one's attention.

Finally, an important point to consider when interpreting the experimental findings of the present study is that interactive technologies were primed as a whole, without focusing on any specific function (such as social communication, entertainment, information gathering, etc.). It is likely that priming a social function of smart devices, such as texting or social networking, may have yielded a different pattern of results. In fact Ho, Wu and Chiou (2016) report that priming social networking sites in a sample of college students leads to increased perceptions of relatedness and felt social support. Together, findings of the present study and that of Ho and colleagues

suggest that the impact of technology may be highly dependent on the purpose for which it is used. Some existing research seems to indicate that there are benefits to using interactive devices for social purposes, if kept in moderation. Even recent research with young children shows that there may be benefits to social online activities, such as video chatting with grandparents. Based on these studies, the AAP has revised its recommendations for limiting young children's screen exposure by allowing video chat with relatives (Chassiakos, Radesky, Christakis, Moreno, & Cross, 2016; McClure, Chentsova-Dutton, Barr, Holochwost, & Parrott, 2015).

Self-Sufficiency Does Not Mediate the Effect of Interactive Technologies on Social Distance

Results from this study failed to provide evidence for the mediating role of self-sufficiency in the current sample. This lack of findings could stem from at least two reasons. First, the measure of self-sufficiency used in this study was adapted from Lammers and colleagues (2012), who used it with college students. Therefore, the measure is not yet validated for use with children. The items on this questionnaire are purposefully vague and general, and the child participants in our sample may have had difficulty grasping the meaning of some of the items. Indeed, several of the child participants asked the experimenter for clarification on some items from this questionnaire, and expressed difficulty in choosing answers. Unfortunately, there is no currently available measure for self-sufficiency that is validated for preadolescent children, perhaps because this is an understudied construct.

Despite this methodological limitation, realizing that preteens may have difficulty grasping the abstract and general items of this questionnaire is a valuable lesson for developmental psychologists designing age-appropriate measures of self-sufficiency for preteens. Children in 5th and 6th grade are still in the concrete operational stage of cognitive development (Piaget, 1970), and may not yet be skilled in understanding abstract self-reflective statements such as those on the self-sufficiency questionnaire.

The second plausible reason why the current study did not find significant mediation effects could be that constructs similar to self-sufficiency (e.g., personal power) were playing a role. Arguably, interactive technologies can increase individuals' sense of power and control, given the many and diverse functions these devices can serve during a single use. The association between an increased sense of power and social distance is well established in the social psychology research literature (e.g., Fiske, 1993; Galinsky, Magee, Inesi, & Gruenfeld, 2006).

Interactive technologies may also create social distance through other mechanisms. For instance, interactive technologies demand users' attention for multiple tasks, and often overwhelm individuals with information, notifications, and animations. As such, priming them may increase cognitive load (Edwards, Aris, Shukor, 2015) that may discourage individuals from engaging in situations that would require cognitive resources for initiating contact with a stranger, figuring out responsibilities, agreeing to a task's terms, and so on. All of these factors could lead children to endorse a preference for solitude during a problem-solving task.

Future research should test the self-sufficiency hypothesis with more age-appropriate measures of self-sufficiency. In these studies, investigators should also include measures of power and other possible mediators such as cognitive load to better understand the underlying mechanisms in the relationship between interactive technologies and social distance.

Self-Construal, but not Familiarity, Moderates the Effect of Interactive Technologies on a Collage Task

It was originally hypothesized that self-construal would moderate the association between the interactive technology prime and children's self-sufficiency. Instead, the results indicate that self-construal moderates the relationship between the interactive technology prime and children's social distance, and only on the collage task. It is possible that self-construal may have impacted

children's self-sufficiency, or a similar construct, but this possibility could not be evaluated in the present study, due to the lack of an age-appropriate measure of self-sufficiency.

The nature of the observed moderation effect was also different from what was originally hypothesized. Results indicate that priming interactive technologies makes children with independent (but not interdependent) self-construal less willing to engage with another child on the collage task, when compared to their counterparts in the non-tech condition. It was expected that children with independent self-construal would, by their nature, have a higher sense of independence than children with interdependent self-construal, and that the self-sufficiency impact of interactive technologies would not be able to make the former children any more self-sufficient and autonomous (i.e., there would be a ceiling effect for children with independent self-construal). Our finding suggest that instead of a ceiling effect, there may be a floor effect for children with an interdependent self-construal regarding their willingness to undertake tasks individually. In other words, our data suggest that children with interdependent self-construal are on average highly interested in engaging with another child, and priming interactive technologies does not seem to have enough power to alter their preferences and make them socially distant. This finding matches the existing understanding about individuals with interdependent self-construal and it goes along with the idea of cohesion and collectiveness that is imbedded in the definition of interdependent self-construal (Markus & Kitayama, 1991). Historically, individuals with interdependent self-construals are described as being less interested in differentiating themselves from others and more invested in connecting with others, especially those whom they consider significant (Bochner, 1994). Even with unacquainted others, individuals with higher relational-interdependence (a construct representing values of interdependence in individualistic cultures) are more open and responsive to needs and concerns of their partners, compared to individuals who have lower relational interdependence (Cross, Bacon, & Morris, 2000).

This finding makes our results even more important for preteens living in individualistic cultures, who primarily have independent self-construals, and suggests that these children may be especially vulnerable to the negative social impacts of interactive technologies. It is important to note that refraining from engaging in social interactions could translate to less practice with social skills and if chronic, could lead to impaired social development (Oden, 1980).

The present study also provides no support regarding the moderating role of familiarity with interactive devices on the association between the technology prime and children's self-sufficiency. Again, this null finding is expected because the mediational pathway of self-sufficiency is not significant.

Putting together the findings of the survey and the experimental part, the results from the present study suggests that technology may negatively impact children's learning of social skills both by displacing opportunities for face-to-face interactions with family and friends, and by making them prefer solitude over company, in certain situations.

Contributions

This study has important contributions and strengths. First of all, this research evaluates the effects of technology on children's social skills and preferences in preteens, an understudied age group. Although there are descriptive studies depicting the amount and nature of technology use in preteens (e.g. Rideout, 2015; Rideout, Foehr, & Roberts, 2010), these studies often group preteens with younger kids (ages 8 and 9) or teenagers (ages 12 and above). The patterns of younger and older children's technology use can be different from preteens and therefore, the current research fills a gap in the literature by specifically studying preadolescents. Moreover, while there is ample research on how technology and specifically online social activities such as texting and social networking relate to adolescents and college students' socioemotional wellbeing, little research has investigated how preteens are impacted by interactive technologies.

Studying preteens also informs pediatricians and practitioners about healthy vs. unhealthy doses of interactive technology use for this specific age group, which can help them provide more research-informed guidelines. Research such as this can also help parents set appropriate rules regarding media use and promote the development of a healthy and balanced technology diet that continues through their child's adolescent and young adulthood years.

Furthermore, our finding regarding technology use and reduced face-to-face interactions with family and peers contributes to our understanding that children's technology use is associated with family dynamics and suggests new patterns of social development. This is in line with the predictions of Greenfield's social change and human development theory, which argues that advancement in technology, together with urbanization, commerce, and formal education, increases children's independent practices, rather than community-oriented ones, and encourages individualistic values (Uhls & Greenfield, 2012). Greenfield's theory (2009) and the current findings each highlight that studying social change related to technology advancements can inform developmentalists about new ways that today's children and youth are socialized and provide a more context-relevant understanding of child development.

Above all, perhaps the main contribution of this study is that it is the first study to my knowledge to investigate the impact of interactive technologies on social distance. It is also one of very few studies on this topic to use a priming technique to understand immediate situational consequences. Another advantage of this study is that it examines this phenomenon with a cultural lens and demonstrates differences in the susceptibility of children from different cultural backgrounds to interactive devices. Considering that many parents are concerned about the social implications of technology (73.5% in our sample), this study should be only the beginning of a long series of studies aimed at identifying how exactly technology plays a role in today's children's social behavior.

This study also contributes to the self-construal literature by validating the Twenty Statement Test in a preteen sample. Our data also confirm that individuals with a collectivist background use more "collective" self-descriptions and individuals with an individualistic background use more "personal" self-descriptions. The fact that many European-American children in our sample used some collective self-descriptions also supports the pan-cultural view of the self which suggests that individuals have complex selves (Bochner, 1994). Many individuals who come from an individualistic background describe themselves using collective terms, and many individuals with collectivist background use private self-descriptions. The difference is in the emphasis that cultures place on these components and the value they ascribe to them (Bochner, 1994).

Limitations and Future Directions

This study also has limitations that should be considered. The first limitation is the study's relatively small sample size. Due to recruitment difficulties, it was not possible to obtain the expected sample size, which may have affected the study's power to detect some small and medium effects. This being said, the experiment has sufficient power ($\alpha = .66$).

A second limitation is that the survey did not ask about the content of children's technology use in detail and as reviewed above, content can make a difference regarding whether or not technology interferes with family interactions. For instance, research by Mesch (2006) shows that parents of preteens consider that time spent on social networking sites such as Facebook is problematic for family interactions, but educational use of technology is not. Because longer questionnaires could increase participants' fatigue and jeopardize the quality of their answers, the current study focused on identifying the extent of only social online activities (i.e., texting, social networking, and talking/video chatting) and not others (such as video game playing, TV viewing, etc.). This decision was also informed by the study's hypotheses. So while identifying the content

with which children are engaged would have been informative, it was not a focus in this research. Future research should look more closely into how different uses of technology relate to the quantity of face-to-face interactions with family members and peers. In this research, researchers should also take a task-oriented approach, as opposed to a device-based one. In other words, researchers should aim to find out the amount of time individuals spend on different online activities (e.g. texting, social networking, etc.) regardless of the device they engage with for these and other purposes. This is because interactive devices have become so multifunctional that they have blurred the boundaries between devices. As a matter of fact, individuals can check their Facebook notifications even by looking at their watch or pedometer!

A third limitation is that the measures of the amount of technology use evaluated in this study were based on self-report. Considering the number of hours that individuals spend on digital devices today, self-report may not provide as precise and reliable data as one would like. It is even harder to determine the number of hours spent on every online activity (such as social networking, texting, homework, etc.) using self-report, so participants were not asked to provide such details in the current study. Although this study and the majority of studies looking at technology use habits have primarily used self-report measures, either by using media diaries or surveys similar to that used in the present study (see Subrahmanyam & Smahel, 2010), future research should aim to utilize software that records the amount of interactive technology use to provide better and more accurate estimates of technology time. This is an area that has received attention from some scholars of the field, but the method has downsides such as data overload, and issues of privacy and ethical concerns.

A fourth limitation is that the amount of face-to-face interactions was measured using a relatively crude question. Even though this question was derived from prior research (Pea et al., 2012), a more concrete and well defined measure might have yielded stronger results. For instance,

some parents wondered whether they should consider their child's sports practices as "face-to-face" or not. A more specific measure of face-to-face interactions could require more cognitive resources and increase response time, but it could potentially yield more precise results.

A fifth limitation is that the priming experiment was not conducted in the highly controlled environment of a laboratory. Instead, it was conducted in quiet and less crowded areas of local public libraries or in a private room in a school. Although efforts were made to avoid potential distractors, the environment was not as controlled and ideal as that in a laboratory. This being said, the fact that the results of this study demonstrated a meaningful impact of condition despite the distractors speaks to the strong effect of interactive technologies on social distance.

Another limitation of our experiment was that our control condition did not fully filter exposure to technology, as some child participants wrote about their technology-related plans for the day and essentially self-primed themselves. To avoid this, future research should consider using a control condition that would not allow any discussion of technology. On a similar note, few child participants used their digital devices (e.g. music players) until minutes prior to starting the priming procedure, and this could have impacted our findings. In other words, some participants in the control condition might have still been primed by interactive technology due to their exposure up until the experiment time. Given how strongly attached preteens are to their devices, children were not asked to stop using their electronics before the study meeting time, because doing so could have created some negative affect. This could also focus children's attention on interactive technologies and contaminate the results. Thus, children's pre-study engagement in technology was treated as a random and uncontrolled variable. Future research should consider running this experiment in a more controlled lab environment, where there are fewer distractors, and time permitting, add a filler task in the beginning of the experiment to help cancel out the effects of prior exposure to technology.

Another limitation of our experimental findings relates to their generalizability. The fact that the social distancing effect of interactive technology was only observed on the collage task, and not the other three tasks, may indicate that only certain tasks are impacted by interactive technologies, and that our results do not generalize to all activities and situations that proceed interactive technology use. Perhaps the type of task (i.e., whether it is social in nature or not), its flexibility (i.e., whether it has right and wrong answer vs. being subjective), and the person's prior preference for how they enjoy engaging with it, impacts whether it is sensitive to the effect of interactive technologies.

In addition to addressing the limitations of the current research study, future research can test the immediate consequences of interactive technology use with samples of younger and older children as any effects on social interactions and preferences may have important consequences for children's social development. Notably, preschool and elementary school years are important developmental points for finding confidence in one's ability to pursue personal interests while taking into account the needs of others and rules of the environment (Erickson, 1950). Insufficient or compromised social competencies can lead to feelings of inferiority and feelings of incompetence in regard to social roles and peer interactions, and also jeopardize academic success (Caprara, Barbanelli, Pastorelli, Bandura, & Zimbardo, 2000; Malecki & Elliot, 2002; Wentzel, 1993), not to mention long-term costs for one's personal and professional lives (Ten Dam & Volman, 2007; Elias et al., 1997).

Implications

Findings of the current study suggest that interactive technologies can have unintended and negative social consequences. The more pronounced part of the results came from the priming experiment which suggests that simply thinking (and writing) about interactive devices may make preteens more likely to withdraw from social interaction and be less interested in engaging with

other children on certain tasks. Now one may ask why it is so important that a child would prefer solitude over the company of a stranger. How can engaging with a stranger be beneficial? Indeed, people often underestimate the importance of casual social interactions for wellbeing (Epley & Schroeder, 2014), even though they are particularly powerful in impacting some of the core psychological human needs, i.e., sense of relatedness (Ryan & Deci, 2000; Fiske, 2014; Ryff, 1989). For instance, research shows that individuals who were instructed to engage in a friendly conversation with the barrister in a coffee shop felt higher sense of relatedness than individuals who efficiently ordered their food (Sandstrom & Dunn, 2014). Similarly individuals who were assigned to initiate a conversation with a stranger on the bus felt happier and found their commute more pleasant than those who were asked to behave as they normally would (Epley & Schroeder, 2014).

Putting together the findings of these studies with that of the current research, using interactive technologies may compromise individuals' opportunities for satisfying their need for relatedness and boosting their wellbeing. Two studies by Kushlev (2015) confirm our claim by a) showing that individuals who waited in a room while having access to their phones had less sense of general connectedness than those who waited without their phones (study 4) and b) demonstrating that conversing with a partner in the presence (vs. absence) of one's smartphones caused lower mood (study 3).

Extending our findings to the home environment, findings of the survey and experimental sections of our research has important implications for family closeness and warmth, as technology is not just used by preteens. According to Pew Research Center, the majority of U.S. adults are smartphone and computer users and nearly half of all Americans own tablets (Anderson, 2015). This means that family members spend considerable portion of their time with screens. Putting our findings in this context, it seems that technology may be playing the role of a double-edged sword

by acting on both sides of family relationships (i.e., parent and child; child and his/her siblings), in making them less interested in disengaging from a screen and connecting with a family member. Given the importance of family closeness for members' wellbeing, it is critical that such negative consequences of interactive technologies are uncovered and acted upon. Counsellors and family therapists would also benefit from our results when trying to improve family warmth. These findings can also inform AAP policy makers about the social correlates and consequences of interactive technology use and help them design appropriate guidelines for children and families.

Knowing that technology is now deeply ingrained in lives of families, and that it gets harder and harder to separate it from individuals, our findings highlight the importance of designing apps that bring family members together and encourage social interactions. Research by Kushlev (2015, study 2) indicates that technology can effectively provoke feelings of connectedness in individuals when it is used toward better connecting with a physically present social partner (e.g., finding the next science demo when at a museum with your child). Therefore, the right use of technology has the potential to counteract its negative consequences and improve feelings of relatedness and closeness.

In addition to the home environment, a context that our findings apply to is schools. Over the last two decades, there has been a profound investment on imbedding technology into school curriculums in hopes of improving academic outcomes (Lim, Zhao Tondeur, & Tsai, 2013). Indeed technology is highly effective in promoting better and deeper understanding through engaging students in the topic, allowing them to research information and tie them to previous learnings, and essentially helping them take an active role in their learning (see Kozma, 2003; Law, Pelgrum, & Plomp, 2008). Our study, however, suggests that there may be some unintended social implications to interactive technology use. For instance, interactive technologies may discourage team work by creating social distance. This will limit opportunities for peer learning, and learning

of problem solving skills, negotiation, and critical evaluation and analysis. Furthermore, students' lack of interest in working together will cause increased hassle and challenge for teachers who work hard to promote group work. This being said, further research is needed to confirm whether interactive devices lead to social distance in the context of classrooms, where students are paired with familiar classmates (rather than strangers), and whether the possible lack of interest in engagement with others is threatening to students' learning, given the strengths of technology in education.

This research also has important methodological implications for studies using interactive technologies as their prime, independent variable, or even the medium to collect participants' responses. Many online studies, including all Mechanical Turk (Mturk) studies, are conducted on interactive devices such as laptops, tablets, and smartphones. Knowing that interactive technologies have the potential to increase social distance can help researchers make more informed decisions about the measures and platforms that suit their research topic and design.

In closing, if nothing else, one goal of this research was to begin a discussion about the social consequences of engaging with interactive technologies that are now so deeply imbedded in lives of today's generation and to better address their repercussions for children's social skills development. This is an important area of research and future work should attend to the social consequences of technology use, including understanding its immediate impacts, while continuing to uncover the educational and cognitive advantages of interactive devices.

Table 1

Sample Characteristics (N=79)

Measures	*n* (%)	*M* (*SD*)
Child's Sex - *n* (% Female)	46 (58.2)	
Child Age (years)		11.21 (.79)
Child Ethnicity/Race - *n* (% White)	45 (57)	
Child Psychological Wellbeing - *n* (% diagnosed with a developmental disorder)	9 (11.4)	
Marital Status - *n* (% Married)	73 (92.4)	
Maternal Education - *n* (%)		
Less than high school	3 (3.8)	
High school graduate	2 (2.5)	
Some college	8 (10.1)	
4-year college degree	23 (29.1)	
Master's or Professional degree	25 (31.6)	
Doctorate or Post Doctorate	18 (22.8)	
Paternal Education - *n* (%)		
Less than high school	3 (3.7)	
High school graduate	3 (3.7)	
Some college	12 (15.18)	
4-year college degree	25 (31.64)	
Master's or Professional degree	24 (30.37)	
Doctorate or Post Doctorate	18 (22.78)	
Only Children - *n* (%)	4 (5.1)	
Living with Extended Family - *n* (%)	17 (21.5)	
Total Family Income - *n* (%)		
< $24,999	0	
$25,000 - $49,999	9 (11.4)	
$50,000 - $74,999	6 (7.6)	
$75,000 - $99,999	12 (15.2)	
$100,000 - $149,999	23 (29.1)	
> $150,000	29 (36.7)	
Parents Concerned about Technology's Social Impacts - *n* (% Somewhat or More Concerned)	58 (73.5)	

Table 2

Children's Technology Profile (N=79)

Measures	*n* (%)
Children's Daily Interactive Technology Use	
Zero minutes	1 (1.3)
Less than 1 hour	13 (16.5)
About 1 hour	23 (29.1)
About 2 hours	18 (22.8)
About 3 hours	9 (11.4)
About 4 hours	8 (10.1)
5 hours or more	7 (8.9)
Devices Owned by Children	
Smartphone	35 (44.30)
Tablet	52 (65.82)
Computer/Laptop	39 (49.36)
Small Personal Computer	26 (32.91)
Small Handheld Game Playing Device	20 (25.31)
Video Game Console	41 (51.89)
MP3 Player	7 (8.86)
Children's Texting Frequency	
Every day	22 (27.8)
A couple of days a week	17 (21.5)
One or two days a week	8 (10.1)
A few times a month	6 (7.6)
Once a month	1 (1.3)
Less than once a month	6 (7.6)
Never	19 (24.1)
Children's Social Networking Frequency	
Every day	6 (7.6)
A couple of days a week	10 (12.7)
One or two days a week	8 (10.1)
A few times a month	5 (6.3)
Once a month	3 (3.8)
Less than once a month	5 (6.3)
Never	42 (53.2)
Children's Oral communication via Technology Frequency	
Less than 5 minutes	37 (46.8)
5 - 30 minutes	32 (40.5)
1 - 2 hours	5 (6.3)
2 - 3 hours	3 (3.8)
More than 3 hours	2 (2.5)
*Children's Main Way of Interaction with Peers	
Always in-person (face-to-face)	14 (17.7)
Mostly in-person (face-to-face)	32 (40.5)
Sometimes in-person and sometimes via technology	31(39.2)
Mostly via technology	2 (2.5)
Always via technology	0
*Children's *Preferred* Way of Interaction with Peers	
In-person (face-to-face)	67 (84.8)
Technology-mediated (e.g., texting, social networking)	4 (5.1)

Parent was not sure	8 (10.1)

* Parent Report

Table 3

Children's Social Profile (N=79)

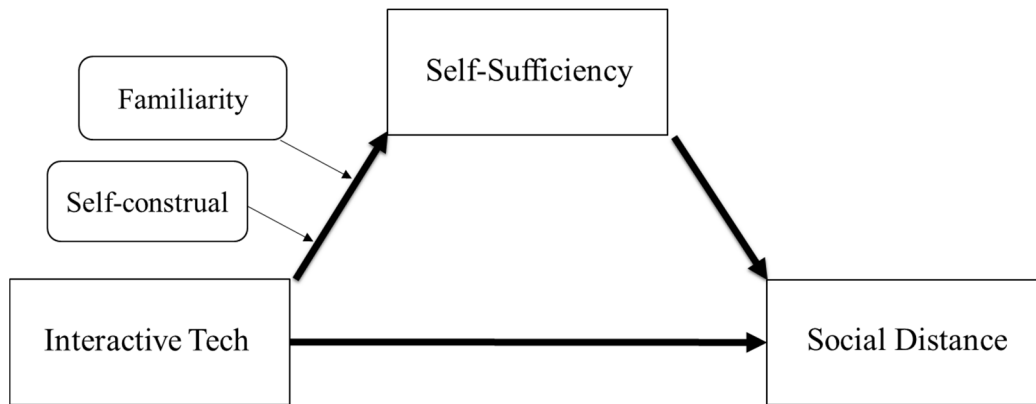| Measures (parent report)	*n* (%)	*M* (*SD*)
Child's General Interest in Social Interaction - *n* (% who Enjoy Somewhat or a Lot)	79 (100)	
Amount of Face-to-Face Interaction on Weekdays - *n* (% 2-3 Hours per Day or Less)	52 (65.82)	
Amount of Face-to-Face Interaction on Weekend - *n* (% 3-4 Hours per Day or More)	66 (83.54)	
Number of Child's Best Friends		2.5 (1.6)
Number of Child's Other Friends		6.5 (4.4)

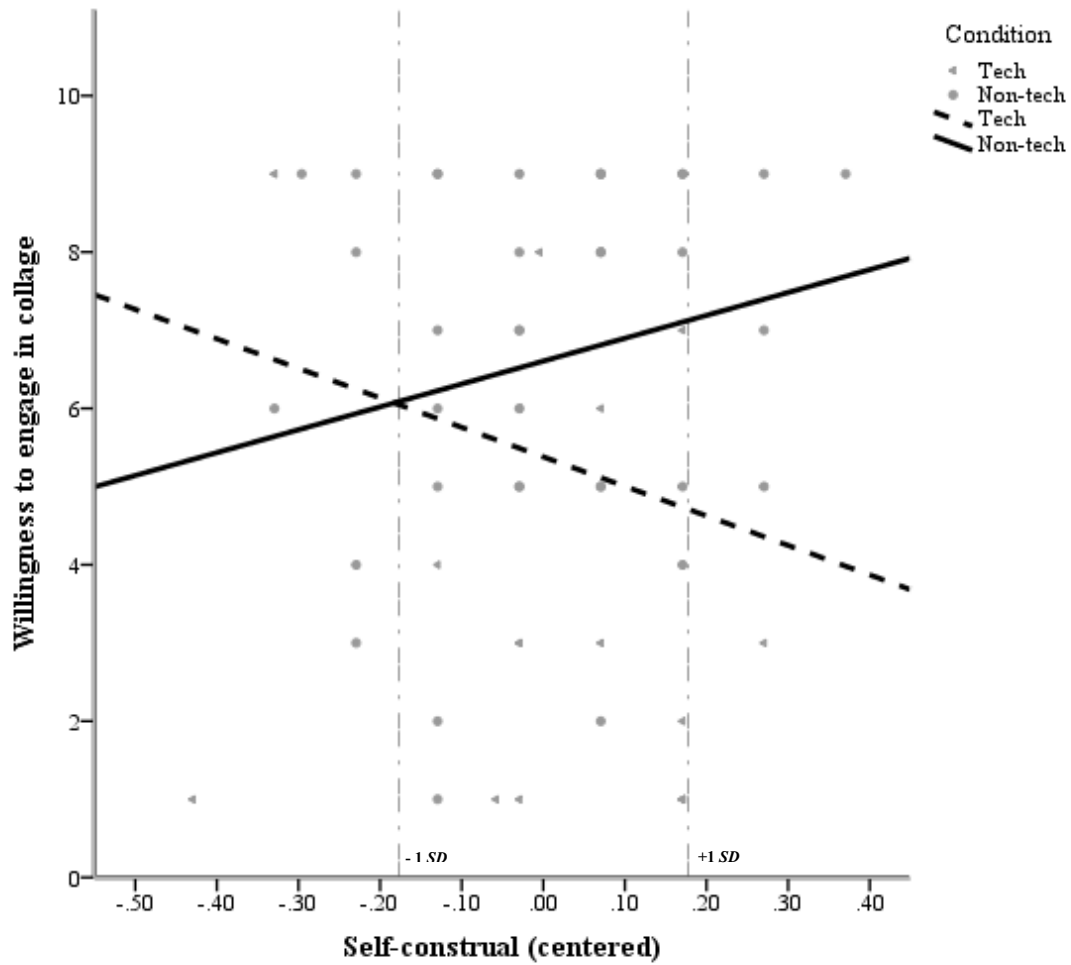*Figure 1*. The conceptual model of Part 2 of the present study.

Figure 2. Self-construal moderates the effect of interactive technology prime on children's willingness to engage with others on the collage task.

APPENDIX: PARENT SURVEY

In this study we are interested in learning about your child's technology habits and other related concepts. Please answer all question in regard to the child who is participating in this study. It is really important to us that you answer every question.

Background Questionnaire

1. What is your child's gender?
○ Boy
○ Girl

2. What is your child's date of birth?
Month …….…....   Day…….……   Year …….……

3. What is the ethnicity of your child?

○ White/Caucasian
○ African American/Black
○ Hispanic-Latino/a
○ American Indian or Alaska Native
○ Asian
○ Native Hawaiian or Pacific Islander
○ Middle Eastern
○ Bi-racial or Multi-racial
○ Other

4. Does your child suffer from depression, anxiety, autism, attention deficit disorder, or other psychological or emotional problems of any kind?

○ No
○ Yes. Please write here _____

5. What is your relationship to your child?

○ Mother/mother figure
○ Father/father figure
○ Grandmother
○ Grandfather
○ Other (please type) _____

6. Choose your age category.

- ○ 18 - 25
- ○ 26 - 30
- ○ 31 - 35
- ○ 36 - 40
- ○ 41 - 45
- ○ 46 - 50
- ○ 51 - 55
- ○ 56 - 60
- ○ > 60

7. What is your education level?

- ○ Less than high school
- ○ High school graduate
- ○ Some college
- ○ 4-year college degree
- ○ Master's or Professional degree
- ○ Doctorate or Post Doctorate

8. What is your occupation?

Please write here…………………………………

9. What is your ethnicity?

- ○ White/Caucasian
- ○ African American/Black
- ○ Hispanic-Latino/a
- ○ American Indian or Alaska Native
- ○ Asian
- ○ Native Hawaiian or Pacific Islander
- ○ Middle Eastern
- ○ Bi-racial or Multi-racial
- ○ Other

10. What is your marital status?

- ○ Single, never married
- ○ Married or living with partner
- ○ Separated
- ○ Divorced
- ○ Widowed

11. How many parents live with your child?

○ One parent -- *Choose "Not applicable" for Question 12*
○ Two parents

12. What is the education level of the other parent?

○ Not applicable
○ Less than high school
○ High school graduate
○ Some college
○ 4-year college degree
○ Master's or Professional degree
○ Doctorate or Post Doctorate

13. Do extended family members or other adults live in your child's home?

○ Yes
○ No

14. Does your child have any siblings?

○ Yes
○ No -- *Skip to Question 16*

15. Indicate the gender and write the age(s) of your child's sibling(s).

	Gender		
	Boy	Girl	Age
Sibling # 1	○	○	
Sibling # 2	○	○	
Sibling # 3	○	○	
Sibling #4	○	○	
Sibling #5	○	○	
Sibling # 6	○	○	

16. What is your family's total annual income?

○ Less than $24,999
○ $25,000 - $49,999
○ $50,000 - $74,999
○ $75,000 - $99,999
○ $100,000 - $149,999
○ More than $150,000

Child Social Interactions

The following questions are about your child's social network and social interactions.

17. How many *best* friends does your child have (outside those living in his/her house)? (Best friends are typically those with whom your child shares personal and intimate information).

Please write here ……………….

18. How many *other* friends does your child have, besides his/her best friends? (Other friends are simply friends that your child hangs out with). DO NOT include your child's best friends in this group. If your child only hangs out with his/her best friends, please write zero.

Please write here ……………..

19. In general, how much does your child enjoy social interactions?

❍ Not at all
❍ A little
❍ To some degree
❍ A lot

20. Today, children interact with others in different ways, for instance in person (face-to-face) and via technology or media devices (for example, through texting, social networking sites, etc.). What is the main way that your child interacts with his/her friends? In person (face-to-face interaction) or via technology?

❍ Always in person (face-to-face interaction)
❍ Mostly in person (face-to-face interaction)
❍ Sometimes in-person and sometimes via technology
❍ Mostly via technology
❍ Always via technology

21. What is your child's *preferred* way of interacting with his/her friends? (Assume both options are available)

❍ In-person (face-to-face interaction)
❍ Technology-mediated interaction (for instance via text messages, social networking sites, etc.)
❍ I don't know

22. On a **TYPICAL WEEKDAY,** how much time does your child spend interacting with his/her family members and friends **face-to-face** (without using digital devices**)? After school time only**

- ❍ Less than 1 hour
- ❍ About 1 - 2 hours
- ❍ About 2 - 3 hours
- ❍ About 3 - 4 hours
- ❍ More than 4 hours

23. On a **TYPICAL WEEKEND DAY**, how much time does your child spend interacting with his/her family members and friends **face-to-face (without using digital devices)?**

- ❍ Less than 1 hour
- ❍ About 1 - 2 hours
- ❍ About 2 - 3 hours
- ❍ About 3 - 4 hours
- ❍ About 5 - 6 hours
- ❍ About 6 - 7 hours
- ❍ More than 7 hours

24. In general, how concerned are you that technology would have a negative effect on your child's social skills?

- ❍ Not at all
- ❍ Very little
- ❍ Somewhat
- ❍ Quite a bit
- ❍ Very much

Child Technology use

The next set of questions are regarding your child's technology habits and some related concepts.

25. Thinking about **LAST WEEK**, how often did your child interact with the following devices?

	5 - 7 days a week	3 - 4 days a week	1 -2 days a week	Zero days
Smartphone (any phone that connects to the Internet and has apps installed on it; like iPhone, Nexus)				
Small Personal Computers (like iPod Touch or other similar devices)				
Tablet (like iPad, Amazon Fire, Kindle, Surface, Nook)				
Laptop or computer				
Handheld game playing device (like PSP, Nintendo 3DS)				
Video game console (any game playing device that hooks up to the TV like Wii or Xbox)				
TV				
DVD, VCR, Blu-Ray player				
Digital TV recorder such as TiVo or other DVR				
MP3 Player device (like iPod Shuffle or iPod Nano)				

26. How many of the following devices are actively used in your child's house?

	0	1	2	3	4	5	More than 5
Smartphone (like iPhone, Nexus)							
Small Personal Computers (like iPod Touch)							
Tablet (like iPad, Amazon Fire, Kindle, Surface, Nook)							
Laptop or computer							
Handheld game playing device (like PSP, Nintendo 3DS)							
Video game console (like Wii or Xbox)							
TV							
DVD, VCR, Blu-Ray player							
Digital TV recorder such as TiVo or other DVR							
MP3 Player device (like iPod Shuffle or iPod Nano)							

Child Temperament

27. Below are few statements that people might use to describe their child. For each statement, please put a "**X**" in the box that best describes how true each statement is <u>for your child.</u> There are no best answers. People are very different in how they feel about these statements. Please circle the first answer that comes to you.

Your daughter/son:

	Almost always <u>UNTRUE</u>	Usually <u>UNTRUE</u>	Sometimes <u>true,</u> sometimes <u>untrue</u>	Usually <u>TRUE</u>	Almost always <u>TRUE</u>
1. Likes taking care of other people.					
2. Likes to be able to share his/her private thoughts with someone else.					
3. Would like to be able to spend time with a good friend every day.					
4. Enjoys exchanging hugs with people s/he likes.					
5. Wants to have close relationships with other people.					
6. Is quite a warm and friendly person.					

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ABSTRACT

PRETEENS' ENGAGEMENT WITH TECHNOLOGY: IMPLICATIONS FOR FACE-TO-FACE INTERACTIONS, SOCIAL SKILLS, AND SOCIAL DISTANCING

by

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Interactive technologies are widely accepted as important communication tools. This said, they may not function the same way for all age groups. Preteens, for instance, spend a considerable amount of time with media devices, however their interactions involve little social content. Therefore, for preteens, engagement with technology may create a social disconnect. This can happen in at least two ways. 1) Interactive technologies may displace face-to-face interactions with individuated screen time. 2) Interactive technologies may create social distance by making individuals independent of other people and devices. To address the social correlates and the situational consequences of interactive technology use among preteens, the present research utilized survey and experimental design. Results of the survey indicated that preteens who spend more time with interactive technologies have fewer face-to-face interactions with their family members and friends. Experimental findings of this research provided preliminary support for interactive technologies potential to bolster social distance. Specifically, it was found that priming interactive technologies increases children's preference for solitude, as evidenced by less willingness to engage with another child on a collage task. Analyses also demonstrated that children from individualistic cultures who hold independent self-construal are more susceptible to

the social distancing effect of interactive technologies, than children with collectivist background, who have interdependent self-construal. Results of this research help address pediatricians', developmentalists', and parents' concerns regarding social consequences of interactive technology use for children. The significance of findings for social development, family dynamics, education, and research design are discussed in detail.

AUTOBIOGRAPHICAL STATEMENT

Mahya is a PhD candidate in the Cognitive, Developmental, Social Psychology program at Wayne State University. She started her undergraduate studies at the University of Tehran, Iran, in 2006. She later pursued part of her studies at York University, Canada, and moved to Michigan to complete her undergraduate education. In 2011, she graduated Summa cum Laude from Eastern Michigan University with a B. A. in Psychology. Prior to her doctoral studies, she worked on multiple child development projects at the University of Michigan. In 2012, she started her doctoral studies at Wayne State University. Mahya received her Master's degree in developmental psychology in 2015. She also minored in Instructional Technology. In her research, Mahya draws on literature in developmental and social psychology to investigate the socioemotional implications of interactive technology use for the digital generation.