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**Parent Perceptions of Adolescent Technology Use: Implications for the Parent-
Child Relationship**

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A Dissertation Submitted to The Graduate School at the University of Missouri – St.

Louis in partial fulfillment of the requirements for the degree

Doctor of Philosophy in Education with an emphasis in Counseling

December 2022

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Abstract

Technology and social media use are now more popular than ever with adolescents. Problematic technology use has often been associated with decreased mental health and relationship quality. Researchers have typically identified problematic technology use by time spent on a device rather than in an interpersonal context. Phubbing and technoference are two constructs that describe how technology use can potentially be disruptive to in-person interactions. Little research has investigated technology use in the context of the parent-child relationship despite reports from parents that technology use is a frequent source of conflict. Through the theoretical frameworks of Bronfenbrenner's neo-ecological model and structural family therapy, the two studies in this dissertation sought to increase knowledge of the phenomenon of adolescent technology use within the parent-child relationship, from the perspective of parents. Connectedness, shared activities, and hostility were aspects of the parent-child relationship explored in these studies. Study 1 ($n = 749$) investigated whether conflict over technology mediated relationships between technology use behaviors and qualities of the parent-child relationship. Results were mixed as conflict over technology served as a significant mediator in some models, including between phubbing and connectedness and between technoference and hostility. Significant mediation did not occur in all tested models, and some directions of relationships differed from what was hypothesized. Parents often utilize technology mediation strategies as part of their parenting style. Different strategies have varying effects on adolescent technology use behaviors, but few studies have explored the implications of these mediation strategies for the quality of the parent-child relationship. Study 2 ($n = 749$) investigated whether the technology mediation strategies

of non-intrusive inspection and active mediation moderated relationships between technology use behaviors and qualities of the parent-child relationship. Results indicated that non-intrusive inspection served as a significant moderator in some models, including between phubbing and connectedness and between phubbing and hostility. Active mediation served as a significant moderator in some models, including between phubbing and shared activities and between technoference and connectedness. Results of Study 2 were mixed as the technology mediation strategies did not significantly moderate all tested models. Limitations and implications of both studies are discussed.

Keywords: Technology, Social Media, Phubbing, Technoference, Adolescence, Parent-Child Relationship

Acknowledgments

First, I would like to thank my committee members, Dr. Susan Kashubeck-West, Dr. Mary Edwin, and Dr. Emily Oliveira. Thank you for your time and your support during this dissertation process. I admire each of you greatly, and I am so grateful for your wisdom and feedback on my work. I would especially like to thank my committee chair, Dr. Emily Brown. Thank you for your patience and understanding with me, your kind words, and your helpful feedback. I am grateful that I had such an excellent counselor educator to guide me through this long and stressful process. Thank you to all of the counseling faculty – you all have taught me so much about how to be a better counselor, supervisor, teacher, researcher, and person, and I would not have been able to complete this dissertation without the knowledge I have gained from your courses and mentorship.

Thank you to my partner, Aaron, for your unwavering support during my time in the PhD program and especially during the dissertation process. You have been my biggest cheerleader since the very beginning, and your confidence in me never wavered even when I did not feel confident in myself. Thank you for loving me. I could not have done this without you.

Thank you to my family for your endless support, especially from my parents. I am so blessed that you have always encouraged me to go after my dreams. I would not have finished this dissertation without your support throughout my entire life and academic career. Thank you to my friends who always provided encouragement, support, laughter, and fun (and food). Finally, thank you to all of my friends and peers from the counseling program. Going through this same journey together made it so much better.

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Section 1

Introduction

Through the theoretical lenses of Bronfenbrenner's neo-ecological theory (Navarro & Tudge, 2022) and structural family therapy (Minuchin, 1974; Murphy et al., 2013), the following studies broadly explored the implications of adolescent technology and social media use behaviors for the parent-child relationship. Technology use, namely social media, has become part of daily life for most individuals in the United States. Adolescents in particular are heavy social media users (Anderson & Jiang, 2018), and social media has in recent years become an integral part of adolescent culture and identity development (Duffy et al., 2019). While there are documented benefits of adolescent social media use, including more connections for individuals from marginalized communities (McInroy et al., 2019) and destigmatization of mental health issues (O'Reilly et al., 2018), excessive social media use has also been associated with increased rates of mental health concerns including depression (e.g., Coyne et al., 2020) and anxiety (e.g., Barry et al., 2017). Mental health professionals, especially those who counsel children and adolescents, are almost certain to encounter clients who use social media on a daily basis. Additionally, counselors with clients who are parents of adolescents as well as family therapists who work with families that include adolescents are likely to encounter issues related to technology use by family members. The goal of these studies was to increase knowledge of the complex phenomenon of technology and social media use within the parent-child relationship in order to better inform mental health professionals on how to serve adolescents and families experiencing technology-related conflict and distress.

Technology and Social Media Use

It is important to note that technology and social media use are not inherently detrimental to mental health or overall well-being; not all types of technology use are created equal, and various patterns of technology use have been differentially associated with well-being outcomes. Furthermore, it is crucial that mental health professionals avoid fearmongering regarding the so-called “dangers” of technology use and instead choose to take a balanced approach informed by empirical evidence. Past research on technology and social media has largely operationalized use in terms of time spent; in other words, “excessive” time spent has been the greatest source of concern to researchers. However, many studies have not found a strong connection between time spent on social media and negative mental health outcomes (e.g., Berryman et al., 2018; Coyne et al., 2020). Attempting to measure problematic technology and social media use by time spent ignores two important components that may more significantly influence well-being outcomes: (1) the specific type(s) of activity occurring during technology use time and (2) how those activities may impact “real-life” interpersonal relationships. These studies explored the latter question in the context of the parent-child relationship.

Because technology like social media is so pervasive in the lives of adolescents and adults in the US (Anderson & Jiang, 2018), one can fairly assume that technology use is frequently happening in the company of family members. Rather than attempt to measure time spent using technology, I instead measured the more specific constructs of “technoference” (McDaniel et al., 2015) and “phubbing” (Roberts & David, 2016) which describe technology use in terms of disruption to interpersonal relationships. “Technoference,” a combination of “technology” and “interference,” describes how

technology use of any kind can interfere in a personal relationship (McDaniel et al., 2015). “Phubbing,” a combination of “phone” and “snubbing,” specifically describes how smartphone use can interfere with in-person communication and relationships (Roberts & David, 2016). These behaviors happen frequently and have been associated with detrimental effects to close personal relationships, including lower communication quality (Chotpitayasunondh & Douglas, 2018), lower satisfaction with time spent together, more conflict, and lower relationship quality (McDaniel et al., 2021; McDaniel & Coyne, 2016). In addition, adolescent phubbing and technofence have been studied with respect to friendships but have not yet been explored within the context of the parent-child relationship. By focusing on phubbing and technofence behaviors from adolescents, these studies provide a more comprehensive picture of technology-related conflict and distress in the parent-child relationship when compared to studies who have only measured time spent using technology.

Parent-Child Relationship

Within the family system, adolescents are at a unique developmental crossroads in which they are separating from their parents’ influence and relying more on the influence of their peers. Social media has now become an important space for adolescents to find support and connection with peers and to engage in the process of identity development (e.g., Bates et al., 2020; Lee et al., 2020). However, adolescents are still greatly impacted by the quality of the parent-child relationship and overall family functioning (e.g., Chen & Harris, 2019; Stafford et al., 2016). Lower quality of the parent-child relationship has been associated with increased depression (Branje et al., 2010), lower psychological well-being (Stafford et al., 2016), and higher rates of substance use (Carver et al., 2017).

Parents of adolescents also report frequent conflicts over their adolescent's smartphone and social media use (Davis et al., 2019) which may increase stress on the parent-child relationship. The first study described in this paper explored the complex relationships between parent perception of adolescent phubbing and technofence, conflict over technology, and the quality of the parent-child relationship.

The potential connections between adolescent technology use and the parent-child relationship are further complicated by the variety of parenting strategies employed by caretakers. Parenting strategies, including the traditional authoritarian, authoritative, and permissive approaches (Baumrind, 1967), have important implications for adolescent development. Modern parents are faced with the difficult question of how to effectively mediate their adolescent's use of new technology and social media that they may not fully understand. Parental mediation of technology can be viewed as a specific aspect of parenting, and much like parenting style, mediation strategies can vary dramatically across families. The second study described in this paper addressed this gap by investigating the relationships between parent perception of adolescent phubbing and technofence, parental mediation of technology, and parent-child relationship quality.

Parent Perceptions

It is important to note that these studies surveyed parents (or other primary caretakers) of adolescents regarding their perspectives of these variables. While parents cannot provide a complete picture of how technology use emerges within their family relationships, their perspective is uniquely valuable in understanding this phenomenon. Qualitative researchers have found that many parents struggle with how technology use disrupts their family relationships, and they are seeking additional information on how to

most appropriately mediate technology use (Davis et al., 2019). Gaining parents' insights into their own family relationships and the impact of their parenting is useful to mental health practitioners who may counsel parents and families coping with technology-related stress. Future research to explore both parent and adolescent perspectives on technology use will provide deeper insight.

Theoretical Lenses

These two studies were developed using the lenses of Bronfenbrenner's neo-ecological theory (Navarro & Tudge, 2022) and structural family therapy (Minuchin, 1974). The neo-ecological theory revisits Bronfenbrenner's (1977) classic theory of human development which conceptualizes an individual's existence within their social contexts, both immediate and broad. Because modern adolescents and adults spend significant amounts of time on social media, the neo-ecological theory inserts the virtual world into this framework. One might conceptualize the virtual and in-person microsystems, for example, as a Venn diagram with significant crossover with one another. I hypothesized that when the virtual and in-person systems are not appropriately in balance, behaviors of phubbing and technoference can occur, subsequently negatively impacting in-person relationship quality. Additionally, the virtual systems of development are especially important to adolescents; in contrast, virtual systems may not be as significant for their parents. Differences in engagement with and understanding of this virtual world may lead to conflict; additionally, differences in opinion regarding the ideal balance of the virtual and in-person systems may be another source of conflict between parents and children. In essence, the neo-ecological theory is relevant to the

development of these two studies as it posits that technology and social media intersect significantly with “real life” interpersonal interactions.

These studies are also informed by structural family therapy (Minuchin, 1974) which provides an additional framework for how technology use may lead to distress in the family system. Structural family therapists look broadly at the family system (or structure) to understand family distress rather than pathologizing the behavior of any particular family member. The entire family system is paramount to this analysis, but sub-systems such as the parent-child relationship are also seen as relevant to the functioning of the family. Essentially, distress is thought to happen when the family system (or a sub-system) is not fully functional in some way. For example, dysfunction may occur through poor communication, frequent conflicts, lack of cohesion, or lack of boundaries. I hypothesized that each of these outcomes could occur as a result of technology use from any member of the family. With respect to the parent-child system in particular, poor boundaries around technology use (e.g., too little or too much regulation) may additionally lead to conflict and distress in the family unit. Together, the neo-ecological theory and structural family therapy provided a theoretical grounding for the overall hypotheses that technology use behaviors of phubbing and technoference would be detrimental to the parent-child relationship.

Importance to the Counseling Profession

These studies will eventually be submitted to the journal *Psychology of Popular Media*, an American Psychological Association journal that includes research on how people are impacted by technology and social media. This journal is generally accessible to a variety of mental health professionals including counselors, psychologists, marriage

and family therapists, and social workers. Gaining a better understanding of how parents perceive phubbing and technoference in the context of the family system will provide useful information for mental health professionals who counsel families through these stressors. Additionally, mental health professionals who are knowledgeable about the literature regarding technology use and family relationships can help bridge the knowledge gap between adolescents and parents. In other words, mental health professionals may be able to educate family members about different types of technology use and the potential implications of technology use for their family relationships. As the presence of technology and social media continues to increase in modern life, providing families with this information will allow them to make meaningful changes in their technology use behaviors that can strengthen the parent-child relationship.

Section 2 – Articles

Study 1 – Parent Perception of Adolescent Technology Use and Parent-Child Relationship Quality: Conflict Over Technology as a Mediator

Introduction

Social media is ubiquitous for adolescents in the United States, with around 90% of adolescents accessing social media at least several times a day (Anderson & Jiang, 2018). Social media is a subset of technology use, defined as “internet-based channels that allow users to opportunistically interact and selectively self-present...with both broad and narrow audiences who derive value from user-generated content and the perception of interaction with others” (Carr & Hayes, 2015, p. 47). More simply stated, social media allows users to post their own content and to interact with others, typically through websites and smartphone applications. Anderson and Jiang (2018) found that 95% of all adolescents ages 13-17 report owning a smartphone or having frequent access to one, and 45% report being online “almost constantly.” While research is conflicting, several studies indicate a connection between social media use and negative well-being outcomes for adolescents, including increased depression (e.g., Coyne et al., 2020), anxiety (e.g., Barry et al., 2017), body image disturbances (e.g., Fardouly et al., 2020), and suicidal ideation (e.g., Twenge & Campbell, 2019). Additionally, while social media can foster connections within relationships (e.g., Duffy et al., 2019; Lee et al., 2020), several studies have demonstrated a connection between excessive social media use and problems within relationships (e.g., Howard et al., 2019; Primack et al., 2019). Research on the implications of social media and technology use within relationships has primarily focused on adolescent friendships (e.g., Sun & Samp, 2021; Yang et al., 2021) and adult romantic relationships (e.g., Beukeboom & Pollman, 2021; Frackowiak et al., 2022).

Family relationships, specifically the parent-child (or primary caretaker-child) relationship, are important to an adolescent's development and psychological well-being (e.g., Balbore et al., 2016; Branje et al., 2010). Both social media use and the parent-child relationship have demonstrated implications for adolescent development and well-being, but there is a lack of research on the connection between the two. Using the lenses of Bronfenbrenner's neo-ecological theory (Navarro & Tudge, 2022) and structural family therapy (Minuchin, 1974), this study investigated the role of conflict over technology within the relationship between parent perception of adolescent technology use behaviors and the quality of the parent-child relationship.

Technology Use

Social media addiction, social media overuse, and excessive social media use are terms often used interchangeably to describe patterns of social media use that are associated in some way with negative well-being outcomes (Banyai et al., 2017; Lin et al., 2020). Each of these constructs falls under the umbrella term of "problematic social media use" (Banyai et al., 2017). Because essentially all adolescents and most adults under age 60 use social media on a daily basis (Anderson & Jiang, 2018; Auxier & Anderson, 2021), it is important for researchers to distinguish between typical and so-called "problematic" use of social media. When compared to typical use, problematic social media use has more often been linked to outcomes such as increased depression symptoms (e.g., Barry et al., 2017; Coyne et al., 2020), lower self-esteem (e.g., Choukas-Bradley, 2019; Twenge & Farley, 2021), and increased anxiety (e.g., Vannucci et al., 2017). In addition to these individualized concerns, problematic social media use has also

been associated with decreased relationship quality across a number of interpersonal relationships (McDaniel & Coyne, 2016; McDaniel et al., 2021).

Perceptions of Technology Use

While much of the literature related to technology in relationships makes reference to “problematic” social media use behaviors, it is important to note that what constitutes problematic behavior is dependent upon the perceptions of the individuals within a relationship. There is a lack of research on how families of varying cultural backgrounds and composition perceive technology use within the family system, but it is possible that important differences exist regarding perceptions of what constitutes problematic use. Researchers should be careful not to assume that all individuals will have similar perceptions of technology usage; furthermore, frequency of technology use behaviors should not be directly conflated with a perception of problematic behavior that is disruptive to a close relationship. Given the differing perceptions on this topic, this manuscript will henceforth use the term “technology use behaviors” which omits the assumption that any specific technology use behavior is inherently problematic. “Technoference” (McDaniel, 2015) and “phubbing” (Roberts & David, 2016) are two types of technology use behaviors that occur within the context of close relationships which can be perceived by some as disruptive to relationship dynamics.

Technoference

McDaniel et al. (2015) defined “technoference” as instances when technological devices, including those frequently used to access social media, disrupt couple or family relationship dynamics. Technoference can result from technology usage by any member of the family system. Much of the research on technoference has explored the

implications of device use by parents of young children (e.g., McDaniel, 2020; McDaniel & Radesky, 2018). For example, frequent smartphone use by a parent of a young child has been shown to interfere with communication in the parent-child relationship (e.g., McDaniel, 2019; McDaniel & Coyne, 2016; McDaniel & Radesky, 2018) and reduce parental responsiveness to the child (McDaniel, 2020).

Researchers have also explored the implications of technoferece in the context of romantic relationships which may point to some general implications of technoferece in other close interpersonal relationships. Findings from these studies indicate that greater technoferece results in lower satisfaction with time spent together as well as greater conflict, subsequently leading to lower relationship quality (McDaniel et al., 2021; McDaniel & Coyne, 2016). These findings indicate that technoferece has implications for the close interpersonal relationships within the family system, but there is a lack of research on adolescent technoferece behaviors within the parent-child relationship. While technoferece has been associated with negative effects on relationship quality, it is important to note that technoferece generally refers to the extent to which the usage of technological devices interrupt a conversation; this disruption may not necessarily be perceived by all as equally harmful to relationship quality (or harmful at all).

Phubbing

Roberts and David (2016) coined the term “phubbing,” a combination of “phone” and “snubbing,” to describe a phenomenon in which individuals use their smartphone while interacting with another person. Phubbing may occur when accessing a smartphone interrupts an ongoing conversation or when an individual chooses to use their smartphone instead of engaging in communication with another person. Phubbing can be

conceptualized as a more specific subset of technofence as it only describes smartphone use which excludes other technological devices like computers and tablets.

Phubbing has become a normal part of social interactions for many social media users. For example, Rainie and Zickuhr (2015) found that 89% of their sample of 3,217 adults reported using their smartphone during their last social interaction. Field and laboratory studies which compare phubbing behaviors to non-phubbing in adult relationships indicated that phubbing is associated with higher distraction and lower levels of enjoyment in the interaction (Dwyer et al., 2018) as well as lower communication quality, lower relationship quality, lower sense of belonging, and lower overall mood (Chotpitayasunondh & Douglas, 2018). McDaniel and Wesselmann (2020) also found that participants who were phubbed in a laboratory study for trivial reasons felt more excluded when compared to those phubbed for important reasons. This finding may be relevant as phubbing for social media use in particular could be viewed as more trivial, subsequently resulting in more negative interpersonal outcomes. Though now commonplace, phubbing still has important implications for communication and relationship quality, such as poorer relationship satisfaction, increased conflict over smartphone use, and lower overall well-being (Roberts & David, 2016).

Research on phubbing in the context of the family system has largely focused on the impacts of parental phubbing on child well-being and development. Parental phubbing has been associated with less responsiveness to young children (Abels et al., 2018) as well as greater rates of depression (Xie & Xie, 2020) and social media addiction (Zhao et al., 2022) for adolescents. While research on adolescent phubbing within the family system is lacking, researchers have explored how adolescents engage in phubbing

behaviors with friends (e.g., Sun & Samp, 2021; Yang et al., 2021). For example, Yang et al. (2021) found that when a friend used their smartphone during a social interaction, participants reported higher friendship quality; however, participants rated their own smartphone use negatively, subsequently resulting in decreased friendship quality. Fear of missing out was also significantly associated with higher phubbing frequency in a sample of 2663 Flemish adolescents (Franchina et al., 2018).

On the other hand, phubbing may not always result in negative relational outcomes. Yang and Christofferson (2020) found that smartphone use primarily occurred during “casual” conversations between friends (e.g., watching TV or eating together); smartphone use during these casual social interactions was not significantly predictive of loneliness or the strength of the friendship. Only the perception of negative qualities of smartphone use (e.g., distraction or feeling ignored) were predictive of lower strength of friendship and increased loneliness (Yang & Christofferson, 2020). Additionally, those who hold a more positive attitude toward phubbing are more likely to engage in phubbing behaviors (Buttner et al., 2021). These findings indicate that phubbing may not be inherently detrimental to relationships; negative perception of smartphone use may instead be more predictive of detrimental outcomes in relationships (Frackowiak et al., 2022). Research on phubbing within the family system and the parent-child relationship has thus far only focused on parental phubbing behaviors and not those of the adolescent. Because 95% of adolescents have access to a smartphone (Anderson & Jiang, 2018) and adolescents are known to engage in phubbing with their peers (e.g., Sun & Samp, 2021; Yang et al., 2021), phubbing behavior from adolescents within the context of the family system warrants further research in order to better understand potential detrimental

effects on the parent-child relationship. Overall, technology use is common within the context of the parent-child relationship; furthermore, while perceptions of technology use are highly individualized, general findings indicate that disruptive patterns of technology use may be associated with poorer relationship quality.

Parent-Child Relationship

The parent-child relationship has important implications for child well-being (e.g., Balbore et al., 2016; Branje et al., 2010), but defining the most significant components of this relationship has been challenging for researchers. Burke et al. (2021) identified connectedness, shared activities, and hostility as essential categories that have emerged from the literature on parent-child relationships. Connectedness generally includes parental responsiveness, emotional availability, affection, and feelings of closeness. The category of shared activities refers to both a parent's involvement in a child's activities as well as engaging in enjoyable activities together. Finally, hostility includes rejection and criticism within the parent-child relationship (Burke et al., 2021).

As children enter adolescence, they naturally begin to separate from their parents' influence and rely more heavily on their peers (e.g., Albert et al., 2013; Koepke & Denissen, 2012). Keijsers and Poulin (2013) repeatedly surveyed 390 adolescents over a period of 7 years (from ages 12 to 19) to explore how parent-child communication changes in adolescents. Results indicated that parent-child communication decreased beginning in early adolescence for both boys and girls. Social media provides a unique avenue through which adolescents engage in the developmental process of individuation and identity development through communication with peers (e.g., Bates et al., 2020; Lee et al., 2020). Ballarotto et al. (2018) found that adolescents with lower attachment to their

parents spent more time online. D'Arienzo et al. (2019) also found that adolescents and adults with insecure attachment are more likely to report disruptive use of social media, indicating that social media may fulfill some of the relational needs that are not adequately met by family and friends. These findings point toward a unique connection between social media usage and the parent-child relationship, particularly for adolescents who use social media in part to separate from parents; this relationship warrants further investigation.

Psychological Well-Being

Despite the adolescent developmental processes of individuation and separation from parents, the parent-child relationship still appears to have an important association with adolescent well-being (e.g., Branje et al., 2010). In a study of 594 young adolescents, Balbore et al. (2016) found that lower emotional availability from both mothers and fathers was predictive of higher rates of depression. Branje et al. (2010) also found that lower relationship quality with a mother significantly predicted greater symptoms of depression for boys and girls, and lower relationship quality with a father predicted greater symptoms of depression for boys only. Similarly, Hazel et al. (2014) found that a stronger parent-child relationship for adolescents moderated the relationship between life stressors and depressive symptoms which points to a protective quality of the parent-child relationship in relation to depression. Finally, Stafford et al. (2016) analyzed cohort study data of 5362 participants; data was collected at 23 points and included measures of parent-child relationship quality and overall well-being. Findings indicated that participants who reported greater connection and lower psychological

control from both parents in adolescence also reported higher psychological well-being scores in adulthood.

Other Health Outcomes

Greater communication and connection within the parent-child relationship has also been correlated with lower overall substance uses rates (Carver et al., 2017), lower alcohol use, and decreased sexual behavior (Johnson, 2013; McElwain & Bub, 2018) for adolescents. McElwain and Bub (2018) utilized longitudinal data from a national survey of 1364 participants from ages 6 to 15 in order to explore parent-child relationship quality and sexual behavior. Findings indicated that participants who reported more conflict with their mother engaged in more sexual behavior at age 15; additionally, participants with lower closeness and greater conflict with their father also engaged in more sexual behavior at age 15. These findings indicate that the parent-child relationship has significant bearing upon adolescent psychological and behavioral well-being, meaning that research on factors such as technology use behaviors that may negatively impact this relationship are worthy of further study. Additionally, behaviors that fall within the categories of connectedness and shared activities are generally positively associated with psychological and behavioral well-being for adolescents.

Influence on Future Relationships

The parent-child relationship has also been associated with the health of an adolescent's future romantic relationships. Kochendorfer and Kerns (2017) conducted a longitudinal study with 1012 participants which explored how attachments to parents and friends predicted frequency and quality of romantic relationships at ages 12 and 15 years old. Results indicated that participants with more secure attachment to their mother were

less likely to engage in romantic relationships at age 12. Seiffge-Krenke et al. (2010) also found that participants who felt more connected to their parents at age 14 experienced more connectedness in their romantic relationships at age 23. Because the parent-child relationship has significant implications for many facets of adolescent well-being and technology may affect this relationship, the role of technology use behaviors in the context of the parent-child relationship warrants further research.

Conflict Over Technology

Conflicts within the parent-child relationship are a normal part of development that occur more frequently as adolescents begin to separate from their parents; subsequently, the parent-child relationship must be collaboratively restructured as the child enters adolescence (Branje, 2018). As children enter puberty, the number of parent-child conflicts increases while overall closeness and communication decrease (Marceau et al., 2016; Withers et al., 2016). Additionally, greater hostility in the parent-child relationship has also been associated with increased conflict in a meta-analysis of 52 studies (Weymouth et al., 2016). Frequent and emotionally intense conflicts in the parent-child relationship have been associated with increased behavior problems (Moed et al., 2015) and aggression in adolescents (Wang et al., 2022) as well as decreased school-readiness in school-aged children (Anderson, 2018). Though some conflict between parents and children is a normal part of adolescent development, conflict is generally negatively associated with the quality of the parent-child relationship, potentially leading to detrimental outcomes for the adolescent.

Technological devices such as smartphones can further complicate the restructuring of the parent-child relationship and thus become a frequent source of

conflict for adolescents and their parents. For example, Davis et al. (2019) surveyed 2083 parents and adolescents and conducted 61 focus groups to explore how smartphone use emerges within the parent-child relationship. Findings indicated that both adolescents and parents felt too attached to their phones and distant from one another in part due to their excessive phone use. Both adolescent and adult participants blamed the other member of the parent-child relationship for this relational distance, and parents reported frequent conflicts around their adolescent's smartphone use which negatively impacted the quality of the parent-child relationship (Davis et al., 2019). Francis et al. (2021) also interviewed 200 dyads composed of a pre-adolescent and their parent regarding how screen use emerges in the parent-child relationship. Conflict about child screen use emerged as a frequent theme, and Francis et al. (2021) postulated that this conflict was part of the pre-adolescent's developmental desire for more autonomy. Additionally, Francis et al. (2021) observed that parents and pre-adolescents had very different interpretations of the effects of screen time from family members; pre-adolescents generally described screen use as detrimental to family dynamics and relationships while parents described screen use as beneficial for building family relationships. These findings indicate that conflict over technology is frequent in the relationships between adolescents and their parents, and these conflicts may be detrimental to the quality of the relationship.

Theoretical Background

Bronfenbrenner's Neo-Ecological Model

In his bioecological theory of development, Bronfenbrenner (1977) postulated that individuals develop and exist within several contexts, including their immediate environment as well as broader social contexts. These contexts, ranging from most

immediate to most broad, are labeled as the microsystem, mesosystem, exosystem, and macrosystem. The microsystem, for example, includes common settings for children such as home and school; the mesosystem further comprises the relationships and interactions that take place within these physical contexts. Because Bronfenbrenner's (1977) developed this theory in the late 20th century well before the advent of social media and smartphones, only physical contexts were described as relevant to development.

Navarro and Tudge (2022) revisited and adapted Bronfenbrenner's bioecological theory to include the virtual environments in which many people now spend significant amounts of time. This adaptation, called the neo-ecological theory, separates the microsystem into physical and virtual environments. Because social media is easily accessible from practically anywhere, an individual can be present in both their physical and virtual microsystems at the same time. Technoference and phubbing behaviors occur when individuals are using a technological device while also interacting in a physical context, meaning these behaviors describe the simultaneous existence in the virtual and physical microsystems. Navarro and Tudge (2022) highlighted some unique traits of the virtual microsystem, such as the ability to interact with others asynchronously, the ability to interact with individuals with whom one would not usually be able to interact with physically, the public nature of many interactions, and the ability to access a record of interactions at a later time. Navarro and Tudge (2022) argued that the virtual world appropriately fits into the mesosystem framework given that the mesosystem comprises interactions and relationships. The virtual environment, namely social media, provides an avenue for frequent social communication. Finally, technology like social media fits into the broader exosystem and macrosystem frameworks as social media is now part of

everyday life for most individuals, particularly for developing adolescents (Anderson & Jiang, 2018). In essence, Navarro and Tudge's (2022) neo-ecological framework positions digital technology and social media as deeply influential contexts for developing adolescents and their families. Furthermore, social media coexists alongside the physical context of family life, meaning that how adolescents and their family members use social media is highly relevant to the parent-child relationship and the family system.

Structural Family Therapy

Minuchin's (1974) structural family therapy also views family members within their social contexts. Rather than focusing on behaviors or qualities of specific family members, the focus is instead on the structures of the family system. Interestingly, Minuchin (1974) described structural family therapy as a necessary therapeutic approach because "modern technology" had shifted the focus from pure individualism to a greater reliance on functioning with others. One could extend this logic to the advent of social media; adolescents in particular are highly reliant upon social media, meaning that social media use is inherently part of the modern family structure. The entire family exists as a system with several subsystems, including the parent-child relationship (Minuchin, 1974). Structural family therapy explores how each member of the system (or subsystem) both affects and is affected by family circumstances. Minuchin (1974) described how distress can occur when the structure of a system changes; for example, when a frequently ill child's sibling also became ill, the parents' attention shifted away from them, subsequently altering the typical structure of the family system. Conflict between family members, often between a parent and child, is usually evident when these

structural shifts occur; in fact, this conflict is typically what spurs families to seek family counseling to help alleviate their distress and heal relationship ruptures (Minuchin, 1974). Using Minuchin's (1974) structural family therapy framework, Murphy et al. (2013) hypothesized that technology and social media use are now part of the structure of the family system as well as the parent-child subsystem. Conflict over technology commonly occurs as a disruption within the parent-child subsystem (Marceau et al., 2016), and conflict has been associated with decreased parent-child relationship quality (Wither et al., 2016). Thus, I hypothesized that adolescent technology use behaviors such as phubbing impact the structure of the family system, creating conflict over technology and subsequently negatively impacting the quality of the parent-child relationship.

Current Study

The purpose of this study was to investigate the relationships between parent perceptions of adolescent technology use behaviors, conflict over technology, and the quality of the parent-child relationship (see Figure 1 for hypothesized model). More specifically, this study explored whether conflict over technology mediated the relationship between parent perception of adolescent technology use behaviors and the quality of the parent-child relationship. The study explored the following research questions:

1. Is there an association between parent perception of adolescent phubbing and parent-child relationship quality?
2. Is there an association between parent perception of adolescent technofence and parent-child relationship quality?

3. Does conflict over technology mediate the relationship between parent perception of adolescent phubbing and parent-child relationship quality?
4. Does conflict over technology mediate the relationship between parent perception of adolescent technoference and parent-child relationship quality?

For research question 1, I hypothesized that parent perception of adolescent phubbing would be negatively associated with connectedness and shared activities within the parent-child relationship (Hypothesis 1) and positively associated with hostility in the parent-child relationship (Hypothesis 2).

For research question 2, I hypothesized that parent perception of adolescent technoference would be negatively associated with connectedness and shared activities in the parent-child relationship (Hypothesis 3) and positively associated with hostility in the parent-child relationship (Hypothesis 4).

For research question 3, I hypothesized that parent perception of adolescent phubbing would be positively associated with conflict over technology, which would in turn be negatively associated with connectedness and shared activities in the parent-child relationship (Hypothesis 5). I also hypothesized that parent perception of adolescent phubbing would be positively associated with conflict over technology, which would in turn be positively associated with hostility in the parent-child relationship (Hypothesis 6).

For research question 4, I hypothesized that parent perception of adolescent technoference would be positively associated with conflict over technology, which would in turn be negatively associated with connectedness and shared activities in the parent-child relationship (Hypothesis 7). Finally, I hypothesized that parent perception of adolescent technoference would be positively associated with conflict over technology,

which would in turn be positively associated with hostility in the parent-child relationship (Hypothesis 8).

Research has indicated that technology-related conflict is common between parents and adolescents (Francis et al., 2021; Davis et al., 2019) and technology-related conflict has been associated with decreased parent-child relationship quality (Davis et al., 2019), but adolescent-specific problematic technology use behaviors have not previously been fully investigated in relation to conflict and parent-child relationship quality from the parent's perspective. Additionally, the neo-ecological theory (Navarro & Tudge, 2022) points to the meaningful influence of social media in everyday life, and the structural family therapy (Minuchin, 1974) framework strengthens the argument that adolescent problematic technology use behaviors may disrupt the structure of the family, subsequently leading to conflict and decreasing family functioning.

Method

Participants

The participants were 749 parents (or other primary caretakers) of at least one child aged 12-18 years old. Participant ages ranged from 22 to 53 ($M = 41.58$, $SD = 5.70$). The majority (96.6%) of participants reported that they lived in the United States. Additionally, nearly half of the participants reported that they lived in an urban area (48.9%), 31.8% reported living in a suburban area, and 18.9% reported living in a rural area. Over half of the sample identified as female (57%) with 42.8% identifying as male and one participant (0.1%) identifying as non-binary/genderqueer. Participants were permitted to select multiple racial and ethnic identities as appropriate for them which included European American/White (72%), African American/Black (13.4%), Native

American/Indigenous American (10.6%), Asian/Asian American (7.8%), Hispanic/Latinx (7.8%), and Native Hawaiian/Pacific Islander (0.5%). Highest level of education completed included “did not complete high school” (0.3%), “high school” (2.9%), “some college, no degree” (26.5%), “undergraduate degree (associate’s or bachelor’s)” (39.6%), “some graduate hours, no degree” (22.3%), “Master’s degree” (6.9%), and “Doctorate/Professional degree” (1.2%). With respect to social class in the past 5 years, 1.2% of participants identified as very low income/poverty level, 14.4% as working class, 52.7% as middle class, 30.6% as upper middle class, and 0.5% as upper class.

Participants also responded to demographic questions about their children and the makeup of their home. The majority of participants reported that there are two primary caretakers in their home (64.1%), with one caretaker being the next most popular choice (29.7%), followed by three caretakers (5.7%), and one participant (0.1%) who reported having five caretakers in the home. The most common number of children in the household was one child (65.3%), followed by two children (26%), three children (6.8%), four children (1.9%), and five or more children (0.1%). Ages of children that parents reported on ranged from 12 to 18 ($M = 14.56$, $SD = 1.71$). Based on a typical week, parents reported that their child lived with them 3 days (5.4%), 4 days (17.9%), 5 days (26.1%), 6 days (23.6%), or 7 days (25.3%). The participants’ children were reported to be 53.2% male, 46% female, and 0.4% nonbinary/genderqueer. Participants were permitted to select more than one racial or ethnic identity for their child as needed; these identities included European American/White (71%), African American/Black (13.9%), Native American/Indigenous American (9.5%), Hispanic/Latinx (8.2%), Asian/Asian American (7.5%), and Native Hawaiian/Pacific Islander (0.5%).

Procedure

Following IRB approval, participants were recruited through the social media platforms of Facebook, Instagram, and Reddit. Social media posts specifically targeted groups that included parents of adolescents. Participants were invited to participate in the study if they (1) read English fluently; (2) had guardianship of at least one child whose age was between 12 and 18 who regularly used at least one social media platform; and (3) had a child appropriate for this study who lived with them at least half of each week. After clicking the survey link in the social media post, participants were directed to the informed consent page (see Appendix A) of the Qualtrics online survey. By continuing with the survey, participants gave their consent to participate. Demographic questions were completed first, followed by the measures on phubbing, technoference, parent-child relationship quality, and conflict over technology. Participants with multiple children were instructed to focus only on their adolescent child who appears to use social media the most often. The last question of the survey prompted participants to select if they would like to be directed to a separate survey where they could enter a raffle to win one of 50 \$15 Amazon cards. Participants were informed that the incentive survey was completely separate from the initial survey and thus their anonymous responses could not be linked with the email address provided for the incentive raffle.

Using G*Power to calculate the recommended sample size based on a medium effect size of .15, an α level of .05, and a high power of .95, the outputted recommended sample size was 234. To account for survey attrition, participants who skipped too many questions to remain in the dataset, and the inevitability of bot infiltration in online research (Bowen et al., 2008; Griffin et al., 2022), a sample size much larger than 234

was desired so that a robust sample would remain after case deletion. A total of 1203 participants agreed to the informed consent and entered the survey measures. Based upon recommended bot-detection strategies (Griffin et al., 2022), responses from duplicate IP addresses were identified, and only the first response from each unique IP address was retained in the data set; this review resulted in the deletion of 224 participants, resulting in a sample of 979. An additional 91 cases were deleted for having 50% or more missing responses, reducing the sample to 888. Three attention-check questions were distributed throughout the survey measures, and 134 participants were removed for failing two or three of the attention check questions, reducing the sample size to 754 participants. Next, response times were analyzed in order to delete cases whose survey response times were more than two standard deviations from the mean response time (Griffin et al., 2022); however, after the other case deletion procedures, response times for all cases fell within two standard deviations of the mean, resulting in a sample size of 754. No univariate outliers (defined as a score on any variable that was farther than three standard deviations from the mean) were detected. Five multivariate outliers were detected as their Mahalanobis distances exceeded the critical value expected for the number of independent variables entered into the model; these multivariate outliers were deleted, resulting in a final sample size of 749. As expected, a large number of cases were deleted due to possible bot infiltration of the online survey link, but a robust sample size remained.

Measures

Demographic Questionnaire

Participants completed a demographic measure regarding their country of residence, age, type of geographical region, gender, race/ethnicity, highest level of education completed, social class of the last 5 years, number of caretakers in the home, and number of children in the home (see Appendix B). Additionally, participants were instructed to answer demographic questions about their child between the ages of 12 and 18 who appears to use social media the most often. These demographic measures included the age of the child, percentage of a typical week the child lives with the participants, number of days in a typical week that the child lives with the participant, the child's gender, and the child's race/ethnicity.

Parent Perception of Adolescent Phubbing

Participants then completed two measures of their perception of adolescent phubbing behaviors. The first measure, the Phubbing Scale (David & Roberts, 2020) (see Appendix C), is a 9-item measure of the frequency of being phubbed. The scale items were modified slightly to specifically reference phubbing from a participant's adolescent child. Sample items include "*During a typical mealtime that I spend with my child, they pull out and check their cellphone*" and "*When I spend time with my child, they often glance at their cellphone when talking to me.*" All items are rated on a Likert scale ranging from 1 ("never") to 5 ("all of the time"). David and Roberts (2020) developed this measure based upon their previously established measure of phubbing in romantic relationships. David and Roberts (2020) administered this measure to a sample of 258 undergraduate students who were 79% white, 7% Latinx, 6% Asian/Pacific Islander, 4% Black, and 1% Native American. An exploratory factor analysis indicated that the factor structure was in line with the author's hypothesized factors. Internal consistency was high

($a = 0.94$). David and Roberts (2020) also demonstrated evidence of convergent validity through a strong correlation with another phone involvement measure. Predictive validity was also established as the measure was significantly predictive of social exclusion. Discriminant validity was tested by using confirmatory factor analysis with the phubbing scale and three other different scales; the phubbing scale loaded on a separate factor as expected, indicating appropriate discriminant validity.

Participants then completed one subscale of the Negative Perceptions of Digital Social Multitasking Scale (Yang & Christofferson, 2020) (see Appendix D). This scale contains two subscales that measure potential negative perceptions of phubbing: the Negative Perception of Self Digital Social Media Multitasking and the Negative Perception of Friend Digital Social Multitasking. Participants completed the latter subscale which was modified slightly to change “friend” to “my child.” They were asked to think about recent scenarios in which they have experienced phubbing from their adolescent child as they respond to these questions. Sample items include “*I felt unimportant*” and “*I felt ignored.*” All 5 items are rated on a Likert scale ranging from 1 (“strongly disagree”) to 4 (“strongly agree”). Yang and Christofferson (2020) administered this measure to a sample of 222 undergraduate students who were 82% female, 45% Black, and 43% white. Yang and Christofferson (2020) reported that the applied subscale showed good internal consistency ($a = 0.94$) and the results of the confirmatory factor analysis were deemed acceptable. Yang et al. (2021) administered this measure again to a sample of 517 adolescents who were 69% white, 17% Latinx, 13% Black, and 6% Asian/Asian American and found that the internal consistency of the

subscale was acceptable ($\alpha = 0.80$). Validity was not assessed in this study, and no subsequent studies were found which explored this scale's validity.

Parent Perception of Adolescent Technoference

McDaniel and Radesky (2018) adapted the Technology Device Interference Scale (see Appendix E) which measured technoference in romantic relationships to instead measure technoference in the parent-child relationship. Participants were asked to rate how often they experience technoference from their child on a typical day. The scale consists of 6 items which reference devices such as smartphones, computers, and tablets. All items are rated on a 7-point Likert scale ranging from 0 ("none") to 6 ("more than 20 times"). McDaniel and Radesky (2018) surveyed a sample of 333 parents of young children; participants were 92% white, 95% married, and 73% had a bachelor's degree or higher. McDaniel and Radesky (2018) stated that the measure was not appropriate for internal consistency tests as there would likely be high variability across participants. Validity was also not assessed in this study, and no subsequent studies were found which assessed the scale's validity.

Conflict Over Technology

Participants next completed the Conflict in Technology Scale (McDaniel & Coyne, 2016) (see Appendix F). Participants were prompted to respond to how often each item is a problem in their relationship with their child. There are 8 items, and items are rated on a 5-point Likert scale ranging from 1 ("never") to 5 ("very often"). Sample items include "*Time spent on social networking sites*" and "*Time spent talking or texting on cell phone.*" McDaniel and Coyne (2016) administered this measure to a sample of 143 married women in heterosexual relationships who were 89% white with an average

household income of \$68,000. Internal consistency from this sample was acceptable ($\alpha = 0.94$). Validity was not tested or explained in the initial testing of the measure. The measure has been used in other studies related to technology use (e.g., McDaniel & Drouin, 2019), but validity does not appear to have been reported in any additional studies.

Parent-Child Relationship

Lastly, participants completed the parent form of the Parent-Adolescent Relationship Scale (PARS) (Burke et al., 2020) (see Appendix H). The PARS is a 21-item scale consisting of three subscales: connectedness, shared activities, and hostility. All items are rated on a 6-point Likert scale which ranges from 0 (“not at all”) to 5 (“nearly always or always true”). Sample items of the shared activities subscale include “*I like talking with my teenager*” and “*We go to family events together.*” Sample items of the connectedness subscale include “*I encourage my teenager to get support from me or others*” and “*I comfort my teenager when he/she is upset.*” Sample items of the hostility subscale include “*I make negative comments about my teenager to others*” and “*I get upset when my teenager disagrees with me.*” Burke et al. (2020) developed an initial 54 items and then conducted focus groups with parents and adolescents as well as experts on parenting in order to determine the final set of items; this process helped to establish strong content validity. Burke (2020) then administered the measure to two samples of parents of adolescents, consisting of 152 and 104 parents. Convergent validity was established through strong correlations with other parenting measures, including the Alabama Parenting Questionnaire, the Family Environment Scale, and the Conflict Behavior Questionnaire. Discriminant validity was demonstrated through a comparison

with the Media and Technology Usage and Attitudes Scale which did not significantly correlate with the PARS. Internal consistency was acceptable for the three subscales of connectedness (H index = .91), shared activities (H index = .82), and hostility (H index = .75). Test-retest reliability was also acceptable for the three subscales of connectedness ($r = .78$), shared activities ($r = .72$), and hostility ($r = .84$) (Burke et al., 2020). Dittman et al. (2020) also administered the connectedness and hostility subscales to a sample of 90 parents and found evidence of acceptable internal consistency, with $\alpha = .91$ and $\alpha = .6$ respectively.

Results

Preliminary Analysis

Data was exported from Qualtrics into IBM SPSS Statistics 27 for analysis. The PROCESS 4.1 macro (Hayes, 2022) was also utilized for mediation analysis. All assumptions for multiple linear regression analysis were met, including normality, linearity, lack of multicollinearity, independence of residuals, homoscedasticity, and normal distribution of residuals. Normality was assessed using visual inspection of histograms as well as calculation of skewness and kurtosis for all variables. According to George and Mallery (2010), skewness and kurtosis values that fall between -2 and 2 are considered acceptable. All variables in the study were found to have acceptable normality with skewness ranging from -.396 to .528 and kurtosis ranging from -.901 to .542. All predictor variables were individually graphed with each outcome variable to assess linearity; all predictor variables showed a linear relationship with each outcome variable. Multicollinearity was assessed using variable correlations as well as the tolerance and VIF collinearity statistics. The strongest correlation between any two study variables was

.72 which is an acceptable level of correlation for multiple regression analysis (Tabachnick & Fidell, 2006). The assumption of no multicollinearity was met as all tolerance values were above .10 (minimum tolerance value = .47), and all VIF scores fell below 10 (minimum VIF value = 1.04) (Pallant, 2016). Independence of residuals was assessed using the Durbin-Watson statistic; values ranged from 1.82-1.96, falling acceptably close to the desired value of 2 (Tabachnick & Fidell, 2006). Visual inspection of the plots of standardized residuals and standardized predicted values showed no evidence of a funnel-shaped distribution, indicating the assumption of homoscedasticity was met. Normal distribution of residuals was confirmed using visual inspection of the P-P plot of the model.

For all study variables, means and standard deviations were calculated as well as internal consistency of scales (Cronbach's α) and correlations between all variables (Table 1). Internal consistency scores ranged from relatively low to acceptable, ranging from .54 to .89. Cronbach's alpha is often considered to be acceptable at .60, and lower scores may result from fewer scale items (Tabachnick & Fidell, 2006). It is likely that the use of relatively brief scales in this study contributed to decreased internal consistency. Mean scores of most scales fell around the middle of the scoring range, indicating potentially high variability in participants' responses or that most participants responded around the middle of the scale. Some expected correlations emerged, including between technofence and conflict in technology ($r = .72, p < .01$) and between conflict in technology and hostility in the parent-child relationship ($r = .59, p < .01$). On the other hand, frequency of perceived phubbing was not strongly correlated with any of the outcome variables. Negative perceptions of phubbing was more strongly correlated with

the outcome variables of connectedness and hostility, indicating that perception of phubbing frequency and one's reaction to phubbing may be associated in different ways with the parent-child relationship.

Correlations were calculated between all demographic variables and study outcome variables in order to determine potential covariates. Number of caretakers was significantly correlated with connectedness ($r = .12, p < .001$) and hostility ($r = -.33, p < .001$). Number of children was significantly correlated with connectedness ($r = .27, p < .001$) and hostility ($r = -.46, p < .001$). Participant age was significantly correlated with connectedness ($r = -.10, p < .001$) and hostility ($r = .38, p < .001$). Finally, social class was significantly correlated with connectedness ($r = -.124, p < .001$) and hostility ($r = .23, p < .001$). Each of these variables was entered into mediation analyses as covariates. Categorical variables were dummy coded to become appropriate for regression analysis.

Research Questions 1 – Multiple Regression Analyses

To test the hypotheses for Research Question 1 (“Is there an association between parent perception of adolescent phubbing and parent-child relationship quality?”), three multiple regression analyses were run. Each model include phubbing frequency and negative perceptions of phubbing as predictor variables. With connectedness as the outcome variable, the model explained 8.3% of the variance and significantly predicted connectedness ($F(2, 679) = 30.60, p < .001$). Phubbing frequency was a significant predictor ($B = .346, p < .001$), but negative perception of phubbing was not ($B = .045, p = .345$). The second multiple regression model with shared activities in the parent-child relationship was not significant ($F(2, 692) = 2.65, p = .072$). Neither phubbing frequency ($B = .098, p = .055$) nor negative perception of phubbing ($B = .079, p = .139$) were

significant predictors. The third regression model with hostility as the outcome variable explained 17.2% of the variance and significantly predicted hostility ($F(2, 681) = 70.60, p < .001$). Both phubbing frequency ($B = -.245, p < .001$) and negative perception of phubbing ($B = -.535, p < .001$) emerged as significant predictors.

Hypothesis 1 was partially supported as phubbing frequency significantly predicted connectedness, but this relationship was not negative as hypothesized. Additionally, neither phubbing frequency nor negative perception of phubbing were significant predictors of shared activities. Hypothesis 2 was partially supported as both phubbing frequency and negative perception of phubbing were significantly associated with hostility in the parent-child relationship. However, each of these associations was negative which differed in direction from what was hypothesized.

Research Question 2 – Simple Linear Regression Analyses

To test the hypotheses for Research Question 2 (“Is there an association between parent perception of adolescent technofence and parent-child relationship quality?”), three simple linear regression analyses were run. Each model used technofence as the predictor variable. With connectedness as the outcome variable, the model explained 6.5% of the variance and was significant ($F(1, 707) = 48.92, p < .001$), and technofence was a significant predictor ($B = -.173, p < .001$). With shared activities as the outcome variable, the model was not significant ($F(1, 717) = 2.50, p = .114$), and technofence was not a significant predictor ($B = -.043, p = .114$). With hostility as the outcome variable, the model explained 22% of the variance and was significant ($F(1, 706) = 199.44, p < .001$). Technofence emerged as a significant predictor ($B = .368, p < .001$).

Hypothesis 3 was partially supported as technofence significantly predicted connectedness, and this association was negative as hypothesized. However, technofence did not significantly predict shared activities. Hypothesis 4 was fully supported as technofence significantly predicted hostility, and this association was positive as hypothesized. Although not all predictor variables in the regression models were significantly associated with their respective outcome variables, mediation analysis proceeded for all cases based upon the recommendation from Hayes (2022) that mediation is complex and can still occur even if the predictor variable is not significantly associated with the outcome variable without the presence of the mediator.

Research Question 3 – Mediation Analysis

To explore Research Question 3 (“Does conflict over technology mediate the relationship between parent perception of adolescent phubbing and parent-child relationship quality?”) a series of mediation analyses were run using the PROCESS 4.1 macro for SPSS (Hayes, 2022). Full results from mediation analyses can be found in Table 2, and representative models can be found in Figures 2 and 3. Number of caretakers, number of children, participant age, and social class were included as covariates, but none were significant in the analyses and thus are not reported. Conflict over technology was a significant mediator in all but two models (Model 1 and Model 4), as evidenced by path coefficients and bootstrapped confidence intervals reported in Table 2. The indirect effect of phubbing frequency on connectedness through the path of conflict over technology was significant ($B = .052$, 95%CI [.026, .064]), indicating that mediation occurred. However, phubbing frequency was negatively associated with conflict over technology, which was in turn negatively associated with connectedness, so

this path differed from what was hypothesized (Hypothesis 5). The indirect effect of negative perception of phubbing on connectedness through the path of conflict over technology was also significant ($B = .205$, 95%CI [.129, .280]), indicating that mediation occurred. Similarly to phubbing frequency, negative perception of phubbing was negatively associated with conflict over technology which was in turn negatively associated with connectedness which differed from what was hypothesized (Hypothesis 5). Hypothesis 5 was partially supported as conflict over technology did significantly mediate the relationships between phubbing frequency and connectedness and between negative perception of phubbing and connectedness, though the directions of the associations between the independent variable and the moderator were different from what was hypothesized. Hypothesis 5 was also not fully supported because significant mediation did not occur as predicted in the models with shared activities as the dependent variable.

Hypothesis 6 was tested using mediation models with hostility in the parent-child relationship as the outcome variable. The indirect effect of phubbing frequency on hostility through the path of conflict over technology was significant ($B = -.163$, 95% CI [-.232, -.089]), indicating mediation occurred. Additionally, the indirect effect of negative perception of phubbing on hostility through the path of conflict over technology was significant ($B = -.414$, 95% CI [-.483, -.349]), indicating mediation occurred. In each of these models, the paths from the mediator to the outcome variable was positive as predicted, but the paths from the independent variable to the mediator were negative which was not predicted. Therefore, Hypothesis 6 was only partially supported as conflict

over technology did significantly mediate the relationships in both models, but the directions of relationships between variables differed from what was predicted.

Research Question 4 – Mediation Analysis

To explore Research Question 4 (“Does conflict over technology mediate the relationship between parent perception of adolescent technofence and parent-child relationship quality?”) a series of mediation analyses were run. Full results from mediation analyses can be found in Table 3, and a representative model can be found in Figure 4. Number of caretakers, number of children, participant age, and social class were included as covariates, but none were significant in the analyses and thus are not reported. Hypothesis 7 was tested using two mediation models with technofence as the independent variable, conflict over technology as the mediator, and connected and shared activities in the parent-child relationship as outcome variables. The indirect effect of technofence on connectedness through the path of technofence was significant ($B = -.071$, 95% CI [-.126, -.017]), indicating mediation occurred. As predicted, technofence was positively associated with conflict which was in turn negatively associated with connectedness. Conflict over technology did not significantly mediate the relationship between technofence and shared activities, meaning Hypothesis 7 was only partially supported.

Hypothesis 8 was tested using a mediation model with technofence as the independent variable, conflict over technology as the mediator, and hostility in the parent-child relationship as the outcome variable. The indirect effect of technofence on hostility in the parent-child relationship through the path of conflict over technology was significant ($B = .303$, 95% CI [.249, .360]), indicating mediation occurred. As predicted,

technofence was positively associated with conflict over technology which was in turn positively associated with hostility in the parent-child relationship; thus, Hypothesis 8 was fully supported.

Discussion

Technology and social media use have continued to increase for adolescents over the past several years (Anderson & Jiang, 2018). Technology use behaviors such as phubbing and technoference can potentially be detrimental to relationship quality (e.g., Chotpitayasunondh & Douglas, 2018; Dwyer et al., 2018; McDaniel & Coyne, 2016). While these technology use behaviors from adolescents have been explored in romantic relationships and friendships (e.g., McDaniel et al., 2021; Rainie & Zickuhr, 2015), they had not yet been explored within the family context before this study. The current study explored the relationships between parent perception of adolescent phubbing, parent perception of adolescent technoference, conflict over technology, and the quality of the parent-child relationship (which included connectedness, shared activities, and hostility). The analyses in this study examined whether there were significant associations between technology use behaviors and qualities of the parent-child relationship and whether conflict over technology helped to explain these relationships. Findings were mixed overall with some evidence for meaningful relationships among these variables.

Previous literature has provided evidence that technology use behaviors of phubbing and technoference have been associated with detrimental outcomes to relationships, including less connectedness (e.g., Chotpitayasunondh & Douglas, 2018). For the current study, this literature was combined with the theoretical models of Bronfenbrenner's neo-ecological model (Navarro & Tudge, 2022) and structural family therapy (Minuchin, 1974) to provide the overall argument that more phubbing and technoference would be connected with more conflict over technology which would in turn be associated with lower parent-child relationship quality.

While some findings from the current study fell in line with this argument, many of the findings were unexpected. First, more phubbing frequency was associated with more connectedness and lower hostility in the parent-child relationship. One explanation for this result could be that frequent phubbing is normal for many individuals, especially in more casual social interactions (Yang & Christofferson, 2020). Therefore, parents that report frequent phubbing from their adolescent may actually be spending more time with their child which could explain the increased connectedness and lower hostility in this relationship. Additionally, as participants perceived phubbing more negatively, both shared activities and hostility in the parent-child relationship went down. Perhaps parents who perceive phubbing more negatively are less motivated to participate in shared activities with their child. It is certainly possible that hostility in the parent-child relationship may not have a meaningful relationship with negative perception of phubbing. Finally, more technoference was associated with lower connectedness and more hostility in the parent-child relationship; these findings supported the previous literature that connected technoference with decreased relationship quality (McDaniel et al., 2021; McDaniel & Coyne, 2016).

With respect to the mediation analyses, there were multiple models in which conflict over technology helped to explain the relationships between technology use behaviors and qualities of the parent-child relationship. Again, some of the findings from these analyses were unexpected, particularly the directions of relationships that emerged. Greater phubbing frequency was associated with less conflict over technology which was in turn associated with greater connectedness in the parent-child relationship. While it was predicted that as phubbing increased, conflict over technology would also increase,

this finding may actually indicate that when phubbing happens often in a family, it may be accepted as a normal behavior (Yang & Christofferson, 2020) and thus does not create significant conflict. Furthermore, as phubbing frequency increased, conflict over technology decreased, and subsequently hostility also decreased. This finding supports previous literature stating that less conflict in the family is generally associated with less hostility (Weymouth et al., 2016). In addition, as negative perception of phubbing increased, conflict decreased, and subsequently connectedness increased. This finding is surprising as one might expect that a more negative perception of phubbing would be connected with more conflict regarding phubbing behaviors. One possible explanation for this finding is that parents who perceive phubbing more negatively may provide stricter rules around technology use, and thus significant conflicts over technology are prevented. Additionally, as negative perception of phubbing increased, conflict over technology decreased, and subsequently hostility decreased. Again, this finding supports the established association between lower conflict and lower hostility in the parent-child relationship (Weymouth et al., 2016). Conflict over technology did not mediate the relationships between phubbing and shared activities. Perhaps conflict over technology is related to feelings of connectedness in the parent-child relationship but does not relate to shared activities in a meaningful way. One might hypothesize that conflict over technology changes the level of general connectedness in the parent-child relationship but does not change how often parents participate in activities with their child.

Findings from models with technofence differed significantly from phubbing. As technofence increased, conflict over technology increased, and subsequently connectedness decreased. In addition, as technofence increased, conflict increased, and

subsequently hostility increased. It is clear that there are important differences in how technology use behaviors are associated with conflict over technology. These findings are in line with research indicating that technology use behaviors are not inherently correlated with negative relational outcomes (e.g., Yang et al., 2021; Yang & Christofferson, 2020). Furthermore, these findings indicate that technoference and phubbing interact differently from each other with respect to conflict over technology. Perhaps phone use behaviors are more “accepted” by some individuals (e.g., Buttner et al., 2021), meaning that phubbing is not typically associated with conflict, but some of the other technologies included in technoference are more associated with conflict. Additional research is needed to differentiate between different types of technology use (e.g., phone use vs. video game console use) in order to better understand the relationships between technology use and conflict. Also, no significant mediation was found in models with shared activities in the parent-child relationship as the outcome variable. This finding may indicate that technology conflict has unique relationships with connectedness and hostility while technology use does not significantly interfere with or impact the level of shared activities between parent and child. Overall, the findings from this study indicate that important relationships between technology use behaviors, conflict over technology, and the quality of the parent-child relationship exist, but there is a need for more research to better understand the nature and direction of these relationships.

Findings from hypothesis testing largely fell in line with predictions based upon this study’s theoretical framework. The neo-ecological model (Navarro & Tudge, 2022) included technology and social media use as part of the microsystem for young people.

Results from this study indicated that phubbing and technoference do have some meaningful associations with both conflict over technology and qualities of the parent-child relationship. These findings point toward significant interactions between the online and in-person microsystems as the parent-child relationship is an influential part of the microsystem for adolescents. This study was also guided by structural family therapy (Minuchin, 1974) which posits that distress in the family and problems in family relationships (like the parent-child relationship) occur when family structures are not functioning adequately. The conclusion that conflict over technology served as a mediator between technology use behaviors and connectedness and hostility supports the idea that the technology use behaviors can potentially disrupt the structure and functioning of the family unit, leading to conflict and subsequently decreasing the quality of the parent-child relationship. Findings from this study are not entirely conclusive or consistent about this phenomenon, but it does appear that the overall findings point toward the interaction of technology use behaviors and the parent-child relationship within the microsystem as well as to disruptions of family structure that can be associated with technology use from adolescents.

Within the relationships of phubbing frequency and hostility, negative perception of phubbing and connectedness, and negative perception of phubbing and hostility, the results indicate that conflict over technology should possibly be analyzed as a moderator instead because the directions of some of these relationships were different from what was hypothesized which resulted in negative mediation terms (path $a \cdot \text{path } b$) (Hayes, 2022). Regardless, the significant associations and mediation effects that emerged from this study indicate that conflict over technology plays an important role in the

relationship between technology use behaviors and the parent-child relationship which warrants further attention from mental health researchers and practitioners.

Implications for Research and Clinical Practice

This study's results indicate that conflict over technology is relevant to the research and understanding of technology use behaviors and the parent-child relationship. There is a lack of research on conflict over technology in the context of the family system despite frequent reports from caretakers that they need guidance on how to navigate this issue in their family (e.g., Davis et al., 2019; Francis et al., 2021). Interestingly, both phubbing and technoference were associated with a "positive" quality of the parent-child relationship (connectedness), a "negative" quality (hostility), and not associated significantly with another "positive" quality (shared activities). These findings indicate that technology use behaviors are complex and likely unable to be explicitly labeled as "good" or "bad" for overall well-being and relational health. Practitioners can help support families in exploring when phubbing and technoference are normative for them and when these behaviors could potentially become a disruptive source of conflict. Additionally, because this research area is relatively new, this study utilized several measures that have not yet been adequately tested. Though some of the Cronbach's alphas were less than desired in this sample, utilizing these new scales in a relatively diverse sample is overall helpful for strengthening reliability. Researchers can expand in numerous ways upon this study's findings as many of the relationships described are unclear or inconclusive. Ultimately, this study can serve as a starting point for further research on technology use within the family context, and this information will be of

practical use to mental health practitioners, especially those who work with adolescents and their families.

Limitations of Research

This study had many limitations that may have impacted the results. First, the scales utilized in this study are relatively new, and many have less psychometric support when compared to scales that measure more established constructs. Scales were selected in part for brevity in consideration of the study's sample of busy parents, and it is possible that the small number of questions per scale also contributed to the unsatisfactory Cronbach's alpha scores. In addition, data was collected via social media through wide-ranging networks which inevitably creates risk for bot infiltration. Though the data was cleaned following guidelines for identifying and removing bots, it is certainly possible that responses from very skilled bots were unable to be identified and thus decreased the quality of the overall dataset. Though the sample was relatively diverse in terms of race/ethnicity, nearly all of the sample came from the United States, and a large portion of the sample reported having only one child. These factors may limit generalizability of the study's findings to all groups. It is also important to note that this study utilized a mediation model in which the direction of the relationship between variables "flows" from the independent variable to the mediator and then to the dependent variable. This path was created based upon previous research and theoretical background for the study, but it is also possible that causality does not occur in this direction. For example, a child who experiences more hostility from their parent may engage in more technology use as a means of coping; technology use cannot be said to "cause" hostility. Finally, this study was limited to only parents' perceptions of their

adolescent's technology use and the quality of the parent-child relationship. While their perspective is unique and valuable for understanding these complex concepts, it is crucial to remember that this study does not provide a full picture without the adolescent child's additional perspective. Additionally, the use of self-report measures is always a limitation, and collecting objective data (e.g., phone screentime logs) would improve the internal validity of the study.

Areas for Future Research

Future researchers who explore conflict over technology may consider using the variable as a moderator instead of a mediator as there are arguments based in theory and literature for either conceptual approach. Additionally, future researchers should consider scale development and the continued use of existing scales in order to establish stronger evidence of validity and reliability. Researchers should also consider the potential drawbacks of using brief scales (e.g., lower internal consistency) while still being mindful of participants' time investment. As noted in this study, many of the significant associations that emerged were in unexpected directions, so future research could continue exploring these variables in order to better understand the nature of these associations. Adding the adolescent perspective would also provide valuable insight into the phenomena investigated in this study; using yoked data from parent-child dyads would allow for deep insight into how parents and children may view technology use in the home in different ways. Patterns of social media and technology use keep changing over time, and technology now plays a vital role in the daily lives of young people (e.g., Anderson & Jiang, 2018; Duffy et al., 2019); thus, researchers have countless avenues

through which they could provide meaningful data for mental health practitioners and the clients they serve.

Study 2 –Parent Perception of Adolescent Technology Use and Parent-Child Relationship Quality: Parental Mediation of Technology as a Moderator

Introduction

Technological devices such as smartphones, computers, and tablets are commonplace for families in the United States, with 84% of families having at least one smartphone, 78% having at least one computer, and 63% having at least one tablet (United States Census Bureau, 2021). Social media, a specific type of technology use defined as “a group of Internet-based applications...that allow the creation and exchange of user generated content” (Kaplan & Haenlein, 2010, p. 61), is accessed several times a day by nearly 90% of adolescents (Anderson & Jiang, 2018) and 81% of adults (Auxier & Anderson, 2021). Despite its frequent use, social media use has been associated with some negative outcomes for adolescents and young adults, including increased risk-taking behavior (e.g., Nesi & Prinstein, 2019; Vannucci & Ohannessian, 2019), depression (e.g., Shensa et al., 2018), and anxiety (Primack et al., 2017). Although the quality of the relationship between an adolescent and their parent (or other primary caretaker) is important to overall adolescent well-being (e.g., Branje et al., 2010; Balbore et al., 2016), relationship quality and communication can be negatively impacted by some technology use behaviors (e.g., Chotpitayasunondh & Douglas, 2018; Dwyer et al., 2018). Both technology use and the parent-child relationship have significant implications for adolescent well-being, but the relationship between the two is not yet adequately understood. Furthermore, there is a need for additional research on how parental mediation of technology use relates to the quality of the parent-child relationship. Using the theoretical perspectives of Bronfenbrenner’s neo-ecological theory (Navarro & Tudge, 2022) and structural family therapy (Minuchin, 1974), this

study explored the relationships between parent perception of adolescent technology use behaviors, parental mediation of adolescent technology use, and parent-child relationship quality.

Technology Use Behaviors

While digital technology use, including social media, is commonplace for nearly all adolescents (Auxier & Anderson, 2021), there are meaningful differences between “typical” use and patterns of technology use that have been associated with detrimental well-being and relational outcomes. Terms including “social media addiction” and “excessive social media use” have been used in the literature to describe social media use that is somehow problematic or disruptive in relationships. Research indicates that these types of social media use have more often been linked to relationship problems when compared to typical use (e.g., Seo et al., 2018; Vannucci & Ohannessian, 2019).

Social media addiction in adolescents has been shown to have a significant association with family functioning. For example, Putri and Khairunnisa (2018) found that adolescents ($n = 100$) with lower family functioning scores were more likely to exhibit addiction behavior to social media. Additionally, Yayman and Bilgin (2020) found that Turkish adolescents ($n = 762$) who exhibited addictive behaviors to social media and online gaming were more likely to have lower family functioning, including the dimensions of problem solving, communication, affection, and behavior. Vannucci and Ohannessian (2019) also found that adolescents ($n = 1205$) who were in the highest social media use subgroup also reported more family conflict and less family support when compared to the other social media use subgroups. Social media addiction in adolescents has also been associated with lower parent-child relationship quality (e.g.,

Bilgin et al., 2020; Ihm, 2018) which subsequently may have negative implications for overall family functioning. Seo et al. (2020) found that adolescents ($n = 2997$) who used social media excessively were more likely to experience a number of daily life stressors, including a lower quality of relationships with parents and higher levels of sibling rivalry which could be disruptive to family functioning. These findings indicate that there is a meaningful association between some types of adolescent technology use and family functioning which includes the quality of the parent-child relationship.

Parents' technology use behaviors also have some bearing on their child's use of technology and on the family's overall functioning. Kim et al. (2018) found that adolescents whose parents exhibited addiction to a smartphone were themselves more likely to be addicted to their smartphone. Additionally, parental smartphone addiction was also significantly associated with domestic violence in the home (Kim et al., 2018). Mun and Lee (2021) also found that in a study of 4,415 parent-adolescent dyads, a parent's addiction to social media significantly predicted their adolescent's addiction to social media. All of these findings indicate that both adolescent and parent technology use have implications for family relationships and overall functioning. However, much of the previous research defines problematic technology use merely by excessive time spent online which ignores the complex interpersonal context of technology use within the family system. It is also important to note that perceptions of technology use behaviors are likely to differ for each individual; in other words, it is crucial for researchers to place technology use behaviors within the context of relationships without assuming that the use of technology in relationships is inherently problematic for everyone. Because terms like "problematic" technology or social media use imply the same level of relational

disruption for everyone, this manuscript will instead use the more general term “technology use behaviors.” “Technoference” (McDaniel et al., 2015) and “phubbing” (Roberts & David, 2016) are two constructs describing specific types of technology use behaviors that more thoroughly define *how* social media use can interfere in relationships such as the parent-child relationship.

Technoference

“Technoference” occurs when technological devices such as smartphones, computers, tablets, and gaming devices interfere with relationship dynamics, including those within the family system (McDaniel et al., 2015). Much of the research on technoference has explored the implications of device usage in the context of romantic relationships. In general, technoference in romantic relationships has been associated with more conflict and lower relationship quality (McDaniel & Coyne, 2016; McDaniel et al., 2021). Research on technoference in families has mostly focused on use by adults. McDaniel et al. (2017) explored the role of technoference in coparenting relationships by surveying over 400 couples. Results indicated that more technoference predicted more conflict around device use which subsequently predicted lower ratings of coparenting abilities. McDaniel et al. (2017) posited that parents should be aware of potential problems related to technoference so that they can adjust their behaviors to both improve their relationship quality and their ability to coparent together.

Technoference from parents also appears to be connected with child behavioral outcomes. For example, Sundqvist et al. (2020) found that technoference from parents of 4–5-year-old children was significantly predictive of both internalized and externalized behavior problems from their child. McDaniel and Radesky (2018) similarly found that

externalizing behavior problems from children and technofence from parents were significantly associated with each other. Parent technofence has also been associated with lower parental ratings of social skills and emotional well-being for 6-10-year-old children, and greater mother-child attachment moderated this relationship (Zayia et al., 2021). On the other hand, McDaniel (2020) found that over half of surveyed parents of 3- to 6-year-old children ($n = 296$) reported positive uses of technological devices, such as using a device to calm themselves in stressful moments and to find helpful information about parenting. These findings point to a relationship between technofence and parenting quality which could impact the parent-child relationship; however, there is a lack of research on technofence from family members other than parents, and research has primarily focused on young children thus far.

Phubbing

“Phubbing,” a combination of “phone” and “snubbing,” refers to the behavior of using one’s smartphone while also interacting with another individual (Roberts & David, 2016). Phubbing may be viewed as a subtype of technofence as phubbing describes only smartphone-use behaviors. For many individuals, particularly adolescents and young adults, phubbing is a normal part of casual social interactions (e.g., Ranie & Zickuhr, 2015; Dwyer et al., 2018). For instance, Vanden Abeele et al. (2019) covertly observed 100 dyads of university students having a conversation and found that phubbing occurred by one or both conversation partners in 62 of the dyads. Much of the research on phubbing has focused on the intrusion of smartphones in romantic relationships (e.g., Frackowiak et al., 2022; Beukeboom & Pollman, 2021). Phubbing in these close relationships has been correlated with lower perceived responsiveness to one’s partner

and decreased intimacy (Beukeboom & Pollman, 2021) as well as lower relationship satisfaction (Roberts & David, 2016).

Much of the phubbing literature has also focused on the impact of parents phubbing when with their children. Smartphone usage has been observed to increase response time, to decrease total number of responses, and to shorten the length of responses for parents interacting with their 2–5-year-old children (Abels et al., 2018). Parental phubbing has been associated with increased rates of depression for preadolescents and adolescents, via the mediators of lower parental warmth and higher parental rejection (Xie & Xie, 2020). Wang et al. (2020) also found that adolescents whose parents engaged in frequent phubbing had higher rates of depressive symptoms, particularly for those adolescents with low self-esteem. Additionally, parental phubbing has been correlated with greater smartphone dependency (Liu et al., 2019; Hong et al., 2019), perpetration of cyberbullying (Wang et al., 2022), and social media addiction (Zhao et al., 2022; Xie et al., 2019) for adolescents. Phubbing specifically from mothers has additionally been correlated with academic burnout (Bai et al., 2020) and increased loneliness (Wang et al., 2021) for adolescents.

Research on adolescent phubbing has focused on this behavior in the context of friendships (e.g., Sun & Samp, 2021; Yang et al., 2021). Adolescent phubbing with friends has been associated with negative outcomes including lower relationship quality (Yang et al., 2021), higher depression and anxiety (Sun & Samp, 2021), and greater “fear of missing out” (Franchina et al., 2018). In studies with young adults, phubbing has been generally associated with lower communication and decreased relationship quality (Chotpitayasunondh & Douglas, 2018) as well as greater distraction (Dwyer et al., 2018).

It is important to note that much of the phubbing research does not attempt to establish the direction of the relationship between phubbing behavior and well-being outcomes, meaning that phubbing cannot be said to be directly detrimental or harmful but has rather been correlated with negative well-being. Additionally, some research indicates that phubbing in “casual” settings with friends does not negatively impact friendship quality, indicating that phubbing is not always perceived as harmful (Yang & Christofferson, 2020). Because research on adolescent phubbing has thus far focused on friendships, there is a need for more research to better understand the implications of adolescent phubbing within the parent-child relationship.

Parent-Child Relationship

Child well-being is significantly influenced by aspects of the parent-child relationship (e.g., Hazel et al., 2014; Seiffge-Krenke et al., 2010). Burke et al. (2021) distilled the most significant components of the parent-child relationship into three broad categories: shared activities, connectedness, and hostility. As part of normal adolescent development, children engage in the processes of identity development and individuation from caregivers (e.g., Kopeke & Denissen, 2012). As a result of these changes, communication between caregiver and child decreases throughout adolescence (Keijsers & Poulin, 2013). Modern adolescents now conduct much of their peer interactions via social media (e.g., Bates et al., 2020). Despite these developmental changes, the relationship an adolescent has with their parent or other primary caregiver is important to adolescent development and well-being. For instance, decreased emotional availability and lower parent-child relationship quality has been associated with greater symptoms of depression (Branje et al., 2010), greater rates of substance use (Carver et al., 2017), and

increased sexual behaviors (Johnson, 2013) for adolescents. Furthermore, a strong relationship between caregiver and adolescent appears to be protective against depression for adolescents experiencing life stressors (Hazel et al., 2014). A strong parent-child relationship has also been correlated with more secure romantic relationships when the adolescent becomes an adult (Seiffge-Krenke et al., 2010). These findings indicate that a strong relationship between an adolescent and their caregiver has meaningful implications for child well-being throughout adolescence and into adulthood. There is a need for further research regarding the potential intersections of technology use and the parent-child relationship.

Parenting Style

Parenting style has important implications for the health of the parent-child relationship, adolescent well-being, and adolescent technology use behaviors. Each parenting style has been differentially associated with adolescent well-being and the health of the parent-child relationship. For example, when compared to other parenting styles, authoritative parenting has been more strongly associated with better academic performance (e.g., Dehyadegary et al., 2012; Masud et al., 2015), fewer depressive symptoms (Piko & Balazs, 2012), higher self-esteem (Pinquart & Gerke, 2019), and less substance use (Calafat et al., 2014). Parenting style may also have implications for problematic internet use behaviors. Ozgur (2019) found that adolescents ($n = 1336$) who received more parental warmth as well as an authoritarian or authoritative parenting style had lower levels of online game addiction. Additionally, Elsaesser et al. (2017) reviewed 23 studies on parenting and adolescent cyberbullying and found that a collaborative

parenting style is more effective in reducing cyberbullying perpetration as well as victimization.

Parental Mediation of Technology

Given the ubiquity of adolescent social media use, modern parents must also consider their role in the mediation of their child's technology use as a significant component of their parenting style. Parental mediation of technology can be conceptualized as a component or subset of general parenting style. Parents frequently engage in strategies to regulate their adolescent's use of technology, especially social media (e.g., Charmaraman et al., 2022; Padilla-Walker et al., 2020). Ho et al. (2019) identified four general types of parental mediation of social media: active mediation, restrictive mediation, authoritarian surveillance, and non-intrusive inspection. Active mediation involves parents providing frequent information and eliciting conversations regarding their child's use of social media. Restrictive mediation includes stricter rules about how children use social media such as limitations on time spent online and on which platforms can be used. Parents who utilize authoritarian surveillance are likely to log into their child's accounts or use other strategies to closely monitor online activity. Finally, parents who utilize non-intrusive inspection are likely to add their child as a friend so they can noninvasively monitor some of their child's online behaviors (Ho et al., 2019). Though Ho et al. (2019) developed the four types of parental mediation after conducting focus groups with children and parents, it appears that the two mediation styles of non-intrusive inspection and active mediation share similarities with the traditional framework of authoritative parenting while restrictive mediation and authoritarian surveillance share similarities with authoritarian parenting (Baumrind,

1967). Mediation style is also dependent on a number of factors, including age of the adolescent (Chen & Shi, 2019), cultural context of the family (de Morentin et al., 2014), and social media literacy of the parent (Daneels & Vanwynsberghe, 2017).

How parents mediate their child's social media use may affect how the adolescent engages with social media (e.g., Charmaraman et al., 2022; Keuhlen et al., 2020).

Charmaraman et al. (2022) found that adolescents ($n = 773$) who were allowed to use social media platforms at age 10 or younger were more likely to exhibit disruptive social media use behavior when compared to their peers who were not permitted to use social media until age 11 or older. Additionally, participants who were permitted to use social media at younger ages were more likely to experience harassment online, and greater control of social media use by parents helped to minimize these detrimental effects (Charmaraman et al., 2022). Paradoxically, Padilla-Walker et al. (2020) found that greater restriction from parents did not appear to reduce social media time for adolescents in this study; findings indicated that only autonomy-supportive mediation was significantly associated with less social media time for adolescents and subsequently lower anxiety when compared to peers who used social media more frequently. Furthermore, authoritative parents with favorable attitudes toward social media have been found to more effectively regulate their adolescent child's use of social media (Keuhlen et al., 2020), and better social media regulation has been associated with better adolescent psychological well-being (Fardouly et al., 2018). On the other hand, Nielsen et al. (2019) reviewed 27 studies regarding adolescent excessive internet and online gaming use and concluded that no specific strategy of parental mediation appeared to be consistently effective at lowering rates of technology use. Chen and Shi (2019) also conducted a

meta-analysis of 52 studies on parental mediation of social media and found that while more restrictive mediation was most effective in reducing social media time, active mediation and co-using were more strongly associated with reduction of numerous risks including cyberbullying victimization and exposure to inappropriate sexual material. Clearly a complex relationship exists between parental mediation of social media use, adolescent technology use behaviors, and adolescent well-being, indicating this relationship warrants further exploration. Additionally, there is a lack of research regarding how different styles of parental mediation of social media use may change the relationship between adolescent technology use and the quality of the parent-child relationship. More insight into this association may be helpful in better understanding which types of mediation are most effective within the parent-child relational context.

Theoretical Background

Bronfenbrenner's Neo-Ecological Model

Bronfenbrenner's (1977) ecological model positions an individual's development within both their immediate environment and their larger social contexts. Levels of influence on individuals are often conceptualized as a set of concentric circles extending from an individual at the center. From the individual outward, the developmental contexts are referred to as the microsystem, mesosystem, exosystem, and macrosystem. For example, the microsystem contains the immediate environment such as home and school while the macrosystem includes the influence of cultural values and norms. Navarro and Tudge (2022) have revised Bronfenbrenner's ecological model into a neo-ecological model which additionally includes the relatively new influence of technology and social media on development and growth.

Navarro and Tudge (2022) defined the microsystem, one's immediate environment, as both physical and virtual. The virtual microsystem consists of interactions with peers, family, and other individuals close to the social media user. Interactions with family members in both the physical and virtual microsystems are a significant component of the microsystem that are highly influential to development. Additionally, interactions with family members are reciprocal, meaning that an individual both influences and is influenced by their family members, creating a complex family system structure (Bronfenbrenner, 1977). Because social media is so commonplace for adolescents and adults in the United States (Auxier & Anderson, 2021), each family member exists within their own virtual microsystem which impacts their behavior and well-being, subsequently affecting and influencing close family members. An individual can exist within their physical and virtual microsystems at the same time; technoference and phubbing can occur when one inhabits both environments simultaneously. Social media is also present in the broader macrosystem for adolescents in particular as social media has become influential in the establishment of cultural norms and the processes of identity development (Bates et al., 2020). Navarro and Tudge's (2022) neo-ecological theory posits that social media is an influential part of everyday life that exists alongside the physical microsystem. Further research is needed to explore the implications of the relatively new phenomenon of social media within the context of the family system and the parent-child relationship.

Structural Family Therapy

Structural family therapy (Minuchin, 1974) is a theoretical approach to family distress that conceptualizes all issues as a result of disturbances to established family

structures. Because social media is inherently present within the microsystem of all family members (Navarro & Tudge, 2022), social media use and related behaviors are naturally part of the family structure. Murphy et al. (2013) postulated that social media is present in the family structure, particularly through adolescent use of social media for identity development and through parental regulation of social media use. Additionally, when adolescents know more than parents about new technology like social media, the usual power structure shifts, potentially causing distress (Nelissen & Van den Bulck, 2017). Conflict over technology arguably occurs as a result of these power structure shifts.

Overall family functioning is a broad construct that is challenging to operationalize. Olson (2011) postulated that cohesion and flexibility are important components of family functioning and relationships. Minuchin (1974) posited that appropriate boundaries within the family system support cohesion, and distress can occur when boundaries are lacking or are suddenly changed. When technology use is unregulated and disruptive within family member interactions, technology use behaviors can decrease cohesion (e.g., Chotpitayasunondh & Douglas, 2018; McDaniel, 2019; McDaniel & Coyne, 2016). Additionally, parents of adolescents must exhibit adequate flexibility regarding technology use regulation in order to respect the adolescent need for autonomy while also protecting against possible negative consequences of technology usage (e.g., Charmaraman et al., 2022; Padilla-Walker et al., 2020). When structure around technology use is too rigid or too flexible, distress can occur (e.g., Padilla-Walker et al., 2020). Furthermore, structure around technology use in the family is complex as it is likely each family member (e.g., multiple parents or caretakers, siblings, extended

family) has their own unique patterns of technology use. Essentially, when technology use behaviors are in some way disruptive or problematic within the family system, a ripple effect is likely to occur across the family system.

Parents may attempt to mediate their adolescent's use of social media while also trying to respect their child's developing autonomy (e.g., Charmaraman et al., 2022; Padilla-Walker et al., 2020), creating a complicated new structural shift that often results in conflict and distress. Minuchin (1974) described appropriate boundaries as a necessary component of a functioning family system; distress occurs when boundaries are absent, inappropriate, or abruptly altered. Parents must determine rules, boundaries, and expectations related to social media behaviors. Disengaged boundaries occur when family members are not closely connected to one another, and enmeshed boundaries occur when members are too close to one another. Murphy et al. (2013) hypothesized that boundary disturbances can occur when parents are not involved enough in their child's social media use or when they are overly involved. Additionally, parents may choose to "friend" their child on social media and engage with them as if they were a peer which also affects the structure of the parent-child subsystem (Murphy et al., 2013). Any of these complex structural issues could potentially negatively impact the quality of the parent-child relationship.

Current Study

The purpose of this study was to explore the associations between parent perception of adolescent technology use behaviors, parental mediation of technology, and the quality of the parent-child relationship (see Figure 5 for hypothesized model). The following research questions guided this study:

1. Does the association between parent perception of adolescent phubbing and parent-child relationship quality vary by type of parental mediation of technology used?
2. Does the association between parent perception of adolescent technofence and parent-child relationship quality vary by type of parental mediation of technology used?

For research question 1, I hypothesized that as the mediation categories of active mediation and non-intrusive inspection increased, the strength of the relationship between parent perception of adolescent phubbing and connectedness and shared activities in the parent-child relationship would decrease (Hypothesis 1). I also hypothesized that as the mediation categories of active mediation and non-intrusive inspection increased, the strength of the relationship between parent perception of adolescent phubbing and hostility would decrease (Hypothesis 2).

For research question 2, I hypothesized that as the mediation categories of active mediation and non-intrusive inspected increased, the strength of the relationship between parent perception of adolescent technofence and connectedness and shared activities in the parent-child relationship would decrease (Hypothesis 3). I also hypothesized that as the mediation categories of active mediation and non-intrusive inspection increased, the strength of the relationship between parent perception of adolescent technofence and hostility would decrease (Hypothesis 4).

While parental mediation of technology has been associated with varying outcomes related to adolescent well-being (e.g., Piko & Balazs, 2012; Pinquart & Gerke, 2019) and some adolescent technology use behaviors (e.g., Charmaraman et al., 2022; Keuhlen et

al., 2020), they have not yet been adequately explored in connection to parent-child relationship quality. Additionally, the structural family therapy (Minuchin, 1974) framework supports the argument that inappropriate boundaries around technology use may result in detrimental changes to the parent-child subsystem, resulting in negative outcomes including decreased parent-child relationship quality. Grounded in theory and previous literature, this study uniquely explored the relationships among adolescent phubbing, adolescent technoference, parental mediation of technology, and parent-child relationship quality from the perspective of parents.

Method

Participants

The participants ($n = 749$; $M_{\text{age}} = 41.58$, $SD_{\text{age}} = 5.70$) were parents (or other primary caretakers) of a child between the ages of 12 and 18 years old. More than half of the sample identified as female (57%), 42.8% were male, and one participant was nonbinary/genderqueer (0.1%). Nearly all participants reported living in the United States (96.6%), 48.9% lived in an urban area, 31.8% lived in a suburban area, and 18.9% lived in a rural area. With respect to highest level of education, 39.6% completed an undergraduate (associate's or bachelor's) degree, 22.3% completed some graduate hours with no degree, 6.9% completed a Master's degree, 2.9% completed high school, 1.2% completed a Doctorate/Professional degree, and 0.3% did not complete high school. Participants were instructed to select multiple options as needed to fully describe their racial/ethnic identity. The majority of participants (72%) selected European American/White, 13.4% selected African American/Black, 10.6% selected Native American/Indigenous American, 7.8% selected Asian/Asian American, 7.8% selected

Hispanic/Latinx, and 0.5% selected Native Hawaiian/Pacific Islander. Additionally, just over half of the sample identified their social class over the past 5 years as middle class (52.7%), 30.6% identified as upper middle class, 14.4% identified as working class, 1.2% identified as very low income/poverty level, and 0.5% identified as upper class.

Additional demographic questions were posed regarding the participants' children and family composition. Participants reported the number of children in the home as one child (65.3%), two children (26%), three children (6.8%), four children (1.9%), and five or more children (0.1%). Participants estimated how much time that their child lives with them during a typical week: 3 days (5.4%), 4 days (17.9%), 5 days (26.1%), 6 days (23.6%), or 7 days (25.3%). Ages of children that participants answered questions for ranged from 12 to 18 years old ($M = 14.56$, $SD = 1.71$). The genders of participants' children were reported to be 53.2% male, 46% female, and 0.4% nonbinary/genderqueer. Participants were allowed to select multiple racial or ethnic identities for their child as needed to describe their race/ethnicity; these identities included European American/White (71%), African American/Black (13.9%), Native American/Indigenous American (9.5%), Hispanic/Latinx (8.2%), Asian/Asian American (7.5%), and Native Hawaiian/Pacific Islander (0.5%).

Procedure

After receiving IRB approval, participant recruitment began through social media via posts on Facebook, Reddit, and Instagram. The survey link was posted broadly through the researcher's social media networks as well as on groups that specifically included primary caretakers of adolescents. Participants were eligible to participate if they met the following criteria: (1) ability to read English fluently; (2) guardianship of at

least one child whose age is between 12 and 18 who regularly uses at least one social media platform; and (3) guardianship of a child appropriate for this study who lives with them at least half of each week. After clicking the survey link in the social media post, participants were directed to Qualtrics where they read the study's informed consent (see Appendix A). Participants indicated their consent to participate by clicking to continue with the survey, or they could choose to exit the survey at any time. The survey included demographic questions followed by the study measures of technofence, phubbing, parent-child relationship quality, and parental mediation of social media use. If participants had multiple children, they were directed to answer questions while focusing on their adolescent child who uses social media the most often. Being mindful of the time constraints of busy parents, an incentive raffle was offered to participants. The final survey question asked participants if they wanted to be directed to a fully separate survey in which they could put their email address to be entered into a raffle to win one of 50 \$15 Amazon gift cards. Participants were instructed that their email address would be entered in a separate survey which could not be connected to their anonymous survey responses.

The recommended sample size, based upon a G*Power calculation with a medium effect size of .15, an α of .05, and a high power of .95, was 234 participants. Because some participant attrition and bot infiltration were expected (Griffin et al., 2022), the desired sample size was significantly larger than 234 to ensure a sufficient sample would remain after data cleanup. An initial sample of 1203 participants consented to and began the survey. To eliminate potential bots and/or duplicate responders, responses from duplicate IP addresses were identified (Griffin et al., 2022), and only the first response

from each unique IP address was kept in the data set. This review led to the removal of 224 participants for a reduced sample of 979. The next review of cases with greater than 50% of missing responses resulted in the deletion of 91 cases for a sample of 888. Three attention-check questions were used to ensure participants were paying attention to each question. Participants ($n = 134$) who failed two or three attention check questions were deleted, resulting in a sample size of 754 participants. To identify potential bots, Griffin et al. (2022) recommended reviewing survey response times and deleting cases with unrealistically low response times. After all other case deletion procedures, all response times fell within two standard deviations of the mean, so no additional cases were deleted. Univariate outliers (defined as a score farther than three standard deviations away from the mean on any variable) were explored, but none were identified. Using the Mahalanobis distance, five multivariate outliers were deleted as their value exceeded the critical value based upon the number of predictor variables entered into the model. Because the survey link was intentionally posted broadly on social media to reach a large, diverse sample, it is unsurprising that many cases were deleted due to potential bots or otherwise low-quality responses. However, the final sample size of 749 participants is a robust sample size well above the requirement needed for sufficient power.

Measures

Demographic Questionnaire

Participants completed a questionnaire regarding themselves and their adolescent children (see Appendix B). Participants identified their country of residence, age, geographic location, gender, race/ethnicity, highest level of education completed, perceived social class in the last 5 years, number of primary caretakers in the home, and

number of children in the home. With respect to the child identified to be appropriate for this study, participants rated their child's age, gender, and race/ethnicity as well as an estimated percent of a typical week the child lives with them and the number of days in a typical week the child lives with them.

Parent Perception of Adolescent Phubbing

Participants then completed two measures of how they perceive their child's phubbing behaviors; the first scale measured frequency of perceived phubbing while the second measured negative perceptions of the phubbing behavior. The Phubbing Scale (David & Roberts, 2020) (see Appendix C) contains 9 items rated on a Likert scale from 1 ("never") to 5 ("all of the time"). Because the Phubbing Scale refers to general phubbing, the scale was modified slightly to specifically reference phubbing from an adolescent child. Sample items include "*During leisure time that I spend together with my child, they use their cellphone*" and "*If there is a lull in my conversation with my child, they will check their cellphone.*" The Phubbing Scale was administered to 258 undergraduate students with the following demographic makeup: 79% white, 7% Latinx, 6% Asian/Pacific Islander, 4% Black, and 1% Native American. Cronbach's *a* was .94, indicating high internal consistency of the scale. The Phubbing Scale was also strongly correlated with a similar phone involvement measure, indicating good convergent validity (David & Roberts, 2020). Discriminant validity was established through confirmatory factor analysis which combined the phubbing scale with other measures; as expected, the phubbing scale loaded entirely on its own factor. The phubbing scale was also predictive of social exclusion, indicating acceptable predictive validity.

The second phubbing measure, the Negative Perceptions of Digital Social Multitasking Scale (Yang & Christofferson, 2020) (see Appendix D), contains items specifically related to how the parent interprets and reacts to their child's phubbing behavior. Participants completed the Negative Perception of Friend Digital Social Multitasking subscale which was modified slightly to alter "friend" to "my child." The subscale contains 5 items rated on a 4-point Likert scale ranging from 1 ("strongly disagree") to 4 ("strongly agree"). Participants were prompted to imagine recent scenarios in which they were phubbed by their child as they respond to the items. Sample items include "*I felt disrespected*" and "*I wish my child was not using the phone.*" Validity was not established by Yang and Christofferson (2020), and no subsequent articles were found which attempted to establish validity.

Parent Perception of Adolescent Technoference

Participants then completed the Technology Device Interference Scale which measures how participants perceive the level of technoference in the parent-child relationship (McDaniel & Radesky, 2018) (see Appendix E). Participants were instructed to rate the frequency with which they experience technoference from their child's device use on a typical day. The 6 items of the scale, rated on a 7-point Likert scale ranging from 0 ("none") to 6 ("more than 20 times"), reference technological devices including computers, tablets, and smartphones. According to McDaniel and Radesky (2018), the Technology Device Interference Scale is not appropriate for internal consistency analysis as the design of the assessment allows for high variability among individual participant responses. Additionally, validity was not established by McDaniel and Radesky (2018), and no subsequent studies were found that explored validity.

Parental Mediation of Social Media Use

Participants then completed the parent form of the Parental Social Media Mediation Scale (see Appendix G) which measures how parents intervene in their child's use of social media (Ho et al., 2019). This measure contains 16 items that are rated on a 7-point Likert scale ranging from 1 ("not at all") to 7 ("very frequently"). Sample items include "*How frequently do you check your child's social media profile(s)?*" and "*How frequently do you restrict the amount of time your child can use social media?*" The Parental Social Media Mediation Scale contains four subscales: Active Mediation, Restrictive Mediation, Authoritarian Surveillance, and Non-Intrusive Inspection. Ho et al. (2019) conducted focus groups with parents, preadolescents, and adolescents to solicit feedback on the items in order to increase content validity of the measure. Ho et al. (2019) then conducted a validation study with 1424 preadolescents and adolescents and 1206 parents. One item was deleted due to low inter-item and low item-total correlations. Cronbach's *a* for subscales in the child sample ranged from .83 to .87 and from .89 to .95 in the adult sample, indicating high internal consistency. Ho et al. (2019) conducted a confirmatory factor analysis and found an acceptable fit for their four-factor model. Composite reliability was calculated at .83 and .89 for the child and parent samples respectively which are both acceptable. Evidence of convergent validity was shown as all factor loadings exceeded .60. Discriminant validity was also shown as the square root of the average variance extracted was "greater than the shared correlation between each pair of factors in both the child and parent samples" (Ho et al., 2019, p. 19).

Parent-Child Relationship Quality

Participants additionally completed the parent form of the Parent-Adolescent Relationship Scale (PARS) (Burke et al., 2020) (see Appendix H). The PARS contains 21-items relating to the three subscales of shared activities, hostility, and connectedness. Items are rated on a 6-point Likert scale ranging from 0 (“not at all”) to 5 (“nearly always or always true”). Sample items include “*I encourage my teenager to get support from me or others*” and “*I show affection to my teenager (e.g., hugs, kisses, smiling, arm around shoulder).*” The PARS was developed through consultation with parenting experts as well as focus groups of adolescents and parents in order to establish good content validity. Then, the PARS was administered to two parent samples ($n = 152$ and $n = 104$). Strong correlations were found with similar measures (e.g., the Alabama Parenting Questionnaire and the Conflict Behavior Questionnaire), indicating good convergent validity. The PARS did not correlate with the unrelated Media and Technology Usage and Attitudes Scale, indicating good discriminant validity. Internal consistency was adequate for the subscales of shared activities (H index = .82), hostility (H index = .75), and connectedness (H index = .91). Test-retest reliability was also adequate for the three subscales of connectedness ($r = .78$), shared activities ($r = .72$), and hostility ($r = .84$) (Burke et al., 2020).

Results

Preliminary Analysis

Data was exported from Qualtrics into IBM SPSS Statistics 27 for analysis. The PROCESS 4.1 macro (Hayes, 2022) was also utilized for moderation analyses.

Assumptions of multiple regression were explored, including normality, linearity, lack of multicollinearity, independence of residuals, homoscedasticity, and normal distribution of

residuals. All study variables were normally distributed as determined by their skewness (-.396 to .528) and kurtosis (-.901 to .542) values which fell within the normal range (George & Mallery, 2010). To assess linearity, all predictor variables were graphed with each outcome variable; all graphs indicated a linear relationship, so the assumption of linearity was met. To assess for multicollinearity, variable correlations were examined; the strongest correlation ($r = .72$) was still appropriate for multiple regression. Additionally, all VIF values were below 10 and all tolerance values were above .10 indicating no evidence of multicollinearity (Pallant, 2016). The Durbin-Watson statistic values (1.82-1.96) were acceptably close to the desired value of 2, indicating appropriate independence of residuals. Plots of standardized residuals and standardized predicted values were analyzed for funnel-shaped distributions; the distributions were rectangularly shaped and centered around the zero point, indicating the assumption of homoscedasticity was met. Visual inspection of model P-P plots indicated normal distribution of residuals.

Means, standard deviations, variable correlations, and internal consistencies of scales (Cronbach's α) were calculated (see Table 4). Internal consistencies ranged from relatively low (.54) to acceptable (.80). Cronbach's alpha may be considered acceptable around .60, and scales with fewer items are more likely to produce lower internal consistency (Tavakol & Dennick, 2011). Mean scores of most scales were around the middle of the scoring range, indicating that either most participants responded around the middle or that variation in responses was high on scales with relatively higher standard deviations.

Correlations between all demographic variables and study outcome variables were calculated to determine potential covariates for the moderation analyses. Number of

children was significantly correlated with connectedness ($r = .27, p < .001$) and hostility ($r = -.46, p < .001$). Participant age was significantly correlated with connectedness ($r = -.10, p < .001$) and hostility ($r = .38, p < .001$). Number of caretakers was significantly correlated with connectedness ($r = .12, p < .001$) and hostility ($r = -.33, p < .001$). Finally, social class was significantly correlated with connectedness ($r = -.124, p < .001$) and hostility ($r = .23, p < .001$). All of these variables were entered into mediation analyses as covariates. Categorical variables were dummy coded to become appropriate for regression analysis.

Research Question 1 – Moderation Analysis

Hypothesis 1

This section will primarily detail significant moderation effects that emerged from the data analysis; full moderation analysis results are included in Tables 5 and 6, representative models can be found in Figures 6 and 7, and simple slope analyses of significant moderation effects are included in Figure 9. To explore Research Question 1 (“Does the association between parent perception of adolescent phubbing and parent-child relationship quality vary by type of parental mediation of technology used?”), moderation analyses were conducted using the PROCESS 4.1 macro (Hayes, 2022) in SPSS. To test Hypothesis 1, moderation models were run with phubbing frequency as the independent variable, active mediation or non-intrusive inspection mediation as moderators, and connectedness or shared activities as dependent variables. Non-intrusive inspection mediation significantly moderated the relationship between phubbing frequency and connectedness in the parent-child relationship ($B = .192, SE = .032, p < .001$). The simple slope analysis of this model indicated that non-intrusive inspection

significantly weakened the negative relationship between phubbing frequency and connectedness. Additionally, active mediation significantly moderated the relationship between phubbing frequency and shared activities in the parent-child relationship ($B = .115, SE = .037, p = .002$), and simple slope analysis indicated that active mediation significantly weakened the relationship between phubbing frequency and shared activities in the parent-child relationship. Non-intrusive inspection mediation also significantly moderated the relationship between phubbing frequency and non-intrusive inspection ($B = .112, SE = .036, p = .002$), and simple slope analysis indicated that non-intrusive inspection weakened the negative relationship between phubbing frequency and shared activities.

Each of these moderation models was run again with negative perception of phubbing replacing phubbing frequency as the independent variable in an additional four moderation models to test Hypothesis 1. Significant moderation effects were observed in the model with active mediation serving as a moderator between negative perception of phubbing and connectedness ($B = .142, SE = .040, p < .001$) and in the model with non-intrusive inspection as the moderator between negative perception of phubbing and shared activities ($B = -.091, SE = .043, p = .034$). Simple slope analysis of the moderation effect of active mediation between negative perception of phubbing and connectedness indicated that active mediation weakened the negative relationship between the x and y variables. Simple slope analysis of the moderation effect of non-intrusive inspection between negative perception of phubbing and shared activities indicated that the moderator weakened the positive relationship between x and y. None of the demographic variables were significant moderators and thus they were not included in the final

analysis. Hypothesis 1 was partially supported as increased levels of active mediation did appear to weaken the relationships between phubbing frequency and shared activities and between negative perception of phubbing and connectedness. Additionally, increased levels of non-intrusive inspection appeared to weaken the relationships between phubbing frequency and connectedness, between phubbing frequency and shared activities, and between negative perception of phubbing and shared activities. However, not all tested moderation models resulted in significant moderation effects, so Hypothesis 1 was not fully supported.

Hypothesis 2

To test Hypothesis 2, moderation analyses were run with hostility as the outcome variable of interest. A significant moderation effect was observed when non-intrusive inspection mediation served as the moderator between phubbing frequency and hostility in the parent-child relationship ($B = -.238, SE = .037, p < .001$). Simple slope analysis of the moderation effect indicated that non-intrusive inspection weakened the positive relationship between phubbing frequency and hostility. Non-intrusive inspection mediation also significantly moderated the relationship between negative perception of phubbing and hostility in the parent-child relationship ($B = .183, SE = .042, p < .001$). Simple slope analysis of the moderation effect indicated that non-intrusive inspection weakened the negative relationship between negative perception of phubbing and hostility. Finally, active mediation significantly moderated the relationship between negative perception of phubbing and hostility ($B = .120, SE = .044, p = .007$). Simple slope analysis of this moderation effect indicated that active mediation weakened the negative relationship between phubbing frequency and hostility. No demographic

variables were significant moderators and thus they were removed from final analyses. Hypothesis 2 was partially supported as increased levels of active mediation appeared to decrease the strength of the relationship between negative perception of phubbing and hostility. Additionally, increased levels of non-intrusive inspection appeared to weaken the relationships between phubbing frequency and hostility and between negative perception of phubbing and hostility. However, Hypothesis 2 was not fully supported as active mediation did not significantly moderate the relationship between phubbing frequency and hostility.

Research Question 2 – Moderation Analysis

Hypothesis 3

Full moderation analyses for Research Question 2 (“Does the association between parent perception of adolescent technofence and parent-child relationship quality vary by type of parental mediation of technology used?”) are detailed in Table 7, representative models can be found in Figure 8, and simple slope analyses are included in Figure 9. To test Hypothesis 3, moderation models were run using technofence as the independent variable, active mediation or non-intrusive inspection mediation as a moderator, and connectedness or shared activities in the parent-child relationship as the outcome variable. Active mediation ($B = -.050, SE = .019, p = .008$) and non-intrusive inspection mediation ($B = .040, SE = .018, p = .032$) both significantly moderated the relationship between technofence and connectedness in the parent-child relationship. Simple slope analyses indicated that active mediation weakened the positive relationship between technofence and connectedness, and non-intrusive inspection mediation weakened the negative relationship between technofence and connectedness.

Additionally, both active mediation ($B = -.068, SE = .021, p = .001$) and non-intrusive inspection ($B = .087, SE = .020, p < .001$) significantly moderated the relationship between technoference and shared activities in the parent-child relationship. Simple slope analyses indicated that active mediation weakened the positive relationship between technoference and shared activities, and non-intrusive inspection weakened the negative relationship between technoference and shared activities. No demographic variables were significant moderators and thus they were removed from final analysis. Hypothesis 3 was fully supported as the increase in both active mediation and non-intrusive inspection weakened the relationships between technoference and connectedness and between technoference and shared activities in the parent-child relationship.

Hypothesis 4

To test Hypothesis 4, moderation models were run using technoference as the independent variable, active mediation and non-intrusive inspection as moderators, and hostility in the parent-child relationship as the dependent variable. No significant moderation effect was observed in either of the two moderation models tested. Hypothesis 4 was not supported as neither active mediation nor non-intrusive inspection significantly moderated the relationship between technoference and hostility.

Discussion

Adolescent technology and social media use have steadily increased over the past few years (Anderson & Jiang, 2018). While the technology use behaviors of phubbing and technoference have previously been explored in romantic relationships and friendships, this study was unique in exploring these behaviors in the context of the parent-child relationship. Previous literature has indicated that phubbing is often

associated with detrimental relationship outcomes (e.g., Beukeboom & Pollman; Xie & Xie, 2020; Yang et al., 2021), but there had not yet been research that explored the potentially moderating effect of parental mediation of technology before this study. This study explored whether the technology mediation styles of active mediation and non-intrusive inspection moderated relationships between phubbing, technoference, and qualities of the parent-child relationship (connectedness, shared activities, and hostility). Overall findings were mixed with some support for the moderating roles of active mediation and non-intrusive inspection in some relationships between technology use behaviors and qualities of the parent-child relationship.

For several of the models in this study, the parental mediation strategies of active mediation and non-intrusive inspection seemed to weaken the relationships between technology use behaviors and qualities of the parent-child relationship. In other words, these mediation strategies appeared to somewhat mitigate or act as a buffer to any potentially deleterious associations, providing evidence that these more authoritative mediation strategies may be effective in helping to preserve parent-child relationship quality in the midst of disruptive technology use. These results support the literature indicating that a more authoritative parenting style is associated with better well-being and relational outcomes (e.g., Piko & Balazs, 2012; Pinquart & Gerke, 2019). Furthermore, this study's results provide evidence that how parents choose to mediate their adolescent's technology use potentially does have an impact on parent-child relationship quality; this association has not yet been studied in-depth in the literature. Within the overall findings that these two mediation strategies often mitigated the associations between technology use behaviors and relationship quality, there were some

interesting findings regarding the nature of these associations. For example, non-intrusive inspection weakened the positive association of negative perception of phubbing and shared activities in the parent-child relationship. This positive relationship was unique and may indicate an unexpected relationship between negative perception of phubbing and shared activities; perhaps parents who engage in more shared activities with their child are more emotionally impacted by phubbing behaviors, leading to an unexpectedly positive relationship. It is also important to note that active mediation and non-intrusive inspection appeared to have significant interactions with phubbing frequency, perhaps indicating that frequency of phubbing is still a meaningful measure in the context of the parent-child relationship despite previous criticism of using a simple measure of phubbing frequency (Yang et al., 2021).

Previous literature has connected parental phubbing behaviors with lower parental warmth and higher parental rejection (Xie & Xie, 2020). Adolescent phubbing with peers has also been connected with lower relationship quality (Chotpitayasunondh & Douglas, 2018) and higher depression (Sun & Samp, 2021). While these previous findings indicate that a relationship between adolescent phubbing and hostility in the parent-child relationship could reasonably exist, this association was not explored before this study. As predicted, when non-intrusive inspection and active mediation were higher, the relationship between phubbing and hostility was weaker, indicating that these mediation strategies may help to reduce hostility when disruptive technology use behaviors occur. Additionally, the relationships between phubbing and hostility were often surprising. Phubbing frequency had a positive relationship with hostility which seems aligned with research findings pointing to an association between phubbing and poor relationship

quality (e.g., Chotpitayasunondh & Douglas, 2018). In contrast, negative perception of phubbing was negatively associated with hostility, indicating that when negative perception of phubbing is higher, hostility is lower. This relationship is contrary to findings in the literature pointing to an association between negative perception of phubbing and poorer relationship quality (Yang & Christofferson, 2020). Perhaps parents who perceive phubbing more negatively have an overall closer and less hostile relationship with their child and thus they are more emotionally impacted by phubbing. Overall, higher levels of non-intrusive inspection and active mediation each appeared to weaken the relationships between phubbing and hostility in some way, but these variables need additional exploration through future research in order to better understand the directions of relationships.

Additionally, active mediation and non-intrusive inspection weakened the relationships between technoference and connectedness and shared activities, providing evidence that these mediation strategies potentially mitigate detrimental associations between technoference and positive qualities of the parent-child relationship. Because technoference includes the use of a variety of different types of technological devices in addition to smartphone use, it is possible that this construct is more heavily dependent upon parental mediation of technology as parents may engage in more regulation of certain types of technology device use. While previous literature has identified an association between technoference and lower relationship satisfaction in adult relationships (e.g., McDaniel & Coyne, 2016; McDaniel & Coyne, 2021), this study was unique in exploring the impact of adolescent technoference within the parent-child relationship. Findings from this study mostly fell in line with previous literature as

technofence was associated with positive qualities of the parent-child relationship, and the two parental mediation strategies explored in this study appeared to help preserve these positive relationship qualities in the midst of technofence. Because technofence is a broad construct containing many types of technological device use, further research is needed to explore how each type of technological device use (e.g. video game consoles, tablets, computers) is associated with parental mediation of technology and parent-child relationship quality. Meaningful differences may emerge that could help provide parents with guidance on how best to mediate a variety of different types of technology usage.

Finally, neither parental mediation strategy seemed to help weaken the relationship between technofence and hostility. This finding contrasts with previous literature which has established a connection between parental technofence and child externalizing behavior problems which could be correlated with hostility in the parent-child relationship (e.g., McDaniel & Radesky); instead, it appears that adolescent technofence may have different implications for the parent-child relationship than parent technofence. Additionally, this result may indicate that technofence and hostility are not meaningfully related or that authoritative mediation styles do not mitigate or otherwise significantly change the relationship between technofence and hostility. Interestingly, active mediation and non-intrusive inspection did seem to weaken the relationships between phubbing measures and hostility; this disparity may point to significant differences in how phubbing and technofence are mediated by parents and subsequently how they are associated with parent-child relationship quality. Additionally, active mediation and non-intrusive inspection seemed to weaken relationships at about the same rate across the analyses which may indicate that these technology mediation

types produce similar results and indeed fall within the broader scope of an authoritative parenting style. However, there were still models in which active mediation weakened relationships between technology use behaviors and relationship quality, and non-intrusive inspection did not, or vice versa, which in contrast points to meaningful differences in the implications of these styles.

Findings from the current study generally support the theoretical framework of this study. This study made clear that the technology use behaviors have some important impacts on the in-person microsystems of adolescents which falls in line with Bronfenbrenner's neo-ecological model (Navarro & Tudge, 2022); the parent-child relationship is an extremely influential component of the microsystem for adolescents as this relationship has significant bearing on well-being (e.g., Balbore et al., 2016; Branje et al., 2010). This study provided evidence for the intersections of technology use and the parent-child relationship within the framework of the microsystem. Additionally, this study provided evidence that technology use behaviors are often associated with disruptions to family structure as evidenced by lower connectedness and shared activities in the parent-child relationship as well as higher hostility. This evidence falls in line with the tenets of structural family therapy (Minuchin, 1974) that guided this study. Furthermore, this study's findings indicated that the active mediation and non-intrusive inspection strategies of technology mediation often weaken the associations between phubbing and negative outcomes for the parent-child relationship; these strategies could be conceptualized as a means of providing additional needed structure within the family system.

Limitations of Research

Likely one of the most significant limitations of this research was the relatively low internal consistencies of many of the scales, with the Cronbach's alphas ranging from .54 to .80. These low scores may be attributed to the brevity of many of the measures used in this study. While brief measures were selected to encourage participation and survey completion from busy caregivers, selecting a smaller number of longer measures would possibly have improved scale reliability. Because research on technology and social media is relatively new, many of the scales also lacked sufficient evidence of validity and/or reliability. More frequent use of these scales over time will help to improve evidence for these scales or make clear that their psychometrics are not sufficient for use. Low scale reliability may also be attributable to large variances in how each individual responded to the measures. Technology use, parental mediation of technology, and parent-child relationship quality are all highly dependent upon family and cultural contexts. While demographic variables did not emerge as significant moderators in this study, it is possible that there are additional individual differences not assessed for in this study that significantly impacted study results. The sample of this study was also recruited entirely through social media through both the researcher's networks as well as through large groups and forums of parents. Spreading a survey widely can result in a more diverse sample but can also introduce the risk of bot infiltration. Despite efforts to minimize bot infiltration and delete potential bot responses, it is also possible that low quality responses remained in the data set which could decrease scale reliability and influence moderation results.

It is also important to note that this study was limited to description of relationships and thus no causal interactions should be inferred. Because this study did

not attempt to establish directionality or causality, technology use behaviors and parental mediation of technology cannot be said to directly “affect” or “cause” changes in the quality of the parent-child relationship. Additionally, this study was focused on parental perceptions of their adolescent children. These perceptions are inherently biased, and they should not be assumed to accurately describe adolescents’ true engagement in technology use behaviors. Finally, two additional types of parental mediation of technology were removed from the analysis to narrow the focus of this study. Eliminating these mediation types may have removed some potentially important findings from the final analysis.

Implications and Areas for Future Research

This study was unique in its exploration of adolescent technology use behaviors from the perspective of parents as well as the analysis of how parental mediation of technology changes the relationship between technology use behaviors and the quality of the parent-child relationship. Parents of adolescents have reported that conflict and stress over technology is common with adolescents, and parents often seek help from mental health professionals to manage this challenging situation (Francis et al., 2021). The overall conclusion from this study is that adolescent technology use behaviors were often associated with lower parent-child relationship quality, and the parental mediation strategies of active mediation and non-intrusive inspection were often impactful in weakening this detrimental association. These findings have many limitations and are by no means entirely conclusive, but they can serve as a starting point for mental health providers to consider the types of guidance and support they can provide to parents who are concerned that their adolescent’s use of technology is in some way negatively

impacting the parent-child relationship. Mental health providers are well-suited to provide psychoeducation that can help caregivers understand their options for mediating their child's technology use and how those options have been thus far associated with different relational outcomes.

With respect to research, social media and technology research are certain to keep expanding. This study has many gaps that could be further explored. Researchers could conduct a similar study with longer, more robust measures that would be more likely to provide good reliability. The variables of this study could be explored within parent-child dyads which would allow for interesting comparison of parent and child perspectives on technology use and their relationship. Researchers could also expand this study to look at both parent and adolescent technology use behaviors. Parental mediation of technology is one area with relatively little research thus far, so expanding on this topic in the context of the parent-child relationship could provide meaningful results. Future studies could also examine additional mediation strategies in order to compare relational outcomes. Finally, it would also be valuable to explore this study's variables within the broader context of the family system which may include other caregivers and siblings. Findings from these studies would provide important researchers that mental health practitioners can use to support adolescents and their families through technology-related stress.

Conclusion

Adolescents are the most frequent users of social media (Anderson & Jiang, 2018), and their use has been associated with negative outcomes like increased depression and anxiety (e.g., Barry et al., 2017; Coyne et al., 2020) as well as positive outcomes like greater peer support (e.g., Bates et al., 2020; Lee et al., 2020). Researchers have found important differences between typical and so-called “problematic” use of technology and social media. Phubbing (Roberts & David, 2016) and technoference (2015) are two such constructs that were selected for use in these studies because they describe patterns of social media use that may be disruptive within the context of a relationship between two individuals. Research questions and hypotheses for these two studies were formulated based on previous literature as well as the dual theoretical frameworks of the neo-ecological model (Navarro & Tudge, 2022) and structural family therapy (1974). In essence, these frameworks provided a theoretical rationale for the overall argument that technology (such as social media) is now a daily part of the individual microsystem, and when the interactions between the in-person and virtual microsystems are not in balance, disruptions to the parent-child relationship occur which negatively impact the quality of the relationship. Thus far, research has not adequately explored the role of adolescent technology use within the contexts of the family system and the parent-child relationship. Mental health practitioners are qualified to help adolescents and their families navigate the potential stresses around the relatively new phenomenon of technology and social media use. The two studies in this dissertation sought to address this research gap by investigating the relationships between phubbing,

technoference, conflict over technology, parental mediation of social media, and parent-child relationship quality.

The first study in this dissertation broadly investigated whether conflict over technology mediated the relationships between phubbing and parent-child relationship quality and between technoference and parent-child relationship quality. Some hypotheses of this study were partially or fully supported which indicated that conflict over technology does help to explain the relationship between technology use behaviors and parent-child relationship quality in some cases. For example, conflict over technology mediated the relationship between technoference and hostility, indicating that higher technoference was associated with more conflict which was in turn associated with higher hostility. This finding in particular highlights the important role of conflict over technology in the potential path from technology use to the parent-child relationship. Additionally, findings indicated that conflict over technology helped explain the paths between technology use behaviors and connectedness but not with shared activities. Connectedness is a significant component of any relationship, and it seems meaningful that technology use and conflict over technology could be associated with a reduction in connectedness. Overall, the findings from study 1 were mixed and certainly not conclusive though they point to relationships between technology use behaviors, conflict over technology, and parent-child relationship quality that are worthy of further investigation.

The second study in this dissertation explored whether parental mediation of social media moderated the relationships between phubbing and parent-child relationship quality and between technoference and parent-child relationship quality. In the interest of

brevity, only the mediation styles of active mediation and non-intrusive inspection were analyzed as moderators; these styles appear to fall within the traditional parenting style framework of authoritative parenting (Baumrind, 1967), and it was hypothesized that these mediation strategies would generally reduce the strength of the relationships between technology use behaviors and parent-child relationship quality. In other words, it was hypothesized that these mediation strategies would partially mitigate the potentially deleterious association between technology use behaviors and the parent-child relationship. As demonstrated by some of the hypotheses in this study, this idea was generally supported. With respect to phubbing and positive qualities of the parent-child relationship, five of the eight models tested had significant moderation which occurred in the predicted direction in all but one of the significant models. Additionally, significant moderation occurred in the predicted direction in the relationships between technoference and positive qualities of the parent-child relationship. However, directions of some relationships in the study differed from what was predicted. The results from this study were far from conclusive, but it seems reasonable to conclude that the mediation strategies of active mediation and non-intrusive inspection appear to change the relationship between technology use and parent-child relationship quality in at least some circumstances. The results from study 2 highlight the need to continue research in this area to develop a deeper understanding of what types of parental mediation can help mitigate the potentially negative effects of certain technology use behaviors.

When viewed together, the findings from both studies highlight the complex ways in which technology use intersects with relationships. Because the parent-child relationship is a crucial contributing factor to adolescent development and well-being

(e.g., Branje et al., 2010; Carver et al., 2017), understanding how technology use behaviors can negatively or positively impact the quality of this relationship is beneficial for families navigating the relatively new phenomenon of adolescent technology use. Findings from these studies also highlight that technology use behaviors like phubbing and technoference are not inherently harmful to relationships. While there were some trends that indicated associations between technoference and hostility, for example, these results were not observed across all tested models. Researchers and practitioners should continue to be mindful that demonizing technology and social media use as inherently harmful ignores the complexity of the phenomenon and does nothing to help adolescents and their families to navigate technology-related stress. The mixed results of the two studies in this dissertation emphasize the need for further exploration of variables related to technology use behaviors within the context of the family system.

Technology and social media use have exploded in the past decade (Anderson & Jiang, 2018), and it is likely that this trend will continue. Furthermore, research indicates that children are starting to use social media at increasingly younger ages (Pew Research Center, 2019). Conflict and stress over technology are already happening within many families (Francis et al., 2021), and this issue may worsen or become more frequent as younger children are starting to use social media. Therefore, it is vital that future research continues to explore technology use within the family context. One area of impactful research may be on the efficacy of parental mediation strategies. Currently there is little guidance for practitioners and parents on what strategies promote online safety while preserving or enhancing positive qualities of the parent-child relationship. Additionally, future research could explore technology use in relation to multiple caregivers and

siblings within the family unit. Eventually, mental health practitioners could develop psychoeducation groups and curricula grounded in empirical research that can be utilized in schools and counseling environments. Mental health practitioners who are educated on both the benefits and drawbacks of technology use can work effectively with adolescents and their families to develop plans and strategies that promote well-being and relationship quality.

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Appendix A: Sample Consent Form

Informed Consent for Participation in Research Activities

“Parent Perception of Adolescent Technology Use: Implications for the Parent-Child Relationship”

You are invited to participate in a research study conducted by Tiffany Somerville under the supervision of Dr. Emily Brown at the University of Missouri - St. Louis.

This study is exploring parent (or other primary caretaker) perceptions of how adolescent children use technology. The purpose of this study is to better understand how adolescent technology use is associated with the quality of the parent-child relationship.

There are no significant risks associated with this research. However, answering questions about your child’s behavior and your relationship with your child could feel somewhat uncomfortable.

To participate in this study, you must (1) read English fluently; (2) have guardianship of at least one child whose age is between 12 and 18 who regularly uses at least one social media platform; and (3) have a child appropriate for this study who lives with you at least half of each week.

If you choose to participate, you will be directed to a survey which will ask you questions about your adolescent child’s technology use behaviors and your relationship with your adolescent child. The survey will take approximately 10-15 minutes. Approximately 300-400 participants may be involved in this study.

Your participation is voluntary, and you may choose not to participate in this research study or withdraw your consent at any time. You will NOT be penalized in any way should you choose not to participate or withdraw.

At the end of the study, **you may choose to enter a drawing to win one of 50 \$15 Amazon gift cards.** If you choose to enter the drawing, your email address will be collected in a separate survey, and your information cannot be connected to your survey responses.

Your responses to this survey will be completely anonymous. No personally identifying information, such as your name or email address, will be collected. We will do everything we can to protect your privacy. Your anonymous responses will be stored in password-protected files on password-protected computers that can only be accessed by the researchers. As part of this effort, your identity will not be revealed in any publication that may result from this study. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human

Research Protection) that would lead to disclosure of your data as well as any other information collected by the researcher.

If you have any questions or concerns about this study, please contact the Principal Investigator (Tiffany Somerville, tasrx4@umsl.edu, 618-780-3680) or the faculty advisor (Dr. Emily Brown, brownemily@umsl.edu). You may also contact the Office of Research at the University of Missouri - St. Louis at 314-516-5897 if you have any questions or concerns regarding your rights as a research participant.

By selecting the arrow to move forward with this study, you are consenting to participate.

Please save or print a copy of this form for your records

Appendix B: Demographics

1. Do you have at least one child between the ages of 12 and 18 who regularly uses social media?
 - a. Yes
 - b. No (exits survey)
2. Does your child between the ages of 12 and 18 live with you at least half of each week?
 - a. Yes
 - b. No (exits survey)
3. How old are you? (Enter a whole number) _____
4. What is your gender?
 - a. Female
 - b. Male
 - c. Nonbinary/genderqueer
 - d. If none of the above fit for you, please describe your gender here:
5. What is your race/ethnicity? (Check all that apply)
 - a. Asian/Asian American
 - b. African American/Black
 - c. European American/White
 - d. Hispanic/Latinx
 - e. Native American/Indigenous American
 - f. Native Hawaiian/Pacific Islander
 - g. If the options above do not accurately describe how you identify yourself, please share how you self-identify: _____
6. What is the highest level of education you have completed?
 - a. Did not complete high school
 - b. High school
 - c. Some college, no degree
 - d. Undergraduate degree (associate or bachelor's)
 - e. Some graduate hours, no degree
 - f. Master's degree
 - g. Doctorate/Professional degree
7. Which most closely describes how you experience your social class in the past 5 years?
 - a. Very low income/poverty level
 - b. Working class
 - c. Middle class
 - d. Upper middle class
 - e. Upper class

If you have multiple children, please answer the following survey questions in relation to only one child. The child you choose to focus on for this survey should be your child who appears to use social media the most often. Please answer the following questions about this child's background:

8. How old is your child? (drop-down menu – ages 12-18)
9. What percentage of each week does this child live with you? (Estimate from 50-100%)
10. What is their gender?
 - a. Female
 - b. Male
 - c. Nonbinary/genderqueer
 - d. If none of the above fit for your child, please describe their gender here:

11. What is their race/ethnicity? (Check all that apply)
 - a. Asian/Asian American
 - b. African American/Black
 - c. European American/White
 - d. Hispanic/Latinx
 - e. Native American/Indigenous American
 - f. Native Hawaiian/Pacific Islander
 - g. If the options above do not accurately describe how you identify your child, please share how you identify them: _____

Appendix C: Phubbing Frequency Scale (Parent Perception of Adolescent)

Please use the scale provided to indicate how frequently you experience each of the following behaviors while spending time with your adolescent child.

1 = “Never”

3 = “Sometimes”

5 = “All of the Time”

1. During a typical mealtime that I spend with my child, they pull out and check their cellphone.
2. When their cellphone rings or beeps, they pull it out even if we are in the middle of a conversation.
3. During leisure time that I spend together with my child, they use their cellphone.
4. When I spend time with my child, they often glance at their cellphone when talking to me.
5. When I spend time with my child, they keep their cellphone where they can see it.
6. My child uses their cellphone when we are talking in person.
7. My child never keeps their cellphone in their hand when they’re with me.
8. When I am out with my child, they use their cellphone at some point during our time together.
9. If there is a lull in my conversation with my child, they will check their cellphone.

Scoring:

Item 7 is reverse-coded.

Source: David & Roberts (2020)

Appendix D: Negative Perception of Phubbing

While responding to the questions below, please recall a recent time when you had a face-to-face interaction with your child when they were using a phone at the same time.

1 = “strongly disagree”

2 = “kind of disagree”

3 = “kind of agree”

4 = “strongly agree”

1. I felt unimportant.
2. I felt ignored.
3. I felt disrespected.
4. I wish my child was not using the phone.
5. It did not bother me.

Scoring:

Item 5 is reverse-coded

Source: Yang & Christofferson (2020)

Appendix E: Technology Device Interference Scale (TDIS) (Parent Perception of Adolescent)

On a typical day, about how many times do the following devices interrupt a conversation or activity you are engaged in with your child?

	None	One	2 to 3 times	4 to 5 times	6 to 10 times	11 to 20 times	More than 20 times
Cellphone/Smartphone	0	1	2	3	4	5	6
Television	0	1	2	3	4	5	6
Computer	0	1	2	3	4	5	6
Tablet (e.g., iPad, Kindle Fire, etc.)	0	1	2	3	4	5	6
iPod or other music player	0	1	2	3	4	5	6
Video game on console	0	1	2	3	4	5	6

Scoring:

Total all items for technoference score

Source: McDaniel & Radesky (2018)

Appendix F: Conflict in Technology Scale

On a scale of 1 to 5, how often is each item a problem in your relationship with your child?

	Never	Rarely	Sometimes	Often	Very Often
1. Time spent on internet	1	2	3	4	5
2. Time spent blogging	1	2	3	4	5
3. Time spent on social networking sites	1	2	3	4	5
4. Time spent watching TV	1	2	3	4	5
5. Time spent talking or texting on cell phone	1	2	3	4	5
6. Time spent on iPod, iPad, smartphone, or other tablet	1	2	3	4	5
7. Time spent on computer	1	2	3	4	5
8. Time spent playing video games (either on console or online)	1	2	3	4	5

Scoring:
Total all items

Source: McDaniel & Coyne (2016)

Appendix G: Parental Social Media Mediation Scale

Rate your response to each question using the following scale:

1 2 3 4 5 6 7

Not at all ←————→ Very
frequently

1. How frequently do you remind your child not to give out personal information on social media?
2. How frequently do you tell your child to stop any experience on social media if they feel uncomfortable or scared?
3. How frequently do you explain to your child about the dangers of social media?
4. How frequently do you restrict the type of social media platforms your child can visit?
5. How frequently do you set rules regarding your child's access to social media, such as Facebook, Twitter, YouTube, Instagram, WhatsApp, Line, etc.?
6. How frequently do you limit the kind of activities your child can do on social media?
7. How frequently do you restrict the amount of time your child can use social media?
8. How frequently do you limit your child to using social media only for schoolwork?
9. How much do you agree that you ask your child to share their social media account(s) and password(s) with you?
10. How frequently do you log onto your child's social media account(s) to check their social media friends list?
11. How frequently do you log onto your child's account(s) to check their conversations with others?
12. How frequently do you log onto your child's social media account(s) to check the games they play?
13. How frequently do you log onto your child's social media account(s) to check the pictures they post?
14. How much do you agree that you know your child's social media account(s)?
15. How frequently do you check your child's social media profile(s)?
16. How much do you agree that you add your child as a friend on social media to check what they post on social media?

Scoring:

Active mediation subscale = sum of items 1, 2, and 3

Restrictive mediation subscale = sum of items 4, 5, 6, 7, and 8

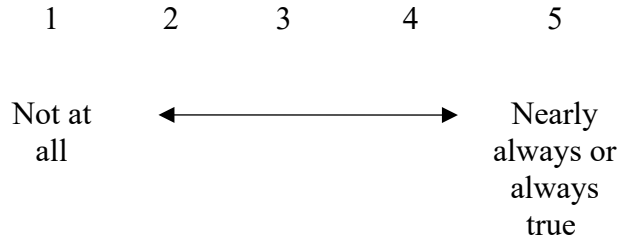
Authoritarian surveillance subscale = sum of items 9, 10, 11, 12, and 13

Non-intrusive inspection subscale = sum of items 14, 15, and 16

Source: Ho et al. (2019)

Appendix H: Parent-Adolescent Relationship Scale (PARS)

Please rate how much you agree with the statements using the following scale:



1. We eat meals together.
2. We spend time doing activities we each like.
3. We go to family events together.
4. I encourage my teenager to get support from me or others.
5. I show affection to my teenager (e.g., hugs, kisses, smiling, arm around shoulder).
6. I comfort my teenager when he/she is upset.
7. I make negative comments about my teenager to others.
8. During stressful times in my teenager's life, I check if he/she is okay.
9. I get upset when my teenager disagrees with me.
10. I play sport or do other physical activities with my teenager.
11. My teenager complains about me.
12. I encourage my teenager to do things he/she is interested in/enjoys.
13. I criticize my teenager.
14. I think my teenager needs to change his/her attitude.
15. I encourage my teenager to talk about their thoughts and feelings.

Scoring:

Connectedness subscale: sum of items 4, 5, 6, 8, 12, and 15

Shared activities subscale: sum of items 1, 2, 3, and 10

Hostility subscale: sum of items 7, 9, 11, 13, and 14

Source: Burke et al. (2020)

Appendix I: Tables and Figures for Study 1

Figure 1

Hypothesized Mediation Model in Study 1

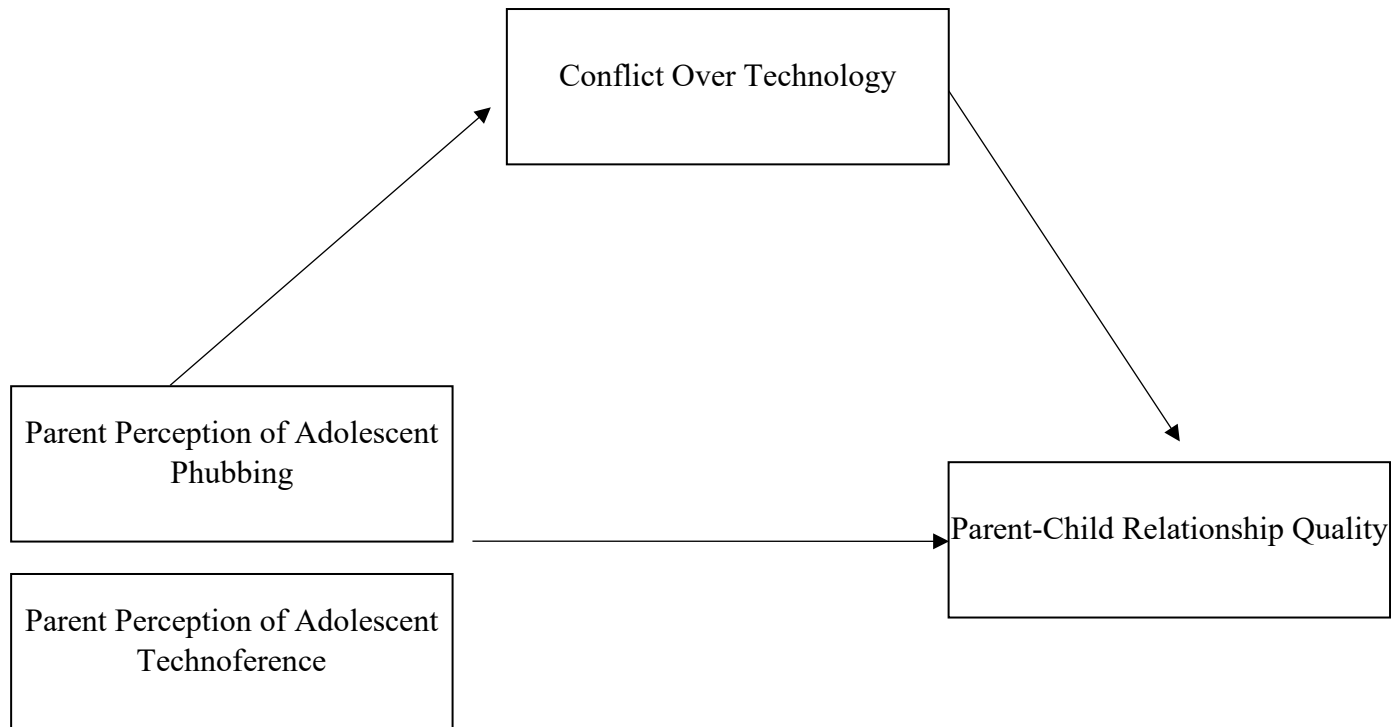
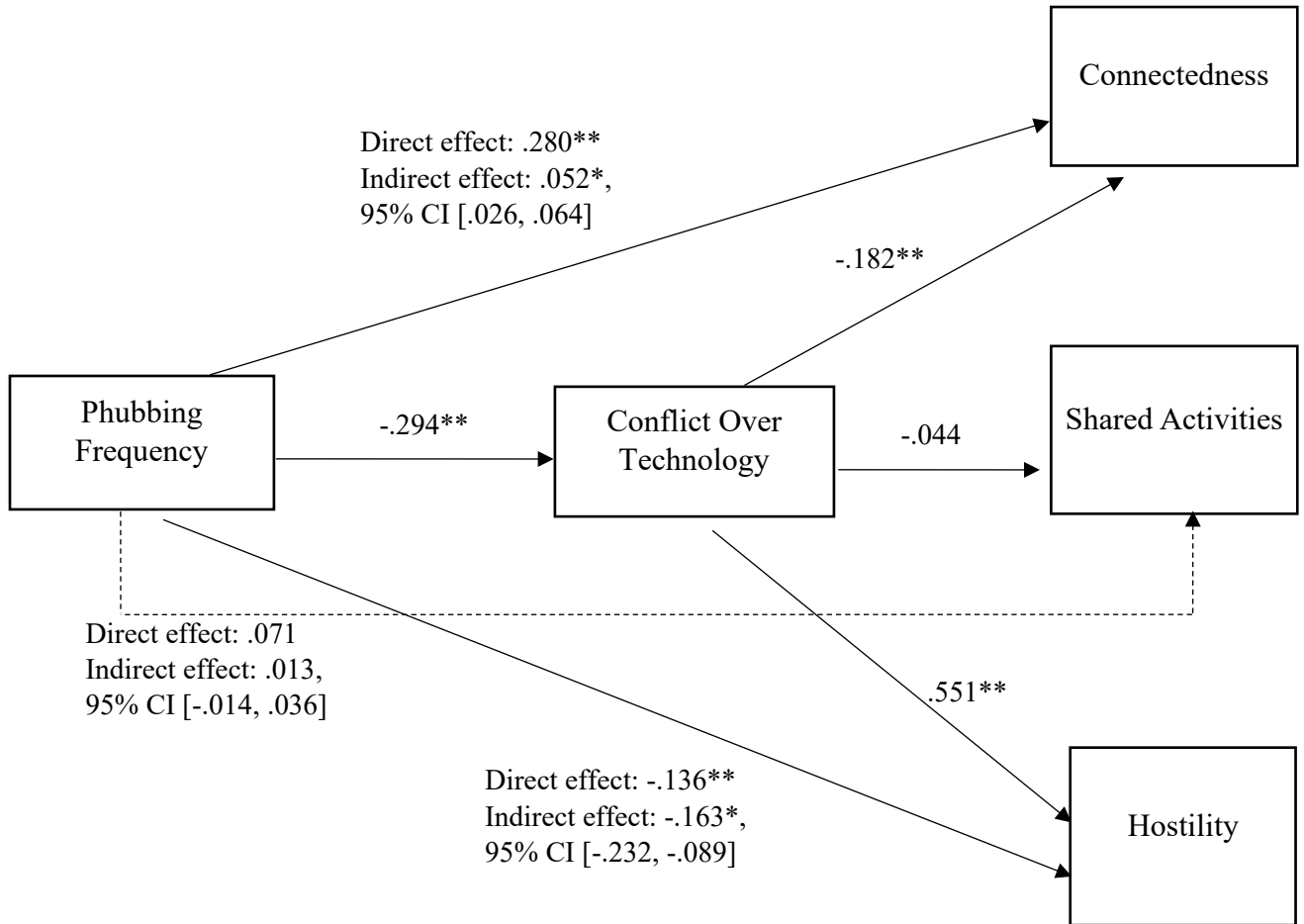


Figure 2

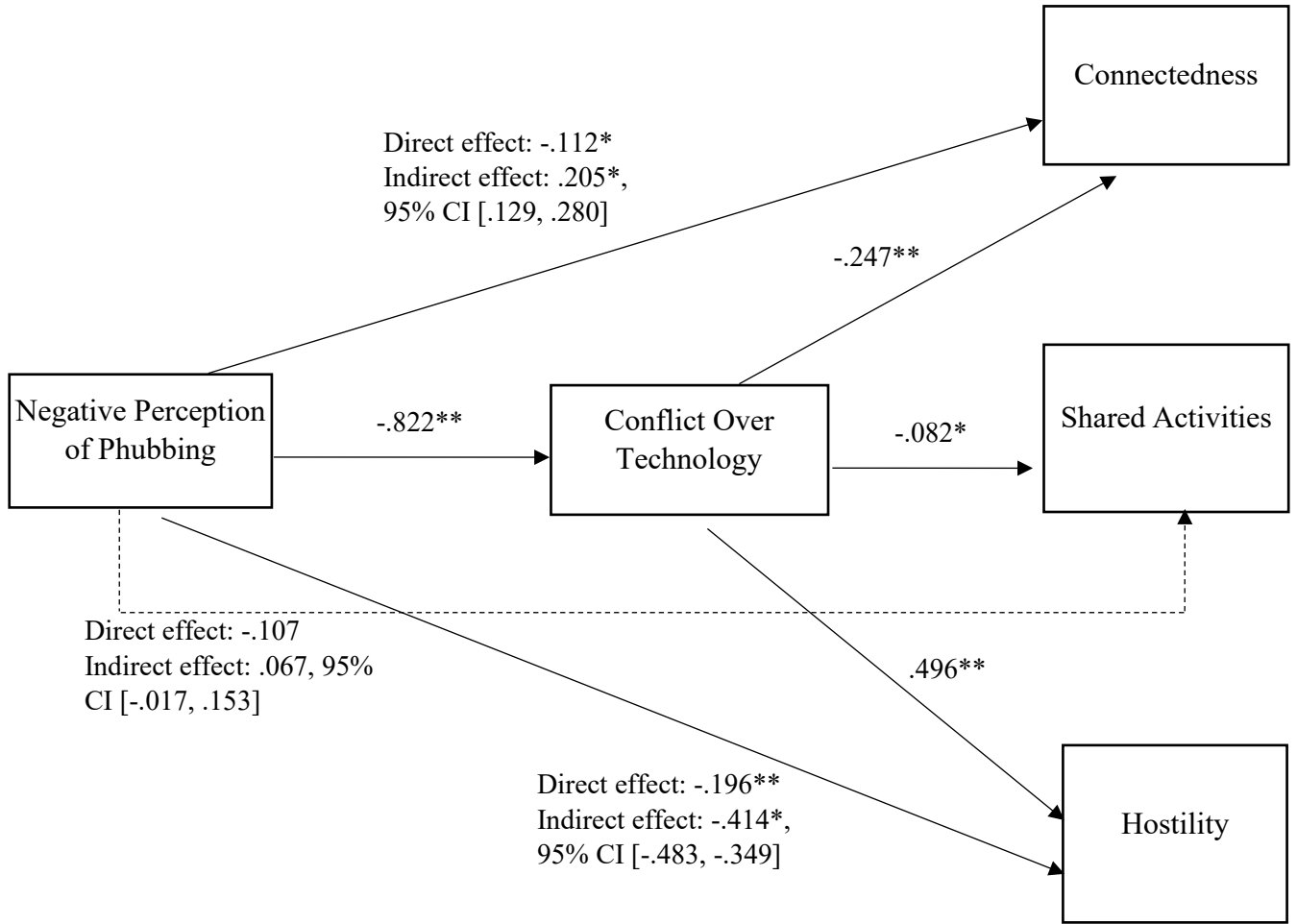
Mediation Model with Phubbing Frequency, Conflict Over Technology, Connectedness, Shared Activities, and Hostility



Note: Path values are unstandardized path coefficients. * $p < .05$, ** $p < .001$.

Figure 3

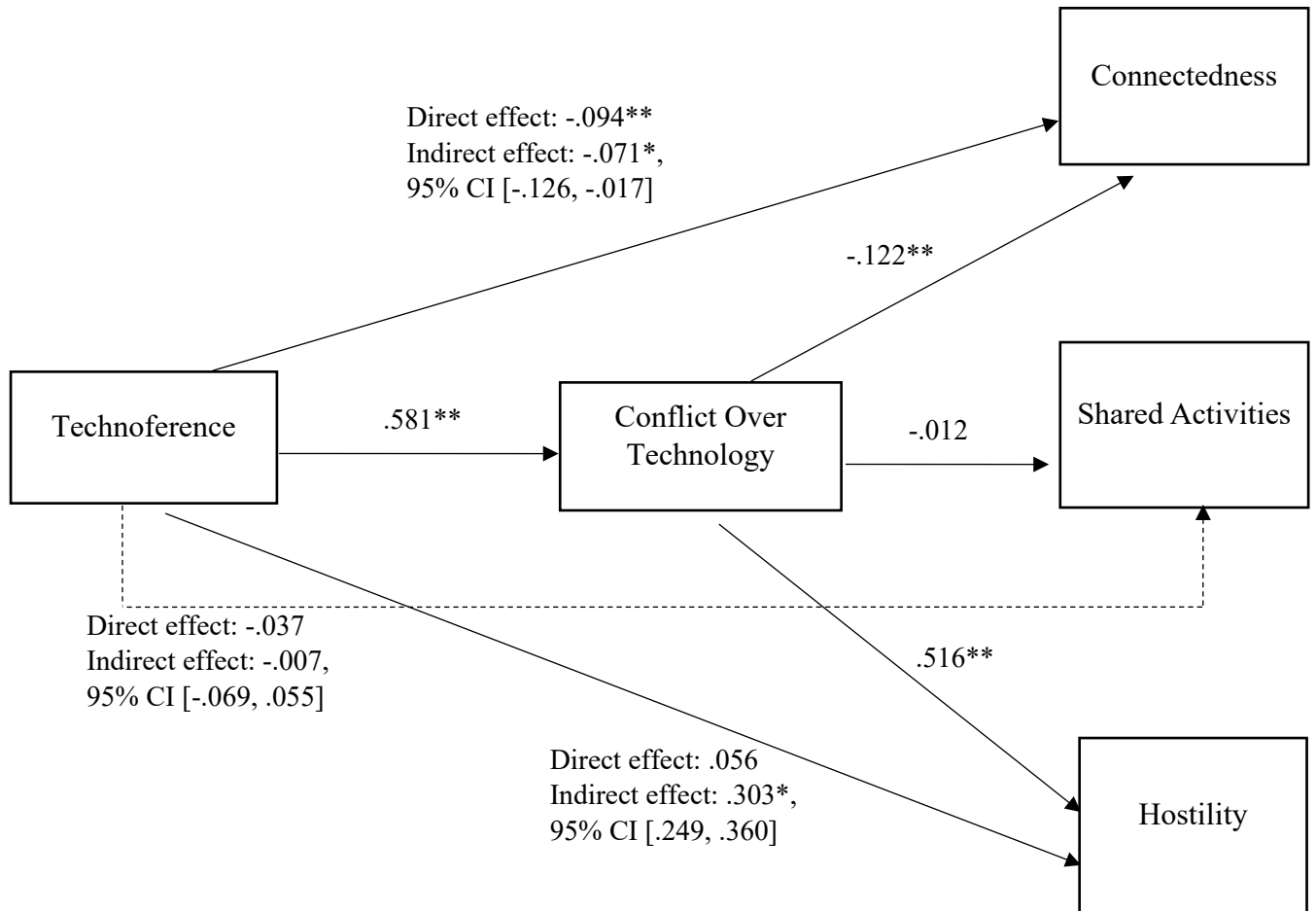
Mediation Model with Negative Perception of Phubbing, Conflict Over Technology, Connectedness, Shared Activities, and Hostility



Note: Path values are unstandardized path coefficients. $*p < .05$, $**p < .001$.

Figure 4

Mediation Model with Technoference, Conflict Over Technology, Connectedness, Shared Activities, and Hostility



Note: Path values are unstandardized path coefficients. * $p < .05$, ** $p < .001$.

Table 1
Means, Standard Deviations, Internal Consistencies, and Correlations of Scales in Study 1

Variable	M	SD	α	1	2	3	4	5	6	7
1. Phubbing	3.18	.60	.67	-						
2. Negative Perceptions of Phubbing	2.13	.57	.73	.12**	-					
3. Technoference	3.32	1.07	.80	-.14**	-.31**	-				
4. Conflict Over Technology	3.33	.86	.89	-.17**	-.54**	.72**	-			
5. Connectedness in Parent-Child Relationship	4.37	.73	.54	.27**	.06	-.25**	-.24**	-		
6. Shared Activities in Parent-Child Relationship	4.18	.79	.58	.04	-.05	-.07	-.06	.47**	-	
7. Hostility in Parent-Child Relationship	3.63	.84	.60	-.19**	-.38**	.47**	.59**	-.21**	-.06	-

Note: $N = 749$. * $p < .05$, ** $p < .01$

Table 2
Mediation Analyses of Conflict Over Technology Between Phubbing and Parent-Child Relationship

	Path	B	SE	p	95% CI
Model 1	PF -> COT (path a)	-.294	.179	<.001	[3.95, 4.65]
	COT -> SAPR (path b)	-.044	.035	.214	[-.113, .025]
	PF -> SAPR (path c')	.071	.224	.169	[3.67, 4.55]
	PF -> COT -> SAPR (a*b)	.013	.013		[-.014, .036]
Model 2	PF -> COT (path a)	-.284	.045	<.001	[3.93, 4.64]
	COT -> CPR (path b)	-.182	.031	<.001	[-.24, -.12]
	PF -> CPR (path c')	.280	.045	<.001	[.10, .37]
	PF -> COT -> CPR (a*b)	.052*	.014		[.026, .064]
Model 3	PF -> COT (path a)	-.295	.056	<.001	[3.95, 4.66]
	COT -> HPR (path b)	.551	.031	<.001	[.491, .612]
	PF -> HPR (path c')	-.136	.046	.003	[-.226, -.046]
	PF -> COT -> HPR (a*b)	-.163*	.036		[-.232, -.089]
Model 4	NPP -> COT (path a)	-.822	.049	<.001	[-.918, -.726]
	COT -> SAPR (path b)	-.082	.041	.047	[-.162, -.001]
	NPP -> SAPR (path c')	-.107	.063	.088	[-.230, .016]
	NPP -> COT -> SAPR (a*b)	.067	.043		[-.017, .153]
Model 5	NPP -> COT (path a)	-.830	.048	<.001	[4.91, 5.33]
	COT -> CPR (path b)	-.247	.038	<.001	[-.321, -.173]
	NPP -> CPR (path c')	-.112	.219	.048	[-.225, -.001]
	NPP -> COT -> CPR (a*b)	.205*	.038		[.129, .280]
Model 6	NPP -> COT (path a)	-.834	.049	<.001	[-.931, -.738]
	COT -> HPR (path b)	.496	.036	<.001	[.425, .566]
	NPP -> HPR (path c')	-.196	.055	<.001	[-.303, -.088]
	NPP -> COT -> HPR (a*b)	-.414*	.035		[-.483, -.349]

Note. $N = 749$. PF = Phubbing frequency; NPP = Negative perception of phubbing; COT = Conflict Over Technology. CPR = Connectedness in the Parent-Child Relationship.

SAPR = Shared Activities in the Parent-Child Relationship. HPR = Hostility. * $p < .05$, significant mediation effect.

Table 3
Mediation Analyses of Conflict Over Technology Between Technoference and Parent-Child Relationship

	Path	B	SE	p	95% CI
Model 1	T -> COT (path a)	.581	.021	<.001	[.539, .622]
	COT -> CPR (path b)	-.122	.045	.007	[-.210, -.034]
	T -> CPR (path c')	-.094	.036	.009	[-.166, -.024]
	T -> COT -> CPR (a*b)	-.071*	.028		[-.126, -.017]
Model 2	T -> COT (path a)	.583	.021	<.001	[.542, .625]
	COT -> SAPR (path b)	-.012	.050	.812	[-.110, .086]
	T -> SAPR (path c')	-.037	.040	.356	[-.117, .042]
	T -> COT -> SAPR (a*b)	-.007	.032		[-.069, .055]
Model 3	T -> COT (path a)	.588	.021	<.001	[.546, .630]
	COT -> HPR (path b)	.516	.044	<.001	[.430, .602]
	T -> HPR (path c)	.056	.035	.118	[-.014, .125]
	T -> COT -> HPR (path c')	.303*	.028		[.249, .360]

Note. $N = 749$. T = Technoference; COT = Conflict Over Technology. CPR =

Connectedness in the Parent-Child Relationship. SAPR = Shared Activities in the Parent-Child Relationship. HPR = Hostility. * $p < .05$, significant mediation effect.

Appendix J: Tables and Figures for Study 2

Figure 5

Hypothesized Moderation Model for Study 2

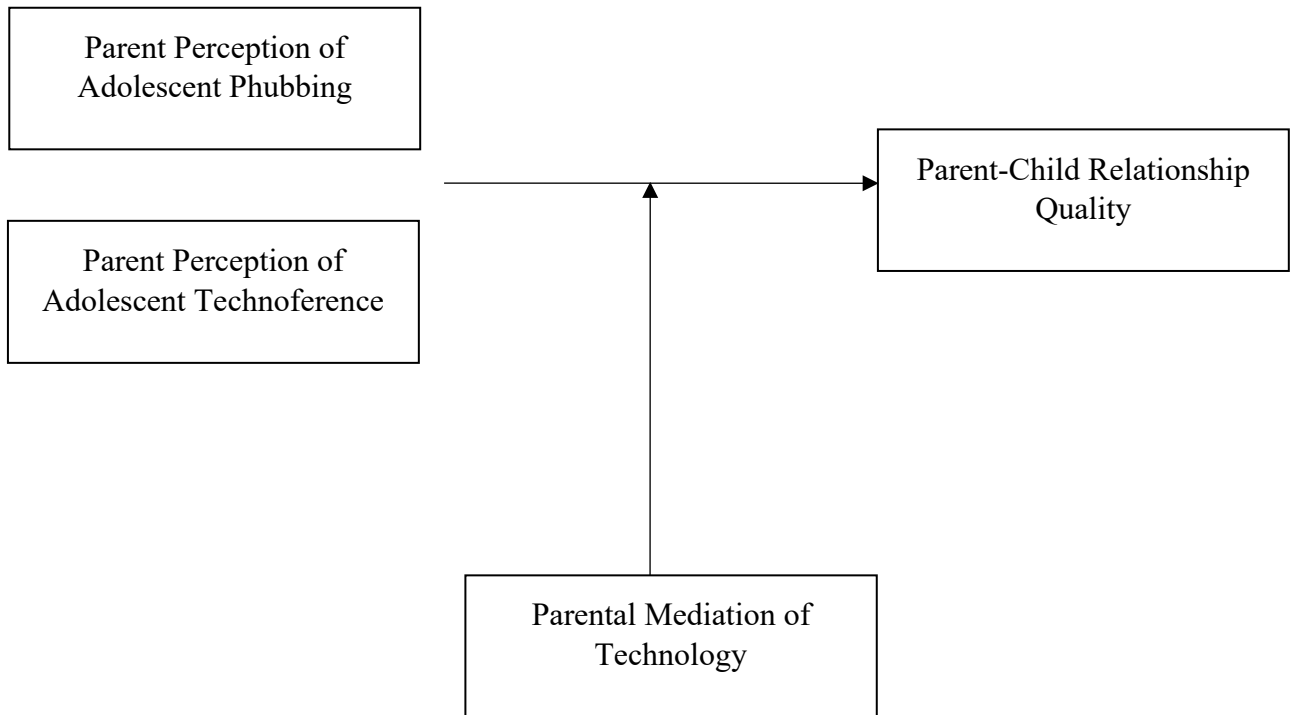
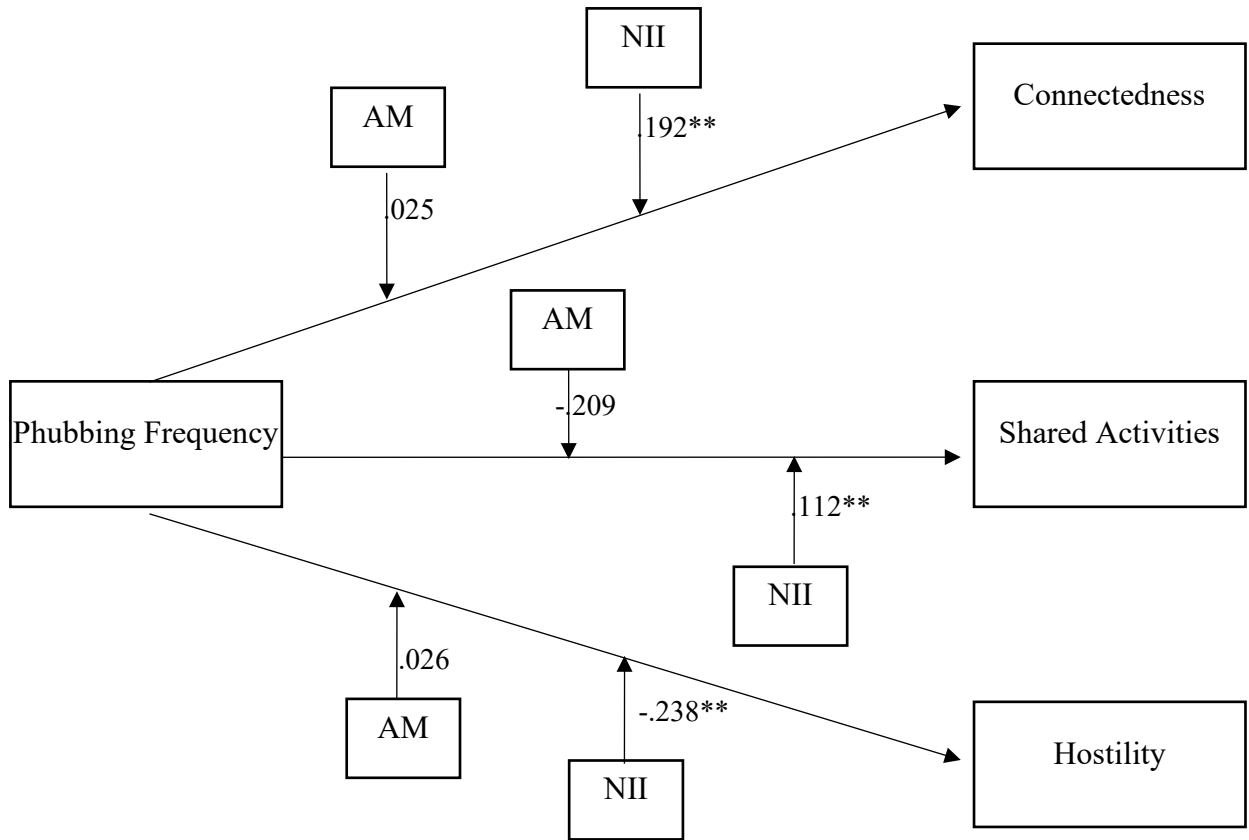


Figure 6

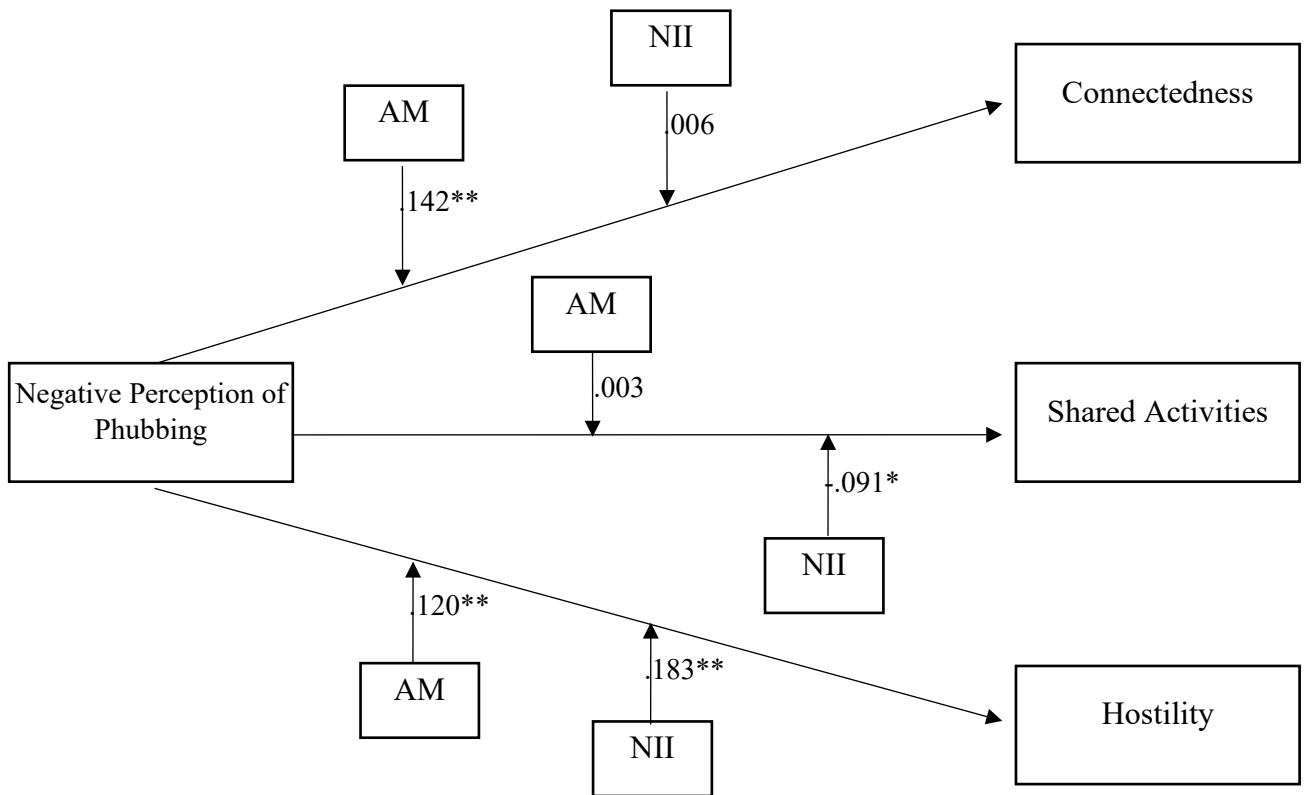
Moderation Model with Phubbing Frequency, Active Mediation, Non-Intrusive Inspection, Connectedness, Shared Activities, and Hostility



Note: Moderation path values are the coefficients for the moderation interaction terms. * $p < .05$, ** $p < .001$.

Figure 7

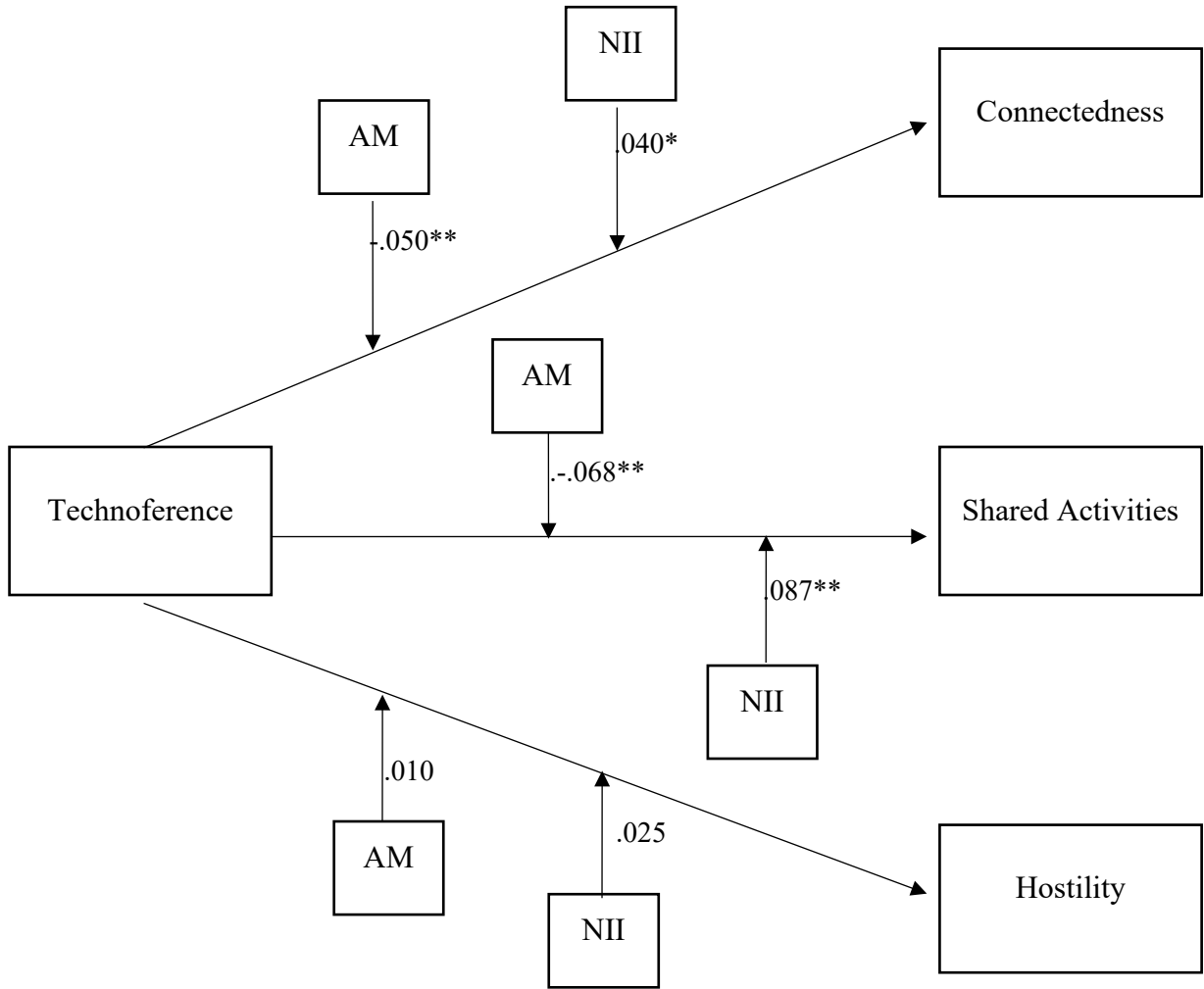
Moderation Model with Negative Perception of Phubbing, Active Mediation, Non-Intrusive Inspection, Connectedness, Shared Activities, and Hostility



Note: Moderation path values are the coefficients for the moderation interaction terms. * $p < .05$, ** $p < .001$.

Figure 8

Moderation Model with Technoference, Active Mediation, Non-Intrusive Inspection, Connectedness, Shared Activities, and Hostility



Note: Moderation path values are the coefficients for the moderation interaction terms. * $p < .05$, ** $p < .001$.

Table 4
Means, Standard Deviations, Internal Consistencies, and Correlations of Scales in Study 2

Variable	M	SD	α	1	2	3	4	5	6	7
1. Phubbing	3.18	.60	.67	-						
2. Negative Perceptions of Phubbing	2.13	.57	.73	.12**	-					
3. Technofence	3.32	1.07	.80	-.14**	-.31**	-				
4. Parental Mediation of Social Media	4.20	.75	.71	-.08*	-.17**	.40**	-			
5. Connectedness in Parent-Child Relationship	4.37	.73	.54	.27**	.06	-.25**	.001	-		
6. Shared Activities in Parent-Child Relationship	4.18	.79	.58	.04	-.05	-.07	.08*	.47**	-	
7. Hostility in Parent-Child Relationship	3.63	.84	.60	-.19**	-.38**	.47**	.33**	-.21**	-.06	-

Note: $N = 749$. * $p < .05$, ** $p < .01$

Table 5
Moderation Analyses of Parental Mediation of Technology Styles in the Relationship Between Phubbing Frequency and the Parent-Child Relationship

	Effect	B	SE	t	p	95% CI
Model 1 (Connectedness)	Constant	2.881	.575	5.012	<.001	[1.753, 4.010]
	Phubbing Frequency	.186	.173	1.074	.283	[-.154, .527]
	Active Mediation	.105	.110	.951	.342	[-.111, .321]
	Phubbing Frequency x Active Mediation	.025	.033	.774	.439	[-.039, .090]
Model 2 (Connectedness)	Constant	5.987	.487	12.29	<.001	[5.030, 6.943]
	Phubbing Frequency	-.573	.156	-3.675	<.001	[-.880, -.267]
	Non-Intrusive Inspection	-.575	.103	-5.604	<.001	[-.777, -.374]
	Phubbing Frequency x Non-Intrusive Inspection	.192*	.032	6.073	<.001	[.130, .254]
Model 3 (Shared Activities)	Constant	5.130	.647	7.935	<.001	[3.860, 6.399]
	Phubbing Frequency	-.538	.195	-2.751	.006	[-.921, -.154]
	Active Mediation	-.209	.124	-1.691	.091	[-.452, .034]
	Phubbing Frequency x Active Mediation	.115*	.037	3.115	.002	[.042, 1.87]
Model 4 (Shared Activities)	Constant	5.503	.553	9.960	<.001	[4.418, 6.588]
	Phubbing Frequency	-.446	.177	-2.517	.012	[-.794, .098]
	Non-Intrusive Inspection	-.342	.117	-2.934	.004	[-.571, -.113]
	Phubbing Frequency x Non-Intrusive Inspection	.112*	.036	3.114	.002	[.041, .183]
Model 5 (Hostility)	Constant	5.766	.689	8.367	<.001	[4.415, 7.122]
	Phubbing Frequency	-.423	.208	-2.033	.042	[-.831, -.015]
	Active Mediation	-.241	.132	-1.83	.069	[-.501, .018]
	Phubbing Frequency x Active Mediation	.026	.039	.656	.512	[-.051, .103]
Model 6 (Hostility)	Constant	1.070	.572	1.872	.062	[-.052, 2.193]
	Phubbing Frequency	.761	.184	4.144	<.001	[.400, 1.121]
	Non-Intrusive Inspection	.810	.121	6.709	<.001	[.573, 1.048]
	Phubbing Frequency x Non-Intrusive Inspection	-.238*	.037	-6.386	<.001	[-.311, -.165]

Note. * $p < .05$, significant moderation effect.

Table 6

Moderation Analyses of Parental Mediation of Technology Styles in the Relationship Between Negative Perception of Phubbing and the Parent-Child Relationship

	Effect	B	SE	t	p	95% CI
Model 1 (Connectedness)	Constant	4.983	.456	10.941	<.001	[4.089, 5.877]
	Negative Perception of Phubbing	-.758	.206	-3.673	<.001	[-1.163, -.353]
	Active Mediation	-.101	.090	-1.119	.264	[-.279, .076]
	Negative Perception of Phubbing x Active Mediation	.142*	.040	3.579	<.001	[.064, .220]
Model 2 (Connectedness)	Constant	3.775	.433	8.729	<.001	[2.926, 4.624]
	Negative Perception of Phubbing	.074	.185	.401	.687	[-.289, .437]
	Non-Intrusive Inspection	.087	.092	.946	.345	[-.094, .268]
	Negative Perception of Phubbing x Non-Intrusive Inspection	.006	.040	.139	.889	[-.072, .084]
Model 3 (Shared Activities)	Constant	3.619	.500	7.234	<.001	[2.637, 4.601]
	Negative Perception of Phubbing	-.183	.227	-.806	.421	[-.628, .263]
	Active Mediation	.190	.099	1.918	.056	[-.082, .089]
	Negative Perception of Phubbing x Active Mediation	.003	.044	.071	.943	[-.082, .089]
Model 4 (Shared Activities)	Constant	3.257	.465	7.008	<.001	[2.344, 4.169]
	Negative Perception of Phubbing	.344	.199	1.731	.084	[-.046, .734]
	Non-Intrusive Inspection	.234	.099	2.366	.018	[.040, .429]
	Negative Perception of Phubbing x Non-Intrusive Inspection	-.091*	.043	-2.1268	.034	[-.174, -.007]
Model 5 (Hostility)	Constant	6.587	.508	12.960	<.001	[5.589, 7.584]
	Negative Perception of Phubbing	-1.126	.231	-4.880	<.001	[-1.579, -.673]
	Active Mediation	-.373	.101	-3.702	<.001	[-.570, -.175]
	Negative Perception of Phubbing x Active Mediation	.120*	.044	2.702	.007	[.033, .207]
Model 6 (Hostility)	Constant	6.960	.458	15.210	<.001	[6.061, 7.858]
	Negative Perception of Phubbing	-1.407	.196	-7.191	<.001	[-1.791, -1.023]
	Non-Intrusive Inspection	-.459	.098	-4.708	<.001	[-.651, -.268]

Negative Perception of Phubbing x Non- Intrusive Inspection	.183	.042	4.331	<.001	[.100, .265]
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Note. * $p < .05$, significant moderation effect.

Table 7
Moderation Analyses of Parental Mediation of Technology Styles in the Relationship Between Technoference and the Parent-Child Relationship

	Effect	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>	95% CI
Model 1 (Connectedness)	Constant	3.193	.324	9.862	<.001	[2.557, 3.829]
	Technoference	.095	.095	.997	.319	[-.092, .281]
	Active Mediation	.343	.062	5.524	<.001	[.221, .465]
	Technoference x Active Mediation	-.050*	.019	-2.676	.008	[-.086, -.013]
Model 2 (Connectedness)	Constant	5.108	.284	17.969	<.001	[4.550, 5.666]
	Technoference	-.356	.087	-4.110	<.001	[-.526, -.186]
	Non-Intrusive Inspection	-.029	.061	-.486	.627	[-.148, .090]
	Technoference x Non- Intrusive Inspection	.040*	.018	2.154	.032	[.004, .076]
Model 3 (Shared Activities)	Constant	2.359	.363	6.497	<.001	[1.646, 3.072]
	Technoference	.315	.107	2.954	.003	[.106, .525]
	Active Mediation	.386	.070	5.551	<.001	[.250, .523]
	Technoference x Active Mediation	-.068*	.021	-3.284	.001	[-.109, -.028]
Model 4 (Shared Activities)	Constant	5.431	.317	17.118	<.001	[4.808, 6.054]
	Technoference	-.440	.097	-4.557	<.001	[-.630, -.251]
	Non-Intrusive Inspection	-.243	.067	-3.609	<.001	[-.376, -.111]
	Technoference x Non- Intrusive Inspection	.087*	.020	4.276	<.001	[.047, .128]
Model 5 (Hostility)	Constant	3.214	.352	9.124	<.001	[2.522, 3.905]
	Technoference	.303	.104	2.932	.004	[.102, .507]
	Active Mediation	-.153	.068	-2.271	.023	[-.286, -.021]
	Negative Perception of Phubbing x Active Mediation	.010	.020	.518	.605	[-.029, .050]
Model 6 (Hostility)	Constant	2.832	.307	9.220	<.001	[2.229, 3.435]
	Technoference	.258	.094	2.750	.006	[.074, .441]
	Non-Intrusive Inspection	-.092	.066	-1.408	.160	[-.221, .036]
	Negative Perception of Phubbing x Non- Intrusive Inspection	.025	.020	1.252	.211	[-.014, .064]

Note. * $p < .05$, significant moderation effect.

Figure 9

Simple Slope Analyses of Significant Moderation Effects

