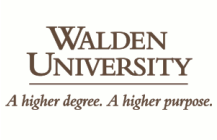

2016

Adolescent Peer-Related Computer-Mediated Communication and Its Relationship to Social Anxiety

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This is to certify that the doctoral dissertation by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2016

Abstract

Adolescent Peer-Related Computer-Mediated Communication

and Its Relationship to Social Anxiety

by

Neil Matthew Parker

MS, Walden University, 2014

BA, Washington State University, 1984

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Psychology

Walden University

October 2016

Abstract

Adolescents are adopting computer-mediated communication (CMC) at a higher rate than any other age group, with CMC becoming integral to their social relationships. This is particularly significant given the role peer relationships play in adolescent mental health. The purpose of this quantitative, quasi-experimental study was to explore the relationship between adolescent CMC and social anxiety. The research was guided by Erikson's theory of psychosocial development and Kock's media naturalness theory. This multiwave panel study included a convenience sample of 58 adolescents ages 11 to 18. Surveys were completed on participant's social skills and introversion, and daily data were gathered on CMC, face-to-face communication, and social anxiety. Three regression models were produced from each day's data. Results indicated a modest relationship between daily CMC and social anxiety. Results also indicated CMC users with lower social skills or higher in introversion may be at greater risk for social anxiety. Lower face-to-face communication was also found to be related to increased social anxiety in CMC users. Findings may be useful to researchers seeking to identify specific populations who are at greater risk for negative outcomes in CMC use. Findings may also be useful to clinicians, educators, and parents interested in CMC's role in adolescent mental health or its impact on the quality of adolescent peer relationships.

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Dedication

I would like to dedicate this dissertation to my father, Sid Parker, who left this world to be with his heavenly Father just as I completed this paper. Without the guidance he gave, the wisdom he imparted, and the role model he provided, I would not have had the courage or the character to complete this challenge.

Acknowledgments

This dissertation would never have happened without a community of people supporting me throughout the process. There were professors who instructed and challenged me. Fellow students played an important role in refining my work and being sounding boards for ideas. There were friends who provided resources that made a real difference. And my family was always there, loving me, believing in me, and sacrificing so much to help me complete this work.

There are a few I'd like to thank here by name: Professor Thomas Edman, who accepted the role as my chair even though his schedule was already full. Dr. Edman made this process a creative journey and an adventure. Our conversations about the true nature of research, statistical analysis, and life are some of my best memories of the entire process. I'd also like to thank Dr. Joanna Bissell-Havran, my content member. Her willingness to jump in for Dr. Edman and fill the chair role during a critical stage was a blessing. She challenged me, refined my work, and made a crucial difference.

I'd like to thank my Mom and Dad. Their belief in me was unwavering and their assistance at critical times made a real difference. My brother Terry helped gain access to my research site, a difficult and critical accomplishment that some said could never happen. Finally, I want to thank my wife Denise and son Evan. They loved me and believed in me. They sacrificed so much, so I could pursue my doctorate and complete this research. Their support meant everything.

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Chapter 1: Introduction to the Study

Introduction

Computer-mediated communication (CMC), which refers to any text-based interaction facilitated through technology (Spitzberg & Spitzberg, 2006), has changed dramatically since its inception in the 1980s. In its early iterations, CMC was primarily business oriented and e-mail based. In addition, early CMC included primitive interaction technologies such as bulletin board systems, which provided a limited but groundbreaking place for connecting and collaborating over the Internet. In the 1990's, these primitive systems gave way to the first socially oriented platforms such as CompuServe, AOL, and Classmates.com. The early 2000's brought the introduction of modern social networking sites (SNS), including Friendster, Myspace, and Facebook. These web-based services became immensely popular for social purposes and were the dominant CMC platforms during the 2000's.

In the last 5 years, changes are taking place that have significantly altered the CMC landscape. First, there have been significant increases in the extent of CMC adoption since 2010, particularly in younger age groups. For example, adolescent use of CMC has almost doubled since the mid-2000s, with 92% of adolescents now using CMC on a daily basis to connect with peers (Lenhart, 2015). Second, CMC has transformed from a computer and Internet-based process to being primarily mobile-based. The proliferation of smartphones has facilitated a dramatic change in how CMC occurs, with the use of cellular phones for CMC purposes doubling in the last 5 years (Smith, 2015). Texting and other mobile-based short messaging services now make up the majority of

CMC interactions (Lenhart, 2015). This change is a dramatic shift from the dominance of the computer-based social networking sites of the 1990's and 2000's. In short, since its inception in the 1980's, CMC has transformed from a computer-based process occurring over social networking sites to a mobile-based technology fully integrated into most people's daily social interactions.

Not surprisingly, this technology is being adopted extensively by teenagers for use with their friends. In fact, adolescents are adopting CMC for peer-related communication at the highest rate of any age group (Lenhart, 2015). This increase has resulted in a widespread migration of peer related communication from face-to-face communication (FTF) to CMC. This development is particularly significant given the importance of peer relationships to adolescent psychological well-being. Peer relationships serve a uniquely important role in well-being during adolescence. The quality of adolescent relationships is strongly correlated with social adjustment, self-efficacy, personality development, the process of individuation, and the development of psychopathology (Bukowski & Adams, 2005; Nangle, Erdley, Newman, Mason, & Carpenter, 2003). Given the relationship between the quality of peer relationships and adolescent well-being, the broad adoption of CMC by adolescents is of particular significance. Any widespread phenomenon that can potentially impact the quality of adolescent peer relationships seems worthy of attention by researchers.

Chapter 1 of this study provides a broad outline of how this research addressed the impact of CMC on adolescent relationships and adolescent psychological well-being. This chapter provides a general description of the research in this area, gives the rationale

for the importance of the study, and describes the research deficits that were addressed. Chapter 1 also introduces the key variables of the study, including how these variables were operationalized and measured. Finally, Chapter 1 also presents the research questions and provides the specific hypotheses that were explored.

Background and Problem Statement

If there is a potential for the adoption of CMC by adolescents to impact their psychological well-being, it is critical that CMC's association with negative mental health outcomes be explored. There is a significant body of research addressing the relationship between CMC and psychological well-being. Researchers agree that there are significant differences between CMC and FTF in forming and maintaining social relationships. Studies have indicated differing social norms between CMC and FTF, as well as greater ambiguity due to a lack of social cues in CMC (Schiffrin, Edelman, Falkenstern, & Stewart, 2010). Studies have indicated that CMC differs from FTF in the amount and types of conflict, as well as the ability to facilitate intimacy-producing communication (Manago, Taylor, & Greenfield, 2012; Tokunaga, 2011).

However, results from the body of literature on the impact of CMC on psychological well-being are decidedly mixed. On one hand, numerous researchers have found CMC related to a variety of negative outcomes. These range from a decline in subjective well-being to personality and internalizing disorders (Best, Manktelow, & Taylor, 2014; Huang, 2010; Rosen, Whaling, Rab, Carrier, & Cheever, 2013). In contrast, other researchers have argued that CMC can improve the quality of social relationships and be beneficial to psychological health (Lloyd, 2014; Valkenburg &

Peter, 2009). The focus of research has now moved on from looking for a basic correlation between overall CMC use and its impact on well-being, to looking for specific populations and unique CMC behaviors that are associated with negative outcomes (Anderson, Fagan, Woodnutt, & Chamorro-Premuzic, 2012; Best et al., 2014; Lloyd, 2014).

Several gaps exist in the search for the specific populations or behaviors that may increase susceptibility to negative outcomes in CMC use. These gaps will be fully explored in Chapter 2 and briefly introduced here. First, the research indicates psychosocially distressed individuals may be more likely to experience negative CMC outcomes, yet research exploring this is lacking (Anderson et al., 2012). Second, researchers have not operationalized and measured CMC as it is currently used by adolescents. As previously discussed, CMC now is primarily mobile-based and largely consists of texting and instant messaging. Most researchers define CMC as Internet or social networking site use. This does not reflect CMC as it currently exists in adolescent peer relationships. In studying the CMC's effect on adolescent psychological well-being, researchers should include texting and instant messaging in a way that accurately reflects adolescent use. Third, researchers have failed to account for the role of FTF communication may have in CMC outcomes. Because CMC and FTF have been found to differ in both function and effect, it seems useful to explore the effect of concurrent FTF when studying CMC. Fourth, there is a lack of CMC research with adolescent subjects (Lepp, Barkley, & Karpinski, 2014). This deficit is significant, given this

population has the highest rates of CMC adoption and is uniquely susceptible to the quality of peer relationships.

Purpose of the Study

The purpose of this quantitative study was to add to the body of knowledge on the consequences of the adolescent adoption of computer-mediated communication. I sought to identify factors that may influence outcomes associated with CMC use. Specifically, I examined the correlation between adolescent computer-mediated communication and social anxiety. This study also explored the impact of FTF, introversion, and social skills on social anxiety in a CMC environment. The study addressed contradictory findings on CMC's effects on psychological well-being by exploring variables that may influence CMC's impact. It did so by measuring CMC in ways that reflect real-world adolescent CMC use and by sampling adolescent peer communication and social anxiety on a daily basis.

Proposed Mechanisms Relating CMC and Psychological Well-Being

There are several potential mechanisms that may occur in any interactions between CMC and psychological well-being. The mechanisms proposed here are for conceptual purposes and are speculative in nature. These mechanisms will be presented, though, as they are the part of the rationale for the inclusion of the variables in this study. Both direct and indirect mechanisms are proposed. First, CMC adoption may directly impact adolescent mental health. This direct effect occurs through increased conflict and social comparison, as well as the limited social cues associated with CMC. As discussed in Chapter 2, conflict, comparison, and relational ambiguity are all associated with

increased social anxiety. There are two indirect mechanisms proposed, both of which occur through CMC's impact on the quality of peer relationships. As discussed in Chapter 2, research suggests the quality of peer relationships is related to psychological well-being in adolescents. The first indirect mechanism is CMC use negatively impacting the quality of adolescent peer relationships, resulting in increased social anxiety. It is proposed the increase in social anxiety occurs through a reduction in intimacy and social support associated with CMC adoption. As noted in Chapter 2, intimacy and social support are central in determining the quality of peer relationships. The second indirect mechanism happens because of the loss of FTF communication resulting from CMC adoption. In this mechanism, the reduction in FTF interactions with peers impacts the quality of peer relationships, subsequently causing increased social anxiety. Finally, it is proposed that levels of introversion and social skills may influence both the levels and quality of CMC and FTF. These conceptual mechanisms are modeled in Figure 1.

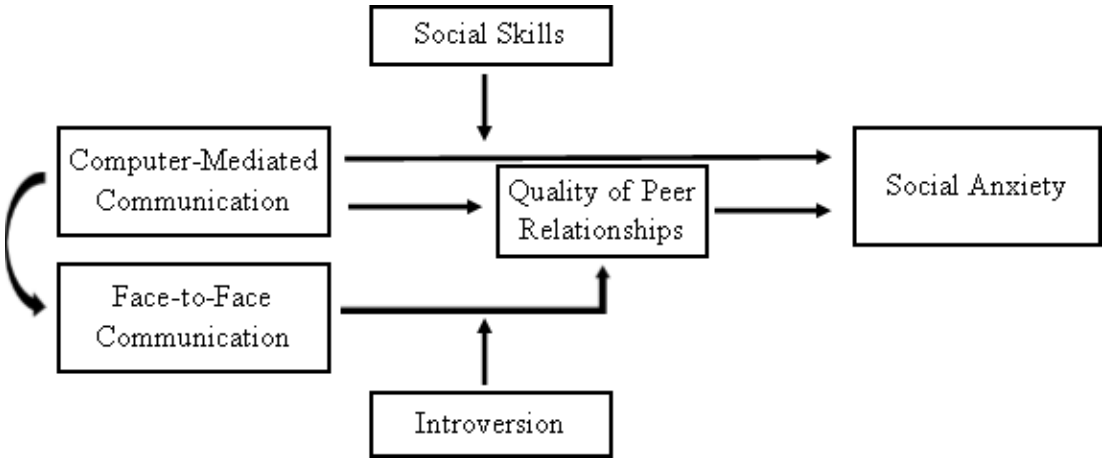

Figure 1: The conceptual model of the study. Figure 1 is a conceptual model illustrating potential relationships between the predictor variables and social anxiety. Actual relationships were determined through statistical analysis. The model illustrates a direct effect between CMC and social anxiety, as well an indirect effect through (a) CMC's impact on FTF and (b) the quality of peer relationships. The model illustrates CMC outcomes may be influenced by social skills and introversion.

Rationale for Inclusion of Variables

Social anxiety. To explore the proposed direct effect mechanism between CMC and psychological well-being, I tested CMC as a predictor of social anxiety. Psychological well-being was measured using state levels of social anxiety. Using social anxiety as an indicator of psychological well-being is uncommon in research exploring the impact of CMC, with depression and subjective well-being the most common choices. Although these are appropriate measures of psychological well-being, social anxiety was chosen because it may have a more direct relationship with computer-mediated communication. This idea is based on research suggesting social anxiety's development and course may be influenced by several factors associated with CMC. These factors, which are discussed in detail in Chapter 2, include ambiguity in social interactions, self-

focused attention, self-evaluation, and relational conflict. Each contributes to the development of social anxiety and increases during the use of CMC.

Face-to-face communication. To address the first indirect effect mechanism proposed between CMC and social anxiety, I explored levels of computer-mediated communication and face-to-face communication as predictors of social anxiety in adolescents. Levels of FTF were included based on the potential the adoption of CMC may result in the loss of FTF in some users. The loss of FTF may be a significant factor in determining CMC outcomes, and is fully discussed in Chapter 2. Measuring both FTF and CMC allowed this indirect mechanism to be explored.

Introversion and social skills. I also explored the impact of introversion and social skills on social anxiety in the context of CMC use. The exact nature of the relationship between these variables and social anxiety was determined by the results of the statistical analysis. These variables were selected as predicting variables based on research indicating that psychosocially distressed individuals may have more negative outcomes from CMC use. The nature of each of these variables and how they may interact with CMC and its outcomes is explored in detail in Chapter 2. The specific details of the design of this study are outlined in Chapter 3.

Research Questions and Hypotheses

Research Question 1: What is the strength and nature of the relationship between the amount of computer-mediated communication and social anxiety in adolescents?

$H_0$1: The amount of computer-mediated communication will not significantly predict the level of social anxiety in adolescents.

$H_1$1: The amount of computer-mediated communication will significantly predict the level of social anxiety in adolescents.

Research Question 2: How do introversion and social skills affect the strength and nature of the relationship between computer-mediated communication and social anxiety in adolescents?

$H_0$2: Introversion and social skills will not significantly moderate the relationship between computer-mediated communication and social anxiety in adolescents.

$H_1$2: Introversion and social skills will significantly moderate the strength and nature of the relationship between computer-mediated communication and social anxiety in adolescents.

Research Question 3: How does the amount of face-to-face communication affect the strength and nature of the relationship between computer-mediated communication and social anxiety in adolescents?

$H_0$3: The amount of face-to-face communication will not significantly moderate the relationship between computer-mediated communication and social anxiety in adolescents.

$H_1$3: The amount of face-to-face communication will significantly moderate the relationship between computer-mediated communication and social anxiety in adolescents.

Theoretical Framework

The premise that CMC adoption in adolescent peer relationships is harmful to psychological well-being includes two basic assumptions: First, that there are inherent

differences between CMC and FTF in its facilitation of peer relationships. Second, that adolescent mental health is susceptible to these differences. Theoretical support for these assumptions can be found in Ned Kock's media naturalness theory and Erik Erikson's theory of psychosocial development. Although these theories are fully explored in the literature review in Chapter 2, they are briefly introduced here.

Media Naturalness Theory

Media naturalness theory, as originally proposed by Kock (2004), provides a framework for establishing the inherent difference between FTF and CMC. Media naturalness theory holds that FTF communication is natural and biologically evolved (Kock, 2004), and because of this it is inherently more effective than other forms of communication in establishing and maintaining relationships. According to this theory, humans evolved by creating relational intimacy through face-to-face communication (Kock, 2004). Because of this, any form of communication that lacks all the characteristics found in FTF will be less effective. Media naturalness theory suggests the lack of natural social cues found in CMC explains its relative ineffectiveness (Kock, 2004). Kock (2004) argued that CMC can be equally effective as FTF. He also acknowledged that effective CMC communication will be more difficult to achieve and require more time than equivalent FTF interactions. The significance of media naturalness theory to this study is that it establishes a theoretical foundation for CMC being inherently less effective than FTF in establishing and maintaining peer relationships.

Theory of Psychosocial Development

According to Erikson's theory of psychosocial development, successful adolescent personality development is dependent on the quality of peer relationships. Erikson posited that an integrated identity is developed during adolescence, and that this requires healthy peer relationships (Erikson & Erikson, 1998). Erikson argues a lack of intimacy and peer affirmation can result in "personality diffusion." This diffusion produces maladjustment, misbehavior, personality regression, and psychopathology (Elkind, 1970; Erikson, 1993). Subsequent research supports a correlation between the symptoms of personality diffusion and several DSM-defined personality disorders (Crawford, Cohen, Johnson, Sneed, & Brook, 2004). Erikson's theory of psychosocial development holds that adolescent mental health is uniquely susceptible to the quality of peer relationships and provides the rationale for the impact of CMC on adolescent psychopathology.

Nature of the Study

This study employed a quantitative, quasi-experimental research design. It explored the relationship between levels of computer-mediated communication, face-to-face communication, and levels of social anxiety in adolescents. A multi-wave panel-study design was used, with data collected at the start of the study and on a daily basis for a period of 5 days.

The independent variables included the amount of participant's peer-related computer-mediated communication and face-to-face communication. Additional

independent variables were the subject's levels of introversion and social skills. The dependent variable in this study was daily levels of social anxiety.

Data were collected from junior and senior high students recruited in school health classes. Online surveys were used, with participants completing surveys using a smartphone or computer. During the initial data collection phase, information on trait levels of social anxiety, introversion, and social skills was collected. During the panel portion of the study, daily amounts of CMC and FTF were collected, along with daily levels of social anxiety. Multiple linear regression was employed to analyze the data.

Operational Definitions

Computer-mediated communication (CMC): Computer-mediated communication was defined as any text-based interaction conducted through technology. This included the use of the internet or wireless technology for texting, instant messaging, use of social networking sites, and e-mail. CMC included the use of cellular phones, smartphones, tablets, and computers for these activities.

Face-to-face communication (FTF): Face-to-face communication was defined as any verbal peer-related communication conducted either in person, using a phone, or through video.

Peer-related communication: Peer-related communication included socially purposed FTF and CMC interactions between adolescent peers. Communication with family, teachers, or other community members was not included.

Social media: Social media refers to websites and applications that enable users to create and share content or to participate in social networking. This includes the use of

the Internet for social purposes, as well as short messaging services such as Instagram, Snapchat, and Twitter.

Social networking sites (SNS): SNSs are web-based services for social networking that include a dedicated web page located on the Internet. Examples of the most popular social networking sites include Facebook, Instagram, Google +, and MySpace.

Internet use: Internet use most often refers to activities that require a Web connection and an online browser. Internet use includes social activities such as e-mail, the use of social networking sites, and SNS-based messaging services such as Google +. It also includes nonsocial activities such as online game playing, information gathering, online videos, and Web browsing. It does not traditionally include texting, nor does it include mobile-based technologies or short messaging services such as Snapchat, Twitter, or Instagram.

Assumptions

One assumption of this study was the survey responses from participants about the amount of daily CMC and FTF interactions were truthful and accurate. Although the daily collection of data was intended to improve the accuracy of data, self-reported data can be less reliable than data collected through observation (McDonald, 2008). A second assumption was the accuracy and truthfulness of the results from the instruments used to measure social anxiety, introversion, and social skills. As discussed in Chapter 3, the instruments used to measure social anxiety, social skills, and introversion have been shown to be valid and reliable in adolescent populations. In addition, steps were taken to check the psychometric properties of these instruments using the data collected in this

study. These steps will be outlined in Chapter 3. Yet it is important to note that it is assumed participants were truthful and accurate in their responses, and the instruments were valid for the individual participants in this study. A third assumption was the collection of 5 days of data was enough for purposes of this study. The decision to limit data collection to 5 days was made considering the difficulties in recruiting adolescent participants for a longitudinal study of this nature, as well as the additional challenges associated with collecting data on a daily basis from this population. It was assumed that 5 days of data accurately represented the subject's normal CMC use and was enough to generalize the findings outside of the study period.

Scope and Delimitations

I measured only socially purposed computer-mediated communication. As previously discussed, researchers in this area have attempted to identify the specific types of CMC users and specific CMC behaviors more likely to result in negative outcomes. Limiting the measurement of CMC to socially purposed peer communication was intended to narrow the focus of the study. Socially purposed CMC behaviors may be more likely to negatively impact the quality of adolescent peer relationships, a potential mechanism in the development of adolescent psychopathology.

The study's primary purpose was to determine whether CMC is a predictor of social anxiety. It also sought to identify any role FTF, introversion, and social skills may play in affecting social anxiety levels in the context of CMC use. Although this study tested for moderation, it was not its goal to determine the distinct mechanisms involved in the relationship between predictors and criterion variables. This study was limited to

examining (a) CMC's relationship with social anxiety and (b) whether adding FTF, introversion, and social skills to CMC as predictors improved the model fit.

In addition, this study did not directly address the issue of online bullying. Nor did it address issues associated with "problematic Internet use," a term referring to addictive or compulsive Internet behaviors. Online bullying has been identified as an issue related to CMC use and is clearly associated with negative impacts on adolescent psychological well-being (Law, Shapka, Domene, & Gagné, 2012). However, bullying is not unique to CMC and is not caused by CMC use. As such, online bullying does not necessarily reflect unique characteristics or outcomes related to CMC. Likewise, problematic Internet use was also not addressed. Although problematic Internet use has been found to be related to some psychopathologies (Law, Shapka, Hymel, Olson, & Waterhouse, 2012), the purpose of this study was to attempt to identify inherent differences between CMC and FTF. So while compulsive CMC use is associated with psychopathology, it is a symptom of a pre-existing disorder and not its cause (Shapira, Goldsmith, & Keck, 2000). Like online bullying, problematic Internet use does not necessarily reflect inherent differences or unique outcomes from the adoption of CMC.

Limitations

One limitation of this study was the study population may not be generalizable. The subjects were recruited in health education classes, which are required courses for students in the schools in question. This strategy was an attempt to access a representative sample of the larger population of each school. Unfortunately, convenience sampling was used due to difficulties with the recruitment of minors. A

convenience sample means the population of this study may not be generalizable to a school's population or adolescents in general (Creswell, 2009).

Other limitations of this study included making inferences of a causal relationship between the study's predictor variables and the dependent variable. The longitudinal design of this study allowed for the establishment of a temporal relationship between variables. Most researchers, however, argue a cause-effect relationship should not be inferred in a quasi-experimental study, even if a temporal relationship has been established (Campbell & Stanley, 1963). In particular, care needs to be taken not to infer causation given the potential for pre-existing relationships between the variables outside of the context of CMC. Some studies have suggested a possible connection between introversion, lower social skills, and social anxiety. As is discussed in Chapter 2, research indicates these are separate and distinct constructs. However, it is important to keep in mind correlations found this study may be the result of relationships between variables that occur apart from CMC use.

Significance of the Study

Exploring the patterns of communication related to FTF and CMC and their effect on adolescent anxiety is essential and timely. The adoption of peer-related CMC in adolescent culture is widespread and growing, and a very large population is at risk for any potential negative effects. It is important to note the development of psychopathologies such as anxiety during adolescence has severe consequences. Social anxiety is one of the most common mental illnesses diagnosed during adolescence and is a significant contributor to depression and suicidal ideation (Costello, Copeland, &

Angold, 2011; King & Vidourek, 2012). Moreover, adolescent mental illness often has long-term consequences well into adulthood (Weissman et al., 1999). If a shift to computer-mediated communication is contributing to social anxiety and other adolescent psychopathologies, it is critical to identify this relationship.

The establishment of a link between CMC and specific types of adolescent psychopathology could serve as a basis for further research into the mechanisms involved, the identification of uniquely susceptible populations, and ways to moderate the negative effects. This study may be used to inform parents, educators, and clinicians on best way to approach adolescent social media use. It is important for these groups to understand any harm that may be occurring so they can identify strategies to protect adolescent mental health.

Summary

In the last decade, computer-mediated communication has evolved from its historical roots as a computer-facilitated, Web-based process with a limited audience. CMC has now become a mobile-based activity, which is fully integrated into the daily social interactions of a large majority of adolescents. Although researchers have identified clear differences between CMC and FTF, the results on the relationship between CMC and psychological well-being have been mixed. Research has now shifted to identifying specific populations and unique CMC behaviors that are more likely to be related to negative outcomes. Given that adolescents have adopted CMC in their peer relationships at a higher rate than other age groups, and given that adolescent psychological well-being is uniquely sensitive to the quality of peer relationships, it is

important to identify these populations and behaviors. Research is needed to more accurately measure CMC as it is currently used by adolescents, explore the impact of CMC on psychosocially stressed adolescents, and include face-to-face peer interactions as a concurrent variable. This study was an attempt to add to the body of literature in each of these areas.

Chapter 2 will provide a detailed review of the research in this area to date. It includes an exploration of the numerous theories that are foundational for a relationship between CMC and adolescent psychological well-being. It addresses research on adolescent development, identifying the reasons why adolescent mental health is uniquely susceptible to peer relationships. It explores the literature on the nature of adolescent peer relationships, identifying unique characteristics that may make them susceptible to the impact of CMC adoption. Finally, Chapter 2 examines the body of literature on CMC and its relationship to adolescent psychological well-being. It highlights the impact of CMC on specific adolescent populations and explores CMC-related behaviors that warrant further research.

Chapter 2: Literature Review

Introduction to the Literature Review

This chapter includes a review the body of literature addressing computer-mediated communication and its role in adolescent psychological well-being. Because CMC may affect adolescent mental health indirectly through peer relationships, particular attention is paid to adolescent peer relationships and the role these relationships play in adolescent psychological well-being. This literature review consists of five sections. The first section is a preview of the organization and content of the review, including the rationale for the inclusion of each section and how the sections relate with one another. The second section is an overview of CMC. This section begins with a review of the various types of adolescent CMC used to facilitate peer relationships. It then explores the unique qualities of CMC in comparison to face-to-face communication and addresses several communication theories that directly relate to CMC and social relationships. Section three examines adolescent peer relationships. This section addresses adolescent neurological development and how it relates to an increase in sensitivity to peer feedback and the salience of social cues. I include research on social development as well as adolescent identity formation. Particular attention is paid to Erik Erikson's theory of psychosocial development, a theoretical foundation for this study. In addition, section three includes a review of research on how adolescents select and maintain dyadic and group relationships, as well as the role of peer relationships in adolescent mental health. In the fourth section I review findings on the impact of CMC on the quality of peer relationships. I discuss several competing hypotheses from the literature that attempt to

explain the impact of CMC on peer relationships. Finally, the fifth section reviews the body of research on CMC's relationship to psychological health, including findings on subjective well-being, depression, and anxiety.

Literature Search Strategy

I used several databases to generate the literature for this review. These included PsycARTICLES, PsycINFO, SAGE Premier, SAGE Encyclopedias, JSTOR, and EBSCO's psychology and behavioral sciences collection. I also used the Google Scholar search engine. It was necessary to use a wide variety of keywords in the literature search, due to the inconsistency in terminology used by researchers in this field. The literature search included numerous keywords referencing the use of technology in social communication. These included *computer-mediated communication, CMC, social media, internet, social networking sites, online communication, instant messaging*, and *texting*. The other predictor variables for this study were searched using the terms *extraversion, extroversion, introversion, social skills,* and *social competence*. The relational component of the search included the terms *peer relationships, online relationships, offline relationships, friendships, face-to-face, FTF, social support*, and *intimacy*. The mental health component of the study included the keywords *mental health, psychopathology, well-being, subjective well-being, anxiety*, and *social anxiety*. The keywords *adolescent, adolescence*, and *teenager* were subsequently added to most of these terms to identify literature that specifically targeted an adolescent population. Because of the previously mentioned diversity of terms in use by researchers, heavy reliance was placed on reference lists and cited references from articles.

An emphasis was placed on literature written in the past 5 years. An attempt was made to comprehensively search for and include all relevant studies on CMC's relationship to mental health outcomes. Foundational and seminal studies were included regardless of the date.

Computer-Mediated Communication

Adolescents and Technology

Although computer-mediated communication is technically defined as any interpersonal communication using technology, this study focused on the specific subset of CMC-related to social communication between adolescents. As such, the modes of CMC addressed in this section reflect the real-world adolescent use of CMC to communicate with their peers. Adolescent social use of CMC has been both growing and evolving, starting with the inception of the first social networking site in 1997 (Ahn, 2011). Currently, adolescents have widely adopted the technology that facilitates socially-purposed CMC, regardless of almost every social and economic barrier. Amada Lenhart, a senior researcher and director of teens and technology initiatives at the Pew Research Center, has led an annual report for the last decade exploring the adolescent adoption of technology and social media. In the most recent Pew Research Center report, Lenhart (2015) stated that 87% of adolescents have daily access to a computer or laptop, and 88% have daily access to a cell phone. As a result, this generation of adolescents is the most technologically connected ever. Somewhat surprisingly, the adoption of technology seems to cross traditional barriers to technology adoption, including culture, income, and gender. Ahn (2011) explored access and adoption of technology by

adolescents, finding that as of 2011, 94% of adolescents in homes without Internet access found access through other means. Ahn found that the gaps in access across gender, race, and SES that existed in the year 2000 had largely disappeared by the time of her report (Ahn, 2011). For example, African American adolescents have higher rates of smartphone ownership than European American, and both Hispanics and African Americans access the Internet on mobile phones at higher rates than European American adolescents. In short, the large majority of adolescents across most demographics have daily access to the technologies that facilitate CMC.

Adolescent Adoption of Computer-Mediated Communication

A large majority of adolescents are using the Internet, and these numbers are steadily growing. Given that adolescents use the Internet almost exclusively for social purposes (Madden, Lenhart, & Duggan, 2013), these increases reflect significant growth in the adolescent use of CMC to communicate within their social networks. Lenhart (2015) reported daily Internet use for adolescents was 93%, up from 51% in 2005. In addition, she reported that 80% of adolescents go online several times per day. Cell phone access to the Internet is growing as well, with 86% of adolescents using their cell phones to access the Internet multiple times per day, compared to 45% who even owned a cell phone in 2005 (Lenhart, 2015; Lenhart et al., 2005).

Data on the trends in the adoption of specific types of CMC by adolescents reflect changes in types of technology and how they are used. As of 2013, 81% of teens used social media services to communicate with peers (Madden et al., 2013). The proliferation of numerous new types of social media sites and instant messaging services means that

adolescent social media is no longer primarily accessed or based via computer. Mobile access to social media sites and social media services based exclusively on mobile platforms are changing the face of social media and result in a constantly evolving picture of adolescent CMC. According to Lenhart (2015) and the Pew Research Project, social media services used by adolescents includes Facebook (71%), Instagram (52%), Snapchat (51%), and Google + and Twitter (31%). More than one social media service is used by 71% of adolescents, and most users have a combination of friends who inhabit multiple platforms and who are unique to a single service. A more recent trend is that Facebook, long the choice of an overwhelming majority of adolescents, is receding in popularity. Although Facebook remains the most used social media service, older teenagers and those higher in SES are trending toward platforms such as Instagram and Snapchat (Lenhart, 2015), which are best described as instant messaging services.

Recent Trends in Adolescent Use of Computer-Mediated Communication

Two recent trends in how adolescents use technology and CMC are contributing to a significant increase in the intensity of CMC utilization. First, there has been a substantial rise in adolescent smartphone adoption, with 73% of adolescents reporting they have regular access to these devices (Lenhart, 2015). This percentage is up from just 21% in 2009 (Lenhart, 2012). This 350% increase in the last 6 years is significant, in that smartphones allow for constant access to a wide variety of social networking and instant messaging services. This proliferation of smartphones has facilitated an increase in the intensity of adolescent CMC, helping to create a subset of adolescents who are, for all intents and purposes, continually online. As of 2015, 24% of adolescents reported

going online "almost constantly" (Lenhart, 2015, p. 2), a pattern of use that was relatively rare only a few years ago. This highly intensive use is only possible with access to a smartphone.

The second noteworthy trend is the proliferation of texting. Although social media and Internet-based platforms dominated adolescent CMC a decade ago, by 2012 texting had become the primary means of peer-related CMC (Madden et al., 2013). As of 2015, 79% of adolescents texted with peers daily, up from 33% in 2005. The median number of texts sent or received was 30 per day. The average number of texts per day was 67, and that number rose to 74 with older teens and to 83 texts per day in girls age 15-17. The difference between the median and mean in texting frequency indicates that while most teenagers are texting relatively often, a subgroup of teenagers is texting at very high rates. In context of the concurrent drop in adolescent voice calls with peers (Lenhart, 2012), the volume of texts and constant online access seem to indicate that a subset of adolescents may be replacing part of their face-to-face communication with CMC.

These two trends are important in the study of CMC's relationship to adolescent peer relationships and its role in their psychological health for two reasons. First, these trends reflect a significant change in the number of computer-mediated social interactions occurring on a daily basis. As little as 5 years ago, the social use of CMC by adolescents was overwhelming computer based and limited by computer access. Now, as discussed, adolescents primarily use mobile phones. The switch from computer-based social media web sites to mobile phone-based instant messaging has changed the typical pattern of

CMC use. It has been transformed from an occasional social activity occurring at home once or twice a day to a continuous social behavior integrated into almost every type of adolescent activity. Second, the adoption of texting and other forms of instant messaging as the primary avenue of CMC, means that much of the research to date in this area may need to be revisited. The majority of researchers addressing CMC measure activities such as Internet use or access to social media web sites like Facebook. These definitions no longer accurately reflect real-world patterns of most adolescent CMC. To accurately study the relationship between adolescent CMC and psychological well-being, texting and instant messaging should be included in the data.

Unique Qualities of Computer-Mediated Communication

Media richness and social cues. A fundamental question about the quality and characteristics of computer-mediated communication as compared to face-to-face communication revolves around its communicative richness (Hu & Sundar, 2007). Media richness refers to the presence of social cues in communication, including a complex array of verbal and non-verbal information. Researchers who suggest a negative relationship between CMC use and psychological well-being question its effect on the quality of peer relationships. The ability of CMC versus FTF to facilitate peer communication, intimacy, and social support is central to answering this question.

In a discussion of the role of nonverbal behaviors in the creation of intimacy, Manusov and Patterson (2009) identified 5 classes of these behaviors that contribute to intimacy: (a) proxemics, which refer to body position and orientation, (b) haptics, or physical touch, (c) kinesics, which include facial expressions, eye movement, and

gestures, (d) vocalics, or vocal cues, and (e) chronemics, the amount of time spent with another person. It is important to note that each of these five intimacy producing behaviors are absent in CMC. The only type of CMC that is an exception is video chatting, which includes kinesics and vocalics. Video chat, though, is a mode of CMC that is used by less than half of adolescents (Lenhart, 2015). The reduction in social cues associated with most forms of CMC can lead to increased ambiguity in communication. Tanis and Postmes (2003) conducted a series of three experimental studies to explore the impact of CMC versus FTF on ambiguity, the positivity of impression, and the social consequences of CMC. Their research found that the limited social cues associated with CMC result in increased ambiguity and decreased positivity of impression (Tanis & Postmes, 2003). This research suggests communicative ambiguity via CMC does not preclude its users from adapting their communication strategies to reduce ambiguity. It also suggests, though, that CMC is inherently more ambiguous in social communication and has the potential to result in relational stress.

Social expectations and norms. Another difference between CMC and FTF is the differing social expectations and norms associated with their use. Tokunaga (2011) explored the relative levels of conflict between CMC and FTF and attempted to identify potential triggers of this conflict. In his study of undergraduate students, he proposed that distinct social norms exist in CMC and FTF and that relational strain may result from employing traditional FTF social norms in a CMC context. Tokunaga found that message construction and friend negotiation were both significantly different in CMC and were the source of potential conflict for users. In addition, social norms associated

with CMC can be highly context specific as compared with FTF, resulting in changing expectations and an increase in the likelihood of relational stress (Tokunaga, 2011). Other studies support Tokunaga's conclusion about differing social norms on CMC, including research on texting (Allen, 2012), self-disclosure (Nguyen, Bin, & Campbell, 2012), and authenticity (Reinecke & Trepte, 2014). These findings seem to suggest that differing norms and expectations, even those considered generally positive in relationship building, have the potential to be a source of relational stress for users of CMC.

Time constraints. CMC offers an additional unique quality that can impact peer relationships: synchronicity differences and an increased capacity for managing social network size. Due to its asynchronous nature, CMC offers the ability to extend time boundaries associated with FTF communication (Tanis & Postmes, 2003). Although CMC can be both synchronous and asynchronous, the asynchronous nature of CMC allows for more flexibility in managing communication. Haythornthwaite (2005) found that although social networks over CMC contained similar numbers of close friends as those using FTF, CMC social networks consisted of several tiers of social ties supported by varying differing amounts of CMC use. Manago, Taylor and Greenfield (2012) surveyed the network size of undergraduate Facebook users and found that social networking sites have the potential to facilitate larger networks of less intimate relationships. They found that the mean number of "friends" on Facebook was 440, and the median was 370, much larger than what is typically sustainable via Facebook. So while the ability to manage more relational interactions over CMC seems to facilitate larger social networks, questions remain about the quality of these extended networks.

Disinhibition, conflict, and self-disclosure. Another unique quality of CMC is its inherent anonymity, which can have both positive and negative effects on relationships. Anonymity is described by Valkenburg and Peter (2011) as one of the three defining characteristics of CMC, in addition to synchronicity and accessibility. There are two basic forms of anonymity: technical anonymity and social anonymity. Technical anonymity is the ability to prevent others from knowing your identity, while social anonymity refers to the perception of others about unique qualities and characteristics (Christopherson, 2007). CMC provides users with more control over both forms of anonymity, with both positive and negative implications for relationships occurring via CMC.

Greater anonymity increases deindividuation, a process that results in a loss of individualized identity and personal responsibility (Valkenburg & Peter, 2011). In the context of deindividuation, anonymity may result in disinhibition, which in turn has been associated with aggression during CMC. Lapidot-Lefler and Barak (2012) sought to explore the specific mechanisms linking anonymity, deindividuation, and aggression. This study, an experimental design using 142 young adults, explored technical anonymity, invisibility, lack of eye contact, and their relationship with online aggressive behaviors. The authors found while aggressive behaviors were related to all three constructs, the lack of eye contact was the only factor that had a significant main effect on all measures of aggression (Lapidot-Lefler & Barak, 2012). A supporting study, one of the few studies focusing on texting behaviors, noted a relationship between texting and increased aggression in the form of "drama" (Allen, 2012). Drama was defined as social

behavior that can lead to conflict or results from conflict, but is more normalized than other types of aggression (Allen, 2012). This study noted that texting is associated with increased drama in adolescents as compared to FTF interactions.

On the other hand, anonymity associated with CMC is also positively related to an important relational behavior necessary to establish intimacy: self-disclosure. As previously mentioned, CMC is marked by limited social cues as compared to FTF. Reduced social cues may result in a corresponding reduction in negative interpretations of these cues. Yen et al. (2012) found reduced anxiety during CMC as compared to FTF, attributing the difference in part to the limited anxiety-producing social cues during CMC. Some researchers have suggested that as a result of fewer social cues, self-disclosure during CMC may be increased. Self-disclosure is integral to affiliation and intimacy, and as such, it is often the subject of research into the effects of CMC on relationships. Numerous researchers have proposed that CMC is marked by greater self-disclosure as compared to FTF, though the research findings on this topic are somewhat contradictory. Nguyen et al. (2012) reviewed the body of research on self-disclosure and CMC. They found that while the research suggests an increase in the frequency of self-disclosure via CMC, the perceived level of disclosure is less when using CMC. In another review on CMC and adolescent relationships, Valkenburg and Peter (2011) agreed that most research seems to associate CMC with increased self-disclosure.

Interestingly, Nguyen et al. (2012) found that experimental studies were more skewed towards an increase in self-disclosure during CMC when compared to survey designs. In a related study that calls into question the validity of experimental designs

measuring self-disclosure, Callaghan, Graff and Davies (2013) found that laboratory experiments tend to overestimate self-disclosure as compared to non-laboratory settings. In summary, the research on self-disclosure and CMC is somewhat contradictory. The majority of studies conclude that CMC seems to result in an increase in self-disclosure activity, a finding that if true would indicate a positive impact from CMC on relationships. In contrast to these findings, users report a perception of reduced self-disclosure during CMC, and there is a possibility that experimental research designs may over-estimate self-disclosure during CMC.

The body of research exploring unique qualities of computer-mediated communication point to findings related to its role in adolescent relationships and its potential to affect adolescent mental health. First, there is little question that CMC is functionally different from FTF communication. It is associated with differing social norms, social cues, and time constraints. Second, these qualitative differences seem to cause changes in how users relate to one another over CMC, including reduced inhibition, along with increased conflict, aggression, and self-disclosure. The research seems to point to several unique qualities and communicative processes that have the potential to impact the quality of adolescent peer relationships, both positively and negatively.

Communication Theories Related to Computer-Mediated Communication

Cues-filtered-out approaches. There are numerous theories that attempt to predict the overall impact of CMC on communication. Several of these theories specifically explore the formation, maintenance, and quality of social relationships via

CMC, and as such will be addressed in this review. Early CMC-related communication theories conceptualized communication as consisting of multiple channels of information, with communication effectiveness being determined by the number of channels being used (Walther & Parks, 2002). This approach, known as a cues-filtered-out approach, was first outlined in Short, Williams and Christie's (1976) *social presence theory*. Social presence theory posits that the effectiveness of communication is determined by the availability of social cues. The more social cues that exist in each communication medium, the greater the "social presence" and the more effective communication will be. *Media richness theory*, another cues-filtered-out approach, theorizes that communication effectiveness is determined by matching the equivocality of the message with the availability of communication (Ijsselsteijn, Baren, J, Lanen, & F, 2003). In media richness theory, if a message has a high potential for misunderstanding, then a communication method richer in social cues is necessary for effectiveness. Both social presence theory and media richness theory view CMC as inherently less effective in communicating that FTF. Some empirical support exists for the cues-filtered-out approaches (Rhoads, 2010), yet there is strong disagreement from some researchers (Walther & Parks, 2002). The implication of these approaches is that relational communication using CMC is inferior to FTF, suggesting that the use of CMC in adolescent relationships should result in less intimacy and social support.

Social context theories. Walther's *Social information processing theory* takes a less deterministic approach as to the proficiency of CMC, proposing that CMC has the potential to be as effective as FTF in social communication (Walther, 1996). As in the

cues-filtered- out approaches, Walther (1996) acknowledges the lack of media channels associated with CMC. Yet he argues that users of CMC in social relationships are motivated to reduce the relational uncertainty that occurs because of a lack of social cues. Walther proposes that users of CMC will adapt to the lack of communication channels by finding additional channels to produce social cues or by placing additional weight on the cues that remain. For these additional channels to result in an equivalent level of communication to FTF, users of CMC will need more time to communicate than in FTF (Walther, 1996). Carlson and Zmud's(1999) *channel expansion theory* is similar to social information processing theory in that it emphasizes the ability of users to adapt to the inherent lack of social cues in CMC. Channel expansion theory posits that the effectiveness of CMC is in part dependent upon the user's skill at utilizing that particular medium, their understanding of their social group, and past experiences with their communication partner (Carlson & Zmud, 1999). Carlson and Zmud (1999) suggest that CMC is a learned ability, and that the reduced communication channels associated with CMC will be overcome given enough expertise gained through experience. The implication of the social context theories is that while CMC contains fewer communication channels than FTF, its relational effectiveness will be similar or greater than FTF due to the adaptations of its users.

Media naturalness theory. In an attempt to account for contradictory research and the lack of empirical support for any one theory (Nguyen et al., 2012), Kock (2004) proposes the psychobiological model, which has become known as *media naturalness theory*. As opposed to presenting another competing theory on CMC's role in

communication, the goal of media naturalness theory is to create a unifying theory of CMC's impact on communication effectiveness (Kock, 2004). The foundation of media naturalness theory is that face-to-face communication is the result of evolution, and as such, humans are genetically predisposed to be more effective at FTF than other forms (Kock, 2004). Media naturalness theory posits that the human brain is designed to excel at FTF in social interactions, and that the effectiveness of other modes of communication is determined by how closely they mimic FTF in five key areas: co-location, synchronicity, and the conveyance of facial expressions, body language, and speech.

Like social information processing theory, media naturalness theory states that when a medium is less natural, effective communication is still possible through compensatory adaptation. Kock (2004) proposes that in less natural conditions, these adaptations require greater cognitive effort and increased time to avoid ambiguity. Kock (2004) also suggests that our biological language systems require practice to become proficient. As with channel expansion theory, media naturalness theory posits that communications "fluency" is acquired through experience, with fluency equating to the number of words that can be effectively communicated per minute (Kock, 2004).

Kock's theory has several implications for the role of CMC in relationships. It suggests that CMC is inherently less effective than FTF, but that these deficiencies can be overcome under some circumstances. It provides theoretical support for the contradictory findings on the impacts of CMC on adolescent relationships and mental health. Media naturalness theory suggests that CMC has the potential to impact adolescent relationships either positively or negatively, with the outcome determined by an individual user's

ability to adapt to CMC's changing norms, lack of social cues, and increased cognitive load. It is important to note that media naturalness theory supports the view that the relational impact of CMC is not universal, and that any potential negative relationship between CMC and adolescent psychopathology could well be limited to unique subgroups of adolescents.

Discussion

There are important findings from the body of literature on CMC that are related to this study and worth noting. First, the recent trends in CMC utilization are relevant. CMC has shifted from a medium primarily based on social networking sites to being focused on texting and short messaging services. The proliferation of mobile phones use among adolescents has resulted in CMC being fully integrated into a large majority of adolescents' peer-related communication. Second, CMC is different compared to FTF, in both its mechanisms and its effect on relational behavior. Differences in normative expectations, social cues, and time constraints can have both a positive and negative impact. CMC adoption can lead to reduced inhibitions, increased conflict, a reduction in self-disclosure, and has the potential to negatively impact the quality of adolescent relationships.

Adolescent Development

Any attempt to understand the impact of CMC adolescent psychological well-being needs to include an understanding of adolescent neurological and psychosocial development, and the role they play in adolescent relationships. Adolescence is a period marked by a unique sensitivity to the social environment. Adolescent behavior,

psychosocial development, and mental health are significantly influenced by social stimuli (Bukowski & Adams, 2005; Carbonell, Reinherz, & Giaconia, 1998; Jones, Vaterlaus, Jackson, & Morrill, 2014).

Although there are numerous developmental and maturational processes associated with adolescence, three of these have the potential to directly impact adolescent peer relationships and thus are relevant to the understanding CMC's role in psychological well-being: neurological changes occurring during adolescence, the processes of individuation and autonomy, and the formation of identity.

Adolescent Neurological Development

Adolescence is a developmental period typically viewed as beginning with the onset of puberty and ending when an individual achieves an adult-like independence. Neurological changes that occur during this period can influence social behavior and create an increased sensitivity to peer relationships. During adolescence, the socioaffective circuitry of the brain, including the amygdala, striatum, and medial prefrontal cortex (MPFC), is uniquely oriented to social stimuli and activity during this developmental period (Blakemore & Mills, 2014). Adolescent brain development patterns seem to result in a predisposition to heightened sensitivity to social emotions, evaluations, and influences (Blakemore & Mills, 2014). Somerville et al.(2013) found adolescents exhibit greater social self-conscious emotions than children or adults. Using neuroimaging, they identified an increase in MPFC and striatum-MPFC connectivity during adolescence during social tasks (Somerville et al., 2013). Researchers have also noted the non-linear development of neural structures during adolescence as another

potential cause of increased social sensitivity, given the relatively later development of the prefrontal cortex and its role in emotional regulation (Somerville, 2013). The neurologically-based social sensitivity found during adolescence suggests the possibility that adolescents may be more susceptible than children or adults to negative effects from CMC's increased ambiguity and relational conflict.

Adolescent Individuation and Autonomy

Adolescent individuation is often referred to as the "second individuation" (Hoffman, 1984), differentiating it from the process of individuation occurring during early childhood. Adolescent individuation primarily consists of the process of developing autonomy from parents. Beyers et al. (2003) conceptualized individualization during adolescence as consisting of primarily autonomy and agency, as opposed to separation, emphasizing the importance of healthy parent/child relationships consisting of a continued connectedness even into adulthood. Levpušček (2006) described a four-step individuation process that begins during early adolescence with differentiation, described as the process of developing psychological distance from parents. The next step, which occurs during mid-adolescence, is a testing process of practice and experimentation. Step three is the mid-adolescent process of rapprochement, a phase marked by conflict where the child attempts to re-establish connectedness. The final step of individuation is achieving a consolidated sense of self and others, where the child recognizes differences and similarities with others and can both function autonomously and also recognize their need for intimacy (Levpušček, 2006).

Although there are many different variations on the components of individuation, theorists agree that it consists of cognitive, behavioral, and affective elements (Geuzaine et al., 2000). The course of individuation has been found to progress from early to late adolescence. There are distinct phases of individuation correlated to early and late adolescence. Early adolescents have yet to achieve individuation from parents, have a stronger drive to achieve this individuation, and exhibit a higher dependency on peers (Beyers et al., 2003; Levpušček, 2006). As adolescence progresses, the child achieves a greater sense of self and others and is less dependent on peers, yet has a stronger drive to develop peer intimacy (Levpušček, 2006). The difference in individuation and peer dependence in early and late adolescents could be a factor in the conflicting findings on the mental health consequences of CMC. Research exploring the mental health outcomes of CMC is heavily weighted toward using late adolescents and young adults. It is possible that the impact of CMC on psychological well-being is, at least in part, dependent on the developmental stage of the user. As a result, much of the research on CMC may be missing the negative impacts of CMC in its most susceptible user group.

Identity Development and Erikson's Theory of Psychosocial Development

Another key developmental process that occurs during adolescence and can influence the mental health impact of CMC is identity development. Identity can be viewed as a person's consistent and subjective view of themselves across both time and situation (Sollberger et al., 2011). There are numerous approaches to identity development, each presenting a unique theory of its formative processes and constructs. Erik Erikson's comprehensive theory of personality formation, known as the theory of

psychosocial development, has influenced identity theory and research for over 50 years since its inception. Because it is a primary theoretical foundation of this study, adolescent identity formation will be addressed considering Erikson's theory of psychosocial development, with particular attention being paid to Erikson's approach to adolescence and its role.

Erikson approached personality development as a lifelong series of steps, with each step grounded in the previous one (Erikson, 1993). He described identity as a fundamental organizing construct, one that included both significant continuity and ongoing change (Goth et al., 2012). Erikson saw identity as providing a filter through which we can perceive and act upon both our uniqueness and similarities with others, and it is the primary force that allows us to act independently from others (Goth et al., 2012). Erikson viewed life as a progression through what he referred to as a "developmental ladder" (Erikson & Erikson, 1998, p. 58). Erikson viewed the progression through the ladder as epigenetic in nature, with identity being closely linked to somatic processes that occur during the different stages of life, yet he also maintained the significance of psychic processes in personality development. What is more, he viewed relational and cultural factors as influential as well, viewing identity development as a complex process of interactions between multiple influences (Erikson & Erikson, 1998).

Eriksonian developmental stages. The eight stages of man as described by Erikson (1993) are a series of conflicts or "crisis" that must be successfully negotiated to develop what he refers to as "human strengths" that include hope, will, purpose, competence, fidelity, love, care, and wisdom. Although Erikson views identity formation

as a lifelong process, this review will focus on adolescent identity development, which corresponds with Erikson's Stage 5 and the four stages leading adolescence. It is important to note, though, that Erikson believed the successful negotiation of the first five stages results in successful ego development, which consists of a capacity for intimacy, a drive for generativity, and an integrated personality marked by a commitment to values and beliefs (Marcia & Josselson, 2013).

Erikson's first stage is *trust versus mistrust*, with the basic goal of this stage being an infant's confidence in the ease of feeding, sleep, and bowel movements. Trust versus mistrust is a very basic concept, yet as with all the other life stages, successful development of trust at this stage impacts identity and social relationships throughout the remainder of life. Step two is *autonomy versus shame and doubt*. Erikson (1993) describes this stage, which corresponds to ages 1-3, as a simultaneous condition of both holding on and letting go. Successful navigation of this stage requires that the child begin to assert their independence and will, yet it also must include parental protection from anarchy and unhealthy choices. Stage three, initiative versus guilt, is chiefly a process of developing healthy inhibition (Erikson & Erikson, 1998). During this "playful age" (Erikson & Erikson, 1998, p. 77), the healthy child learns to push through limitations, yet must also learn healthy inhibitions without allowing those inhibitions to develop into pathologies. Stage four corresponds with entering formal education, and successful navigation of this stage requires the child to learn that one of their roles in society is to be productive (Erikson, 1993). The threat to the successful resolution of this

stage is a sense of inferiority and inadequacy, which can result from either internal or external influences.

Adolescence: Identity versus role confusion. Erikson's stage five, corresponding to adolescence, is marked by the physical changes associated with puberty that drive a re-assessment of identity and purpose (Erikson, 1993). A successful navigation of stage five results in the development of a lasting sense of identity that will carry forward into adulthood. This process is profoundly socially oriented, with the primary concern of adolescents being how they appear to others and the need for acceptance by peers. Erikson proposed that adolescence personality formation is marked by a temporary over-identification with peers, to the point that many will appear to almost completely lose their identity (Erikson, 1993). The successful navigation of this stage culminates in the integration of a person's ego identity, which has been accrued step by step through the first five stages of life. Erikson proposed that the development of identity during adolescence is highly dependent on the affirmation received from healthy peer relationships, with the lack of social support potentially resulting in identity confusion.

Marcia and Josselson (2013) suggested a status approach to Eriksonian identity development, proposing four labels to identify progress: *Achievement* occurs at the end of adolescence and is the healthy commitment towards occupational, relational, and ideological values. *Moratorium* represents a person undergoing an identity crisis, while *foreclosure* is the inflexible adoption of identity positions acquired from others. Identity d*iffusion* is marked by a lack of commitment to identity positions and a lack of significant

exploration to develop identity, and is directly correlated to Erikson's concept of role confusion (Marcia & Josselson, 2013).

Empirical support for the theory of psychosocial development. According to Erikson, adolescence is a combination of an identity crisis and a strong need for social acceptance to navigate this crisis. The combination of emotional turmoil and the drive for peer affinity can result in a tumultuous period of life. Erikson's view of personality formation during adolescence and the importance of peer relationships has been the subject of several studies that have found empirical support for his ideas. In a study designed to explore the relationship between the quality of peer relationships and identity achievement, Jones et al. (2014) found that friendship support predicted identity achievement, while friendship conflict predicted identity diffusion and moratorium. This study also found that peer conflict was negatively related to identity traits such as autonomy, trust, initiative, and industry. Studies have found a correlation between the achievement statuses of Eriksonian stages of personality formation and a variety of psychological and behavioral outcomes. For example, Dumas, Ellis, and Wolfe (2012) noted a correlation between identity diffusion and the willingness to engage in risky behaviors such as drug use and crime. In addition, Sollberger et al. (2011) found a significant correlation between patients who suffered from borderline personality disorder and identity diffusion. Furthermore, they noted a relationship between diffusion and psychiatric symptoms including depression and anxiety (Sollberger et al., 2011).

Erikson's theory of psychosocial development has important implications in the understanding of CMC's role in adolescent mental health. First, Erikson's theory

proposes a unique adolescent sensitivity to the quality of peer relationships. Second, it suggests a correlation between the quality of peer relationships and successful identity development, which is in turn related to negative psychological and behavioral outcomes. If the adoption of CMC in adolescent peer relationships does impact the quality of these relationships, then Erikson's theory of psychosocial development suggests a path for a correlation between adolescent adoption of CMC and the development of psychopathologies such as social anxiety.

Discussion

The adolescent developmental period is unique in numerous ways, several of which are directly related to this study. First, the research indicated that adolescent neurological development may predispose this age group to have a heightened sensitivity to social emotions, evaluations, and influences. This heightened sensitivity may leave them more susceptible to the increased ambiguity and conflict associated with CMC. Second, the process of individuation occurring during adolescence may also result in a greater sensitivity to peer approval, and may have a similar effect. Finally, as proposed by Erikson, personality development is both adolescent-centered and highly dependent on peer affirmation. As such, it suggests that any negative impact to the quality of adolescent peer relationships may result in an increased potential to develop psychopathology.

Adolescent Peer Relationships

Most of the research on how computer-mediated communication impacts adolescent mental health focuses on peer relationships as a mediating factor. Although

CMC can play a direct role in the development of psychopathology through mechanisms such as online bullying or addictive use, the research on whether CMC is inherently more likely to produce psychopathology focuses on its impact on adolescent friendships (Valkenburg & Peter, 2011). As such, it is important to understand the unique characteristics of adolescent peer relationships and how these characteristics may relate to the use of CMC and the development of psychopathology.

The Development and Progression of Adolescent Peer Relationships

The processes that create and maintain adolescent friendships are directly tied to this developmental stage. Given the increased neurological sensitivity to social feedback during adolescence and their desire for peer affirmation during individuation and identity development, it is not surprising that adolescents tend to associate with peers who are similar in behaviors and values. Researchers have long noted adolescents primarily develop friendships with congruent peers and are motivated to do so at least in part by the desire for peer affirmation (Brechwald & Prinstein, 2011).

In 1978, Kandel proposed a process called *homophily* as an explanation for how this phenomenon occurs during adolescence. Kandel(1978) noted that homophily takes place in adolescent dyadic relationships and consists of three processes: selection, socialization, and deselection. Kandel's research found that adolescents begin the relational process by choosing peers who are often similar in a wide array of behaviors and beliefs. According to Kandel, these similarities are subsequently expanded through socialization, a process where peers modify their behavior or attitudes to reduce incongruences with peers. Kandel found that differences in a dyadic friendship result in

two primary outcomes: The friends modify their behavior to reduce differences, or the friendship is ended. This process referred to as deselection (Kandel, 1978).

Motivations behind adolescent homophily. Although numerous individual motivators for homophily in adolescent relationships have been identified and discussed in the literature, researchers seem to have settled on three primary types of motivations. The first of these, attitudes and values, was the subject of Kandel's original research in this area. Early researchers focused almost exclusively in this area, and tended to address negative influences such as drug use and delinquency (Brechwald & Prinstein, 2011). Veenstra, Dijkstra, Steglich, and Van Zalk (2013) noted that researchers have now extended these results, finding that adolescent homophily impacts both antisocial and prosocial behaviors and includes both internalized and externalized behaviors.

Another catalyst for adolescent homophily is social motivation. Ojanen, Sijtsema, and Rambaran (2013) addressed two primary categories of social motivations: agentic and communal. Agentic goals are those related to self-interest, power, and independence, while communal goals refer to social motivations such as affiliation and intimacy (Ojanen et al., 2013). Their research found that communal goals were less attractive to early adolescents than agentic goals. They also found agentic and communal goals were the subject of socialization but not selection and similarity in agentic goals was associated with deselection. Ojanen et al. (2013) hypothesized that adolescence is a period of initial individuation, and as such is marked by a strong need for dominance and status.

A third motivator of homophily during adolescence is popularity or status. Dijkstra, Cillessen and Borch (2012) explored the effects of popularity on early adolescent homophily, finding that status drives adolescent friendship choices and socialization effects. They found that higher status individuals want to affiliate with peers of equal or higher status. They also found that lower status adolescents desire to increase their popularity by affiliating with higher status friends and that lower status peers increase their popularity when affiliated with higher status peers (Dijkstra et al., 2012). In line with the previously mentioned research finding that older adolescence is marked by a greater sense of identity, autonomy, and reduced susceptibility to social influence, Dijkstra et al. noted that older adolescents tend to be less concerned about affiliating with lower status peers.

Recent trends in research on homophily. In a literature review of the last decade of research exploring homophily during adolescence, Brechwald and Prinstein (2011) found that the body of research largely supports Kandel's findings on homophily. They also found several themes in more recent studies, two of which are potentially related to this study. First, researchers have expanded their understanding of the source of homophily as being beyond dyadic peer relationships and now understand it to include larger peer networks. This is significant, given that individual adolescent friendships are both set within these larger networks and tend to come and go, while the larger network itself remains relatively static (Brechwald & Prinstein, 2011). Considering Brechwald and Prinstein's findings, the role of CMC in developing larger and more numerous networks of peers during adolescence becomes more significant. Brechwald and

Prinstein (2011) found that belonging to more than one peer network can create an internal conflict, with the adolescent struggling to determine which peer group to become congruent with. This dynamic could theoretically create an additional source of stress and anxiety to users of CMC, given research suggesting that CMC users develop more numerous social circles than non-CMC users (Valkenburg & Peter, 2009). Second, in support of Erikson's psychosocial theory, researchers have found adolescent susceptibility to homophily is age-related. Mid-adolescents are more open to socializing influences from peers and exhibit a greater tendency to select and deselect peers based on the need for congruency. This openness seems to be tied to the role identity development and increased autonomy occurring primarily during mid adolescence (Brechwald & Prinstein, 2011). Finally, neurological imaging research has found that the tendency of adolescents to form and maintain relationships based on homophily is correlated to neurological developments in the adolescent brain. As previously mentioned, the socioaffective circuitry in adolescents is uniquely sensitive to social cues. Brechwald and Prinstein's (2011) review noted several studies that found these same neural structures are associated with heightened peer influence and play a role in the selection and deselection of peers.

There are several important findings in the research on homophily as it pertains to CMC in adolescent peer relationships. First, given the tendency for early adolescents to favor agentic behavior, and given CMC's proclivity towards increased aggression and conflict, it is possible that early adolescents may be more prone to any potential negative effects of CMC on the quality of peer relationships. Not only is agentic behavior valued

during early adolescence, but the socialization of this behavior is greater during this period. It is also possible that the desire to affiliate with higher status peers combined with CMC's increased relational access to non-affiliated peers may result in an increase in unsuccessful affiliation attempts. For some, the increase in interactions made possible by CMC may result in larger social networks. For others, though, it could result in additional stress caused by failed attempts to affiliate with higher status peers.

Adolescent Peer Relationships and Psychological Well-Being

One of the proposed mechanisms for potential harmful effects of computer-mediated communication on adolescent mental health occurs indirectly. If CMC negatively impacts the quality of adolescent peer relationships, it is possible that the outcome is an increase in the incidence of various psychopathologies, including internalized disorders such as anxiety. Thus, to establish a potential indirect effect of CMC on adolescent psychopathology, it is important to understand the mechanisms of interaction between adolescent peer relationships and psychological well-being. This section will address three different roles that peer relationships can play in the development of psychopathology: First, its role as a predictor of psychopathology will be discussed. Next, the potential indirect role peer relationships can play as a buffer between stress and mental illness will be explored. Finally, the direct role peer relationships can play in the development of psychopathology will be examined, and the specific mechanisms of this direct role will be identified.

Peer relationships as a predictor of adolescent psychopathology. There is a clear and well established link between adolescent peer relationships and

psychopathology (Bukowski & Adams, 2005; Deater-Deckard, 2001). Numerous studies dating back to the early 80's have found that the health of adolescent peer relationships is predictive of the onset of adolescent mental illness (Bukowski & Adams, 2005). It is important to note that this correlation is not dependent upon a specific experience or attribute of the friendship. Although some research suggests the direction of the relationship between the quality of peer relationships and psychological well-being can be difficult to determine (Ladd & Burgess, 2015; Laible, Carlo, & Raffaelli, 2000), there is a large body of research suggesting relational quality as an antecedent to adolescent psychopathology and internalizing disorders in particular (Deater-Deckard, 2001; Parker, Rubin, Erath, Wojslawowicz, & Buskirk, 2006). Studies have found rejection by peers predicts adult maladjustment and psychopathology (Bagwell, Newcomb, & Bukowski, 1998), the development of internalizing disorders such as anxiety and depression (La Greca & Harrison, 2005), and that social isolation lowers self-esteem and resiliency (Christenson & Neumark-sztainer, 2007). There are two primary processes that have been explored to explain a causal relationship between the quality of peer relationships and psychopathology. An indirect model, or buffering affect, and a direct effect model that includes numerous potential mechanisms.

Indirect or buffering effects. The indirect model proposes that peer relationships moderate or mediate the relationship between risk factors experienced by adolescents and their ability to adjust. A literature review by Cohen and Wills (1985) found extensive support for the role of social support as a buffer against the effects of stress on the development of pathology. They proposed two mechanisms for this effect:

First, social support can impact the initial appraisal of a stressful event, attenuating the sense of helplessness that can lead to a potential stress response, thus moderating the perceived amount of stress (S. Cohen & Wills, 1985). Second, social support can intervene after the experience of stress, moderating its impact on psychological well-being (Cohen & Wills, 1985). These indirect effects were explored in a longitudinal study by Carbonell et al. (1998), which followed a group of children at risk of developing psychopathology due to stress experiences such as abuse, loss of parents, learning disabilities, and exposure to violence. The researchers followed the children from age 5 to 18, looking for factors that increased resilience and were associated with lower levels of depression. Family and peer support were found to be the primary buffers against negative outcomes, with resilient subjects perceiving greater assistance, advice, positive feedback, and self-disclosure than non-resilient subjects. In an attempt to determine the relative value of family support versus peer support in the buffering effect, Sentse, Lindenberg, Omvlee, Ormel and Veenstra (2010) used longitudinal data from the TRIALS study of over 3,000 Dutch adolescents. Their study supported a buffering role for both a parental and peer support, yet noted that while peer support buffered against parental rejection, parental support did not buffer against peer rejection (Sentse et al., 2010). Their findings suggest peer support plays an outsized role in buffering against stress. Given the role that CMC plays in facilitating peer relationships and social support, this would be significant if CMC is shown to negatively impact peer relationships.

Direct or main effects. Another potential avenue of effect is that peer relationships can directly impact the development of adolescent psychopathology. There

are several proposed mechanisms for this effect. For purposes of this discussion I will address only the mechanisms that are both pertinent to CMC and associated with internalizing disorders, both of which are within the purview of this study.

In an overview of the mechanisms involved in the relationship between adolescent friendships and mental health, Deater-Deckard (2001) proposed peer rejection as a significant in the development of both externalizing and internalizing disorders. Deter-Deckard noted 32 different adolescent rejecting behaviors, and suggested each of these has the potential for negative psychosocial consequences. Peer rejection can result in loss of status, lack of acceptance by others, social withdrawal, damaged self-perception, and lower self-efficacy (Deater-Deckard, 2011). He argued that these outcomes can potentially lead to the development of internalizing disorders such as depression, anxiety, and suicidality.

In addition, Deater-Deckard (2001) listed aggression and victimization as a direct-effect mechanism in the development of psychopathology. There is broad agreement in the literature about the role of CMC in facilitating so-called "cyberbullying" (Wang, Iannotti, & Nansel, 2009), as well as the effect of victimization on the development internalizing behaviors such as depression, anxiety, and suicidality (Hodges, Boivin, Vitaro, & Bukowski, 1999). Although cyberbullying in adolescent CMC is certainly not rare, a more common occurrence is non-violent aggression, referred to as relational aggression. As previously discussed, CMC is marked by an increase in relational aggression as compared to FTF. Prinstein, Boergers and Vernberg (2001) focused on less than overt forms of aggression such as exclusion or rumor spreading in their work on

adolescent aggression and mental health. They found that relational aggression was significantly associated with internalizing symptoms such as loneliness, loss of self-esteem, and depression (Prinstein et al., 2001).

Another potential direct effect mechanism associated with psychopathology is co-rumination. Co-rumination with peers has been shown to be associated with development of internalizing disorders such as anxiety in adolescents (Schwartz-Mette & Rose, 2012). Significant to this study is research showing that CMC uniquely fosters co-rumination. Davila et al. (2012), in a study exploring the relationship between social networking and depression, found the use of social networking sites to be uniquely related to depressive co-rumination. A recent study specifically targeting adolescent co-rumination via cell phone as a moderator between stress and mental health outcomes extended these findings. Murdock, Gorman and Robbins (2015) found that cell phone co-rumination was associated with a decrease in psychological well-being, whereas face-to-face co-rumination was not. Murdock et al. suggested that the constant cell phone access facilitated greater co-rumination and resulted in more negative outcomes from stress. Taken together, these findings not only support co-rumination as a direct effect mechanism in developing internalizing disorders, but also suggest that CMC uniquely facilitates co-rumination.

Discussion

In conclusion, adolescent peer relationships can play a significant role in the development of psychopathology, specifically in the development of internalizing disorders such as anxiety and depression. The literature points to several potential ways

in which these relationships are related to psychopathology, including both as a predictor of psychological well-being as well as through indirect and direct mechanisms. As previously discussed, adolescents are uniquely sensitive to the quality of peer relationships. One of the implication of the connection between adolescent peer relationships and their psychological well-being is that it provides a potential means for CMC to negatively impact adolescent psychopathology: If CMC is shown to be detrimental to adolescent peer relationships, its connection to a decline in adolescent mental health will be in large part established.

Computer-Mediated Communication and Adolescent Peer Relationships

As stated, the body of literature has clearly established a relationship between the quality of adolescent peer relationships and the development of psychopathology. Given this, the impact of computer-mediated communication on adolescent relationships becomes a central question in determining the role of CMC in adolescent mental health.

To explore the impact of CMC on adolescent relationships, the first step is to identify which relational characteristics potentially impact adolescent mental health, and to determine how these characteristic relate to the quality of the relationship. Researchers exploring the relationship between adolescent peer relationships and well-being focus on the quality of these relationships, social support between friends and the *i*ntimacy of these relationships. Berndt (2002) noted that while there are numerous qualities that characterize a high-quality relationship, adolescents uniquely identify intimacy, social support, and their closely related constructs as the most valuable traits in a close friendship. Berndt (2002) argued that intimacy and social support are not only key

indicators of friendship quality, but cited research indicating friendships with high levels of intimacy are typically also high in social support. As such, this review will focus on intimacy and social support to understand the role of CMC in the quality of adolescent relationships.

CMC and Intimacy

As discussed previously, Erik Erikson viewed the primary task of adolescence as identity formation and believed intimacy with peers to be the primary process through which identity formation takes place (Marcia & Josselson, 2013). According to Erikson, intimate relationships begin to form during adolescence, and intimacy becomes the fundamental task of emerging adulthood (Erikson, 1993). Shulman, Laursen, Kalman and Karpovsky (1997) addressed intimacy as a quality central to adolescent friendships, citing developmental research that finds it first appears during early adolescence. They described intimacy as consisting of affection, loyalty, disclosure, commitment, and shared activities. In general, these qualities can be organized into three basic categories: cognitive, affective, and behavioral, with female adolescents emphasizing disclosure and commitment and males focusing on shared experiences (Shulman et al., 1997).

To develop intimacy in a relationship, it is necessary to engage in actions that facilitate an increase in intimacy. Although this may seem obvious, it is important to note that the development and experience of intimacy occurs in the context of relational interaction. Although intimacy is experienced as an emotion and perception, intimate cognitions are developed through meaningful interactions that lead to these emotions and perceptions (Manusov & Patterson, 2009). Because CMC is by its nature a facilitator and

moderator of relational interaction, it has the potential to impact the development and experience of intimacy.

Intimacy and self-disclosure. One type of relational interaction addressed in the research on CMC that has been shown to influence relational intimacy is self-disclosure. Bauminger, Finzi-Dottan, Chason and Har-Even (2008) described self-disclosure as both the tendency and willingness to share relevant private information with another and note that a substantial increase in self-disclosure occurs with the onset of adolescence. Self-disclosure is consistently correlated with increases in intimacy and friendship quality in adolescent peer relationships (Bauminger et al., 2008). Self-disclosure over CMC is the subject of numerous studies, with the results nuanced and inconsistent. Several studies found a general increase in self-disclosure in adolescents while using CMC (Lee, Noh, & Koo, 2013; Valkenburg & Peter, 2007b). Other studies noted the opposite, including Schiffrin, Edelman, Falkenstern and Stewart (2010) who found that adolescents are less willing to discuss personal topics online versus FTF. Nguyen et al. (2012) performed a systematic review of the body of research comparing online to FTF self-disclosure and found the results mixed, with equal number of studies finding greater disclosure via CMC versus FTF. One interesting finding from their review was that studies with an experimental design tended to find more self-disclosure using CMC, indicating that experimental design may be influencing the contradictory results (Nguyen et al., 2012). In addition, they noted that while the depth of self-disclosure was similar in CMC and FTF, the frequency of self-disclosure was greater over CMC. A possible explanation for

this finding is the previously mentioned increase in relational ambiguity in CMC, which could give rise to increased communication aimed at preventing miscommunication.

Although the research concerning levels of overall self-disclosure over CMC is mixed, researchers have found self-disclosure tendencies within certain subgroups pertaining to disclosure that may help inform the question of CMC's impact on adolescent relationships. The data from research in this area seems to indicate that psychosocially distressed adolescents tend to gravitate towards social media use and an increase in self-disclosure over CMC.

Psychosocial distress refers to social dysfunction and its accompanying negative consequences arising from maladaptive cognitive and behavioral processes. Researchers have identified several groups who are psychosocially distressed that seem to increase their use CMC. These groups seem to have the common trait: A reticence about social interaction. Several studies have noted that shy or socially inhibited adolescents are more prone to engage in online social interactions and self-disclosure (Laghi et al., 2013; Nguyen et al., 2012; Sheldon, 2008). Attachment style has also been correlated with an increase in self-disclosure over CMC. Researchers have found that those with a fearful attachment style tended to increase social communication and self-disclosure in online communication (Buote, Wood, & Pratt, 2009; Nguyen et al., 2012). Personality type has also been correlated with greater social use of the Internet and self-disclosure. Research has also revealed that people who are high in introversion increase their self-disclosure during CMC (Buote et al., 2009; Peter, Valkenburg, & Schouten, 2005), as well as those who are lonely or lack social skills (Lee et al., 2013; Valkenburg & Peter, 2007b). In a

literature review covering ten years of research in this area, Valkenburg and Peter (2009) found that socially anxious adolescents tend to increase their self-disclosure over CMC.

Taken as a whole, there is a trend in the body of literature of a significant relationship between psychosocial distress and increased self-disclosure over CMC. Given the relationship between self-disclosure and friendship quality, this would suggest psychosocially distressed adolescents would benefit from the adoption of CMC in their peer relationships. Surprisingly, the body of research on this question seems to indicate the opposite. Numerous studies have noted the failure of increased self-disclosure over CMC by socially distressed individuals to result in either higher quality relationships or larger network size. They point to a complex set of factors as the cause of this result.

In a study looking at the impact of online interactions on offline friendship initiation, Rauch, Strobel, Bella, Odachowski and Bloom(2014) found that previous online interaction fails to decrease physiological arousal in future interactions in the socially anxious. In fact, this study found just the opposite. Rauch et al. (2014) noted an increase in galvanic skin response in socially anxious subjects in face-to-face meetings with someone they were previously exposed to over Facebook. This study reveals a key reason increased self-disclosure over CMC fails to increase the friendship quality in psychosocially distressed users: a lack of crossover effect from online relationships to offline relationships in this group.

Additional studies on related subjects point to a similar lack of benefit from online interaction for psychosocially distressed users of CMC. Buote et al. (2009) noted that while people with fearful attachment style increased their self-disclosure over

Facebook, their friendship quality was less than those with secure attachment style. Bazarova (2012) addressed the question of the impact of self-disclosure over CMC, exploring the people's perceptions of self-disclosure over Facebook. This study found that the benefit of self-disclosure over CMC is dependent on whether the disclosure is private or public. Although private self-disclosure made to a single friend was perceived as intimate and resulted in increased liking, self-disclosure made more in public forums was considered inappropriate. This type of self-disclosure actually resulted in reduced liking (Bazarova, 2012). The implications of this study are that successful self-disclosure via CMC requires a clear understanding of its relational context and appropriateness. It seems that inappropriate self-disclosure over CMC can result in the loss of intimacy. The tendency for psychosocially distressed users to increase self-disclosure over CMC suggests the potential that these individuals may be drawn to CMC as an avenue for intimacy, but may utilize it in a maladaptive manner.

Intimacy and statements of affection. Another form of relational interaction that creates greater intimacy is the expression of affection, both verbal and non-verbal. Feeling affection for someone is a key component in experiencing intimacy, and the expression of affection is conducive to its formation (Manusov & Patterson, 2009). Antheunis, Schouten, Valkenburg, and Peter (2011) researched the effectiveness of expressing verbal affection over CMC, exploring differences between visual and text-based CMC, as well as FTF communication. Their study found that verbal affection is more prevalent during CMC versus FTF, and found there were no differences between affection over visual and text-based CMC. The reason for an increase in verbal affection

over CMC may be similar to the previously discussed process found in self-disclosure. Because of the increased uncertainty in CMC interactions, the users may be motivated to reduce this ambiguity by increasing communication, including statements of affection (Antheunis et al., 2011).

The expression of affection non-verbally via CMC is very limited as compared to FTF. Although video-based CMC is being used by adolescents, as mentioned previously, it is limited to a small percentage of adolescent peer-related CMC. And while there are non-verbal techniques such as the use of emoticons to communicate affection within CMC, these are extremely limited as compared to the numerous and nuanced non-verbal channels available within FTF communication. The potential negative impact of the lack of non-verbal affection within CMC on the expression of affection is important to note. Manusov and Patterson(2009) cited research suggesting that non-verbal behaviors may play an outsized role in expressing affection and developing intimacy. They suggested this due to non-verbal communication's spontaneous nature, the increased number available channels, and its unique potential to create emotional responses. Manusov and Patterson emphasized the important role of *involvement behaviors* in developing intimacy, which are overwhelmingly non-verbal in nature. There are five dimensions of involvement behaviors: touch, emotional expressiveness, attention, smooth interaction management, and the lack of vocal pauses while communicating (Manusov & Patterson, 2009). It is important to note that each of these dimensions is either inhibited or unavailable over CMC.

CMC and Social Support

Although intimacy is a key factor in the quality of adolescent peer relationships, the social support received from friends may be directly responsible for the beneficial effect of peer relationships (Carbonell et al., 1998). Social support consists of either receiving or perceiving emotional, practical, or informational aid (Trepte, Dienlin, & Reinecke, 2014).

Social support and well-being. In an attempt to better understand self-disclosure and social support over CMC and their relationship to well-being, Lee et al.(2013) explored social support as a mediator between self-disclosure and well-being. This study produced two significant findings: First, that people who are lonely increase self-disclosure and perceive greater social support over CMC. Second, that the positive relationship between self-disclosure and well-being was fully mediated by social support.

These findings on the role of social support are important in the context of this study. The results from Lee et al. (2013) identified social support as the critical mechanism in the relationship between peer relationships and well-being. Although research shows intimacy to be closely related to well-being, its importance seems to be that it ultimately results in social support, which in turn leads to improved well-being. If social support is the mechanism relating peer relationships to psychological well-being, then understanding the effect of social support in the context of CMC is central to the question of whether CMC is related to negative psychological outcomes.

Social support via CMC. Research comparing the availability of social support in CMC and FTF has produced mixed results. Some studies have found social support

less available over CMC (Pollet, Roberts, & Dunbar, 2011), while others suggest the potential for social support is similar (Tokunaga, 2011). The research exploring the relative effectiveness of social support over CMC provides significant insight related to this study. Lewandowski, Rosenberg, Jordan Parks and Siegel (2011) explored the relative effectiveness of social support over CMC versus FTF in a longitudinal study of military families, looking at the type of social support they received during a crisis and the effectiveness of that support. They found that while social support over CMC and FTF both resulted in improved psychosocial outcomes after a crisis, these outcomes were significantly improved when social support was received via FTF. Subjects not only reported a perception of more effective social support when it was face-to-face, but the study found that outcomes were improved as compared to social support received online.

Exactly why social support over CMC is less effective than support via FTF was explored by Trepte et al. (2014). They approached social support as context specific, suggesting it consists of three separate dimensions: emotional, instrumental, and informational. Their two-year longitudinal study compared social support received online versus offline in each of these dimensions. They found that online social support was primarily informational, while offline social support tended to be more emotional and instrumental. They also noted that offline social support was perceived as more beneficial, resulting in an increase in life satisfaction as compared to online social support (Trepte et al., 2014). This study suggests both a functional and qualitative difference between support over CMC and FTF.

Overall, the result of recent research on social support over CMC seems mixed. Some studies have found an increase in the perception of social support over CMC, particularly in those who are psychosocially distressed. Yet the benefit of CMC-based social support has been questioned. As previously mentioned, the effectiveness of online social support is central to the question of CMC's impact on adolescent mental health. If, as some research suggests, social support is less effective over CMC than FTF, the tendency for psychosocially distressed individuals to seek out online social support may be maladaptive and provide a direction for future research.

CMC and Social Network Size

As noted earlier, CMC offers users the theoretical means to increase the size of its user's social networks. The research presents a mixed picture as to whether CMC increases the number of meaningful relationships within these networks, and whether these relationships translate into face-to-face friendships. CMC can produce rather large online social networks, with typical networks ranging from 200 to 300 connections (Manago et al., 2012). The makeup of these networks changes, though, as the networks get larger. Manago et al. (2012) noted that as online social networks grow, the percentage of relationships deemed as intimate shrinks. In addition, the general composition of the relationships that make up these larger networks tend to be more superficial versus those initiated offline (Manago et al., 2012).

In addition, the impact of these large online networks seems to be limited to the online arena. Pollet, Roberts and Dunbar (2011) found while CMC use is related to larger offline networks, it is not related to larger online networks nor are there increases

in intimacy in offline or online relationships. In contrast, studies have noted online communication to be correlated with an increase in offline communication with friends and relational intimacy (Reich, Subrahmanyam, & Espinoza, 2012). This effect, though, was limited to existing friends, having no impact on new relationships developed online (Valkenburg & Peter, 2007a). As a whole, the research seems to suggest that CMC use creates larger online networks, but the quality of these relationships is more superficial. In addition, these larger online social networks do not influence the size of offline networks, and there are contradictory findings on CMC's impact on the quality of existing friendships.

Theoretical Approaches to CMC and Peer Relationships

Since its inception, researchers have attempted to incorporate research data on CMC into theoretical approaches that explain and predict CMC's impact on social relationships. These approaches are commonly referred to as "hypothesis" in the literature (Sheldon, 2008; Valkenburg & Peter, 2011). There are four primary hypotheses that have been proposed, each receiving varying degrees of empirical support.

The displacement hypothesis. In 1998, Kraut, Patterson, and Lundmark did a longitudinal study on the impact of online communication on the social life of users. The study found that CMC use not only decreased social network size and interactions with existing friends, but also resulted in higher rates of loneliness and depression (Robert Kraut et al., 1998). They proposed an "internet paradox" where the use of a technology intended to create social connections resulted in more isolation and a decline in well-being. Kraut et al. (1998) argued there is a finite amount of time for social interaction,

and the use of CMC took the place of FTF interactions. The results of this study and supporting arguments became known as the *displacement hypothesis*.

The body of research attempting to explore Kraut et al.'s findings has largely failed to support their initial findings. Valkenburg and Peter (2007a) explored CMC use in adolescents causing a reduction in offline time with friends and found no such effect. In a follow-up of their original research, Kraut, Kiesler and Boneva (2002) noted the negative effects experienced by their original subjects had largely dissipated. Kraut et al. (2002) noted one exception: introverts and those with less social support benefitted less from the use of CMC than extroverts. This finding continues the pattern of research that finds psychosocially distressed individuals experiencing worse outcomes when using CMC.

The stimulation hypothesis. In 2000, McKenna and Bargh proposed an effect of CMC on social relationships quite the opposite of the displacement hypothesis. Their framework, referred to as the *stimulation hypothesis*, posits that the increase in anonymity associated with the Internet decreases inhibition and increases self-disclosure, potentially increasing relational intimacy (McKenna & Bargh, 2000a). In addition to reducing social anxiety, the stimulation hypothesis posits that CMC provides an environment where people can better control their social presentation, leading to an improvement other's perception (McKenna & Bargh, 2000b).

The research findings on the stimulation hypothesis are decidedly mixed, apart from Mckenna and Bargh's original studies. Research by Valkenburg and Peter (2007a) found support for the stimulation hypothesis. They noted CMC increased time spent with

existing friends, even though other studies have failed to find this effect (Pollet et al., 2011). A literature review by Valkenburg and Peter (2011) concluded that there is more support for the stimulation hypothesis than against it, but that the positive effects seem limited to existing friends.

The social compensation hypothesis. The *social compensation hypothesis* addresses the impact of CMC on a subpopulation of users. The basis for the social compensation hypothesis comes from the same foundation as the stimulation hypothesis: the increased anonymity and deindividuation found in CMC. This hypothesis was the result of research that found those who are socially anxious, introverted, or lack social skills are more likely to use CMC (Gross, Juvonen, & Gable, 2002; R Kraut et al., 2002). The social compensation hypothesis proposes that people who struggle to establish intimate relationships are drawn to CMC because of the lack of anxiety producing cues and the ability to control self-presentation. It also suggests that these individuals benefit from this environment, increasing the size of their social networks and the quality of their current relationships (Peter et al., 2005).

There is widespread support for social compensation's first premise that psychosocially distressed users prefer CMC. Numerous studies have noted that adolescents who are socially anxious, shy, or introverted are more likely to use CMC and report higher satisfaction with its use (Desjarlais & Willoughby, 2010; Peter et al., 2005; Skues, Williams, & Wise, 2012). There is little support, though, for the second premise of the social compensation hypothesis that psychosocially stressed users of CMC increase their social network size and the friendship quality. Caplan (2003) found that lonely and

depressed individuals prefer CMC over FTF communication with peers. He also found that a preference for CMC over FTF predicted negative outcomes in CMC use, including increases in loneliness and depression. Sheldon (2008) found that while socially anxious users of Facebook spend an equal amount of time on the site as non-anxious users, they have smaller social networks and initiate fewer relationships. Although a few studies noted positive outcomes for psychosocially distressed users of CMC (Desjarlais & Willoughby, 2010; Lee et al., 2013), Valkenburg and Peter (2011) found that a large majority of research in this area fails to support the social compensation hypothesis.

The rich-get-richer hypothesis. As previously noted, Kraut et al. performed a follow-up on the subjects from their original study, looking to see if the negative outcomes from CMC use persisted. This study noted the negative outcomes found in their original group had dissipated, except in those who were high in introversion or lacked existing social support (Kraut et al., 2002). These findings gave rise to the *rich-get-richer hypothesis*. This theory suggests a) extroverted or socially skilled individuals are able to use CMC to expand their social networks and increase the quality of their existing friendships, and b) individuals who are introverted, socially anxious, or lack social skills are unable to take advantage of CMC's social opportunities (Valkenburg &Peter, 2009). The negative impact of CMC on this second group is sometimes referred to as *poor-get-poorer*, and is considered by some researchers as ancillary to the rich-get-richer hypothesis (Rauch et al., 2014; Selfhout, Branje, Delsing, ter Bogt, & Meeus, 2009a)

The rich-get-richer hypothesis garners extensive confirmation in the literature, with a large majority of the research in this area supporting both of its basic premises (Valkenburg & Peter, 2011). Research exploring the exact mechanisms that prevent psychosocially stressed users from benefitting from CMC have provided several possible explanations. The first possibility is that introverted or socially anxious individuals make the maladaptive choice to not follow up online interactions in an offline environment, preventing any benefit from CMC (Buote et al., 2009; Caplan, 2003; Kraut et al., 2002). In short, they simply choose not to pursue potential FTF relationships.

The second possibility is that those with limited social skills lack the requisite ability to navigate the differing social norms in the CMC environment (Caplan, 2005). Support for the second possibility is found in research on the differences between shy and non-shy CMC users. The research found that shy users express significantly more negative emotions and content over CMC than non-shy users (Laghi et al., 2013). This finding is important in light of research exploring authenticity and online social networking by Reinecke and Trepte (2014), who noted a positivity bias in CMC communication. Their study found that CMC users expected a more positive valance on interactions, and formed negative opinions of those who were more negative. Taken together, these results suggest two possibilities: First that introverted users of CMC may be naturally more negative in their online communication and are not suited for its use. Second, that those who lack the social adeptness to understand the differing social norms associated with CMC may experience negative consequences from its adoption.

In either case, the rich-get-richer and poor-get-poorer hypothesis points to two sub-groups of CMC users: Those who potentially benefit from its use, and the psychosocially distressed, who while uniquely drawn to the use of CMC may be ill-equipped to benefit from its use. This possibility is particularly compelling given the previously discussed research finding that psychosocially distressed individuals increase their self-disclosure over CMC, but that that inappropriate self-disclosure over CMC results in a decline in friendship quality. In both instances, there is a suggestion that psychosocially distressed individuals may lack the social judgment needed to successfully navigate the adoption of CMC.

Computer Mediated Communication and Psychological Well-Being

As previously discussed, the body of literature on the relationship between computer-mediated communication and psychological well-being is decidedly mixed. Although there are numerous reasons for the lack of consistent findings in this area, one contributing factor is the lack of consistent parameters in choosing which communication technologies to measure in CMC research, as well as the changing nature of social technology and its patterns of adoption (Blomfield Neira & Barber, 2014).

Reviews and Meta-Analysis

There have been several meta-analysis and narrative reviews of the research addressing the role of CMC in mental health outcomes. In a 2009 review, Valkenburg and Peter found a trend towards research that finds more positive consequences of Internet use. They argued that this trend was the result of the widespread adoption of social networking sites in the mid and late 2000's, which they posited are more beneficial

in building higher quality relationships (Valkenburg & Peter, 2009). Their review found that the body of research generally supports an increase in self-disclosure in CMC use, which they hypothesized will naturally result in greater friendship quality and improvements in well-being. They conceded, though, that their conclusions are not generalizable to all types of users of the Internet, nor to the differing social media technologies in use (Valkenburg & Peter, 2009).

A 2010 meta-analysis of Internet use and psychological outcomes measured the strength of the correlation between Internet use and factors such as well-being, depression, loneliness, and self-esteem. The analysis by Huang (2010) incorporated the results of 40 studies and included over 21,000 participants. The study found a small overall negative relationship between internet use and measures of psychological well-being, though it failed to fully support the identification of any specific contributing factors (Huang, 2010). A systematic review by Best, Manktelow and Taylor (2014) cited significant support for a negative relationship between online social communication and adolescent well-being. The review by Best et al., which included studies published between 2003 and 2013, also found widespread support for the rich-get-richer hypothesis. On the other hand, the review cited several studies that found positive outcomes from social media use, including increased social support and self-esteem, as well as decreased social isolation (Best et al., 2014).

Individual Studies on CMC and Well-Being, Depression, and Social Anxiety

Well-being. Researchers exploring the psychological outcomes of CMC adoption tend to focus on three measurements: well-being, depression, and social anxiety. Not

surprisingly, the findings in these areas are mixed as well. Examples of research studying the impact of CMC on well-being include a study of the impact of Internet use on 3,657 10 and 11-year-old children (Devine & Lloyd, 2012). The study noted a small but significant negative correlation between the amount of time spent on the Internet and well-being in girls but not in boys. Kross et al. (2013) explored the relationship between Facebook use and subjective well-being in young adults. This multi-wave longitudinal study found a significant correlation between the amount of Facebook use and declines in subjective well-being, establishing a temporal relationship between Facebook use and life satisfaction (Kross et al., 2013). On the other hand, Schiffrin et al. (2010) noted no significant correlation between the number of hours spent on the Internet and well-being in subjects high in extroversion, though they did note that more introverted subjects reported a more negative experience and a reduction in subjective well-being. Valkenburg, Peter and Schouten (2006) found no correlation between time spent on social networking sites and well-being, though they did note that negative and positive feedback received on the sites resulted in both positive and negative impact on well-being.

Depression. Research on CMC use and depression is similarly mixed. For example, Gross (2004) looked at generalized Internet use in 271 early adolescents, finding no correlation between the amount of Internet use and depression. Similarly, a study looking at the use of social networking sites in young adults found no relationship between their use and clinical depression (Jelenchick, Eickhoff, & Moreno, 2013). In contrast, Pantic et al. (2012) noted a significant correlation between the time spent on

social networking sites and results of the Beck Depression Inventory in high school students. Likewise, researchers found a correlation between the frequency of social networking site use and depression in a large group of adolescents (n = 1819), though this effect was much stronger in females (Rauch et al., 2014).

Social anxiety. Social anxiety is a condition marked by a fear or avoidance of social interactions, with its cause being primarily due to an unrealistic concern about social evaluation (Haller, Cohen Kadosh, Scerif, & Lau, 2015). There are relatively few studies examining social anxiety as a potential outcome of CMC use. Although numerous researchers have addressed the impact of pre-existing social anxiety on CMC behaviors, there is a relative lack of research exploring CMC as an antecedent to social anxiety. This is somewhat surprising, given that social anxiety is one of the most common psychopathologies during adolescence, with a 12-month prevalence of 7% in the U.S. (American Psychiatric Association, 2013) and an age of onset of early to mid-adolescence (Miers, Blöte, De Rooij, Bokhorst, & Westenberg, 2013). Although social anxiety is approached from many different perspectives, many of the prevailing theoretical approaches point to the potential for CMC to influence its development and course.

As is the case with many other psychopathologies, the development of adolescent social anxiety is likely a combination of neurological predisposition, the environment, and cognition. MRI studies have found that individuals with social anxiety symptoms exhibit neurological differences from the non-socially anxious. These differences include increased activity in the prefrontal cortex and more negative interactivity between rostral

anterior cingulate cortex and the bilateral amygdala (Clauss et al., 2014). Of interest to this study, some of the environmental and cognitive mechanisms involved in social anxiety are potentially related to CMC characteristics. The development of social anxiety during adolescence has been linked to negative interpretations of ambiguous social interactions, self-focused attention, and self-evaluation (Miers et al., 2013). As previously discussed, CMC increases ambiguity in social interactions. In addition, CMC increases self-focused cognitions and self-evaluation (Rauch et al., 2014). The development of social anxiety has also been linked to negative peer interactions (Tillfors, Persson, Willén, & Burk, 2012). It is important to note that CMC is marked by previously noted increases in conflict and aggression. So, while there is a paucity of research on CMC as an antecedent to social anxiety, there is ample evidence in the literature on social anxiety to suggest CMC may influence its trajectory.

The few studies that have addressed CMC as an antecedent to social anxiety seem to suggest a possible relationship. In a study exploring self-presentation while using CMC, Gross (2004) found a correlation between Internet use and social anxiety, though the relationship was fully mediated by identity pretending. Selfhout, Branje, Delsing, ter Bogt and Meeus (2009) reported no direct correlation between time spent online for social purposes and anxiety in their overall research population, yet they did note increased anxiety in adolescents using the Internet for non-social purposes with lower social skills. In a study limited to Facebook use, McCord, Rodebaugh and Levinson (2014) found a correlation between Facebook and social anxiety in a group of adults. Interestingly, this study found the relationship between Facebook and anxiety was fully

mediated by anxiety about the use Facebook itself. In another study finding a positive relationship between CMC and anxiety, Selfhout et al. (2009) explored the role of adult cell phone use and texting in and social anxiety. Their research revealed a positive relationship between texting and social anxiety, with the authors suggesting a perceived obligation to stay constantly in contact with friends as a possible mechanism (Selfhout et al., 2009b).

In summary, the body of research on CMC as an antecedent to social anxiety is limited in its scope, purpose, and findings. Although several studies did note some relationship between CMC and social anxiety, these studies either were exploring other mediating mechanisms involved or were limited to addressing a small segment of overall CMC use. There seems to be a lack of research addressing the direct relationship between comprehensive CMC utilization and levels of social anxiety.

Potential Direct and Indirect Mechanisms

As noted, there is distinct disagreement among researchers on the relationship between CMC and psychological well-being. The body of research that does find a correlation between these constructs points to both indirect and direct mechanisms that may contribute to this relationship. CMC can directly affect adolescent mental health through the relational stress caused by greater ambiguity in social cues and social norms, the increase in disinhibition, aggression, and conflict associated with its use, as well as the paucity of non-verbal social cues that facilitate intimacy.

Several additional direct mechanisms associated with CMC are proposed as factors in CMC's relationship to psychological well-being. One of these factors is the

increase in social comparison that can occur over some forms of CMC. Social networking sites often include a significant element of self-presentation, and users spend a large amount of their time on these sites comparing themselves to others (Manago et al., 2012). Research has found that individuals high in comparison behaviors over CMC have an increased likelihood of exhibiting psychopathologies such as narcissism and depression (Feinstein et al., 2013). Research has also found that some individuals report a more localized anxiety while using Facebook, where social anxiety is only experienced during actual Facebook use (McCord et al., 2014).

Another direct mechanism noted by researchers is anxiety about the technology itself. Rosen, Whaling, Rab, Carrier and Cheever (2013) explored the relationship between a wide variety of psychopathologies and attitudes towards social media technologies. They reported that some users exhibited a strong need to check continually for messages on their mobile devices and that this pattern was positively associated with social anxiety. Multitasking is another behavior negatively associated with psychological well-being. Several studies have noted a relationship between a preference for multitasking or multitasking behaviors and psychopathologies such as depression and anxiety (Pea et al., 2012; Rosen et al., 2013).

One indirect mechanism noted by researchers is the possibility that CMC results in the loss of face-to-face communication thus decreasing in the quality of peer relationships. Huang (2010) suggested in his review that some CMC users replace their FTF communication with CMC. Caplan (2003) found that lonely individuals can develop a preference for online interaction and express a willingness to sacrifice face-to-

face interaction. Caplan's research supported the findings of other researchers who have suggested in psychosocially distressed individuals, CMC can replace FTF relationships (Erwin, Turk, Heimberg, Fresco, & Hantula, 2004; Pierce, 2009).

Populations with Greater Potential Susceptibility to CMC

As noted, there is disagreement about the relationship between CMC and adolescent mental health. Yet the research does seem to suggest several possible groups who may be more prone to the psychological effects of CMC, both negatively and positively. As previously noted, individuals who are extroverted or more socially skilled have been shown to benefit from the use of CMC by leveraging it to increase their social network size and improve the quality of existing relationships. In addition, there is evidence that socially isolated individuals can benefit from its adoption. Researchers have noted that people with chronic disabilities, the geographically isolated, and some ethnic minorities can take advantage of the increased access to social connections via CMC, enlarging their social networks and improving friendship quality (Lloyd, 2014).

Psychosocial distress and CMC adoption. Although there is no clear agreement among researchers, there is evidence to suggest some individual users of CMC may be more likely to experience negative psychological outcomes from its use. The poor-get-poorer effect, previously discussed as an ancillary to the rich-get-richer hypothesis, suggests those who are introverted, have poor social skills, or are socially anxious tend to experience more negative outcomes from CMC adoption. Some of the findings in the research suggest these individuals as a likely target for research to identify who may be more likely to be associated with negative psychological outcomes.

Introversion. It is important to note that introversion is a separate construct from social anxiety, though some researchers treat them as interchangeable (Schiffrin et al., 2010). While social anxiety is a fear of social interaction, introversion is marked by a preference for fewer social interactions. Individuals high in introversion tend to be quieter, reserved, and withdrawn than their peers (John & Srivastava, 1999). Some of the studies addressing introversion and CMC have noted the potential for negative outcomes. Erwin et al. (2004) explored the interaction between introversion, extraversion, and CMC use. They found that while extraversion was related to positive CMC outcomes, introversion resulted in negative psychological outcomes including lower self-esteem, increased negative affect, and greater loneliness. The results of this study supported the findings of Kraut et al. (2002), who noted higher depression in introverted CMC users. It is important to note the lack of research exploring introversion, CMC, and social anxiety. Schiffrin et al. (2010) observed that introversion and social anxiety are different psychological constructs, and suggested a need for further research into their interaction with CMC adoption.

Social skills. Social skill reflects an ability to appropriately and successfully relate to others (Caplan, 2005). It includes expressivity, sensitivity, and control of social interactions and emotions (Caplan, 2005). There is a relative lack of research looking at the correlation between social skills deficits with negative outcomes from CMC, though several studies have indirectly addressed this topic. Caplan (2003) found that a lack of social skills can result in a maladaptive preference for CMC use in social interaction, and additional research supported these findings (Bonetti, Campbell, & Gilmore, 2010;

Caplan, 2005). Kim, LaRose and Peng (2009) found those with deficient social skills using CMC in peer relationships were more likely to be lonely. Given the close relationship between social skills and loneliness, as well as the relationship between loneliness and psychological well-being, it seems reasonable to suggest this study may point to a potential correlation between social skills and psychological well-being.

Social anxiety. As previously discussed, research exploring the outcomes associated with CMC use in those with social anxiety is minimal. As noted, studies on this subject have noted that individuals higher in social anxiety prefer text-based CMC, may use it to replace FTF relationships, and reported more loneliness as a result (Pierce, 2009; Reid & Reid, 2007).

Discussion. Although research exploring a correlation between CMC, psychosocial distress, and psychopathology is relatively scarce, the literature does provide a rationale for the possibility they are related. The rationale lies in the confluence of three findings, all of which have previously been discussed but warrant further exploration. First, the predilection for psychosocially distressed individuals to favor CMC over FTF, with some evidence that they may be forgoing at least some FTF communication to do so. Second, the unwillingness or inability of psychosocially distressed individuals to successfully navigate the differing social skills and norms associated with CMC and to capitalize on its opportunities. And third, research indicating that social support over CMC is both functionally different and qualitatively inferior, even while psychosocially distressed individuals perceive it as being equally effective (Schiffrin et al., 2010). In context with each other, these findings seem to

support further research exploring the relationship between CMC, psychosocially distressed individuals, and psychological well-being.

Research Deficits

The primary research deficits in the exploration of CMC's relationship to adolescent psychological well-being have been previously discussed but warrant further clarification. As noted, because findings to date have been decidedly mixed, the next step in research is to look at specific populations and the effect of CMC on their psychological well-being. The literature suggests one possible direction in this research is psychosocially distressed individuals. Both Anderson, Fagan, Woodnutt and Chamorro-Premuzic (2012) and Schiffrin et al. (2010) suggested this line of research, encouraging future studies that focus on introversion, social anxiety and loneliness as potential variables. As such, the lack of research looking at the relationship between psychosocially distressed CMC users and psychological well-being needs to be addressed.

Second, the body of research has failed to measure computer-mediated communication in a way that accurately represents its current pattern of use among adolescents. As mentioned, most adolescent CMC now consists of texting. While texting and other instant messaging services dominate adolescent CMC, the vast majority of studies to date focus on social media web sites or Internet use. It would seem critical for any study hoping to measure the impact of CMC on adolescent mental health to accurately model and measure the current usage patterns of adolescents. What is lacking

in the body of research are studies that comprehensively measure adolescent CMC use in a way that reflects its real-life use.

Another research deficit is the potential moderating role of face-to-face communication in the relationship between CMC and psychological well-being. Very few studies in this area include a concurrent measurement of face-to-face social interactions. Some research has found that FTF communication is being replaced by CMC in some users, which suggests it could be useful to explore the relative amounts of FTF to CMC. It is possible that the combination of the adoption of CMC and the loss of FTF is responsible for negative psychological outcomes in CMC use. In addition, given the suggestion that CMC and FTF differ in their effect on mental health, the need to appropriately control for FTF interactions seems clear.

Finally, there is a general lack of studies using adolescent subjects on this research topic (Blomfield Neira & Barber, 2014). Given that adolescents are the population with the highest adoption rates for CMC for peer relationships, further research into the effects of CMC use in adolescents seems justified.

Literature Review Conclusion

There are several observations that can be taken from the body of literature on CMC and adolescent psychological well-being. First adolescents have adopted CMC at a rate higher than any other population, and a large majority of adolescents have fully integrated CMC into their peer relationships using mobile technology. Second, adolescence is a developmental period in which there is a unique sensitivity to the quality of peer relationships. Third, CMC involves numerous mechanisms that may result in

negative outcomes for both the quality of adolescent peer relationships and their mental health. And finally, the research exploring the overall impact from CMC on adolescent mental health is decidedly mixed. From this, one of two conclusions can be drawn: It is possible the research linking CMC use to negative psychological outcomes is invalid. This conclusion seems unlikely, given the numerous studies that continue to find these results. It is also possible that CMC has differing outcomes for different groups. If this is the case, the mechanisms responsible for any negative psychological outcomes would be limited to a specific subgroup of adolescents. The goal of this study is to explore that possibility, seeking to identify specific subgroups that may be more susceptible to the negative psychological outcomes of CMC.

Chapter 3: Research Method

As discussed, the purpose of this quantitative study was to examine the relationship between adolescent computer-mediated communication and social anxiety. I attempted to address the contradictory findings on CMC's effects on the psychological well-being of adolescents by measuring CMC in ways that model real-world CMC adoption by adolescents. FTF, introversion, and social skills were added to CMC as predictors in order explore their ability to improve model fit.

This chapter details the methodology that was employed to accomplish the purposes of the study. The chapter will describe the study's basic research design, providing a rationale for the nature of the study and its design elements. This rationale is based on the overall purpose of the study, the design elements necessary to measure the variables, and limitations related to the variables and the study population. Next, the methodology of the study is described in detail. The study population and sampling frame is detailed, including population demographics, sampling strategies, recruitment, and participation requirements. Data collection is outlined, including the collection methods used, the instruments chosen to measure each variable, and how each variable is operationalized. Following this, the detailed data analysis plan is reviewed. How the data were cleaned, analyzed, and reported is specified. Next, internal and external threats to validity are addressed. Finally, the ethical practices necessary to protect the study participants are described, including informed consent procedures, recruitment strategies, and the treatment of collected data.

Research Design Description and Rationale

This study used a quantitative, quasi-experimental design. A quantitative design was chosen because the study's purpose was to explore the correlation between variables. The predictive variables in this study were daily amounts of CMC and FTF, as well as trait levels of introversion and social skills. The criterion variable was daily levels of social anxiety. The rationale for each variable was addressed in Chapter 1.

Rationale for Quasi-Experimental Nature of Study

Although an experimental design with random sampling and control groups is preferable to increase generalizability and establish causation in research (Frankfort-Nachmias & Nachmias, 2008), there were limitations inherent in this particular study that precluded this design. One limitation was the nature of the key predictive variables in the study. CMC and FTF are adolescent social behaviors. Any attempt to artificially control these social behaviors by randomly assigning subjects to behavior and control groups would have been impractical and would have contaminated the data. This would have occurred through disruption and reactive effects, which can change participant's normal behavior (Bracht & Glass, 1968; Campbell & Stanley, 1963). Second, there were difficulties associated with randomly recruiting adolescents, who are a protected population and require parental consent. The limited access available to recruit potential subjects meant that true random sampling of a school's population was impractical. Because of these two limitations, a quasi-experimental design was chosen for this study.

Rationale for Multiwave Panel Design

This study employed two distinct phases. Phase 1 consisted of gathering data on subject characteristics. This phase included the collection of data on participant demographics, introversion, social skills, and trait social anxiety. Phase 2 was a longitudinal design, employing a multi-wave panel design that collected data on a daily basis. During Phase 2, data were collected on daily CMC, FTF, and social anxiety for five consecutive days.

The multiwave panel design aspect of this study was chosen for two reasons: First, it was important to accurately measure daily amounts of CMC, FTF and social anxiety. Although it was possible to have participants attempt to recall social interactions and anxiety levels from previous days, the reporting of data at the end of each day was expected to result in greater accuracy. Second, the multiwave panel design provided the opportunity to correlate daily data and establish basic temporal relationships between the variables. The exploration of daily variations of CMC, FTF, and social anxiety provided better understanding into the relationship between CMC use and its outcomes. As such, data was collected from participants daily, both to explore temporal relationships and to avoid inaccuracies in participant memory. Similar studies exploring CMC and well-being (Kross et al., 2013; Pea et al., 2010) used daily surveys to collect communication data to ensure accuracy and to establish daily correlations with subjective well-being or depressive symptoms. The basic research design used for this research was modeled after these studies.

One constraint faced in this study was difficulty in collecting data from adolescents, whose availability is limited because of their status as minors. Adolescents have less personal control over their schedules than adults. Although the online gathering of data was incorporated to improve the convenience of data collection, an adolescent's behavior is often controlled and limited by the rules and expectations of supervising adults. Experience sampling would have been an effective option for collecting this type of data, as it allows for the detailed exploration of temporal relationships between variables and allows for causal inference (Kross et al., 2013). However, during the school day, most adolescents are unable to regularly access their cell phones due to school and parental restrictions. As such, data collection was limited to retrospective sampling at the end of each day, when adolescents typically have more discretion and flexibility in the use of their time.

Methodology

Population and Demographics

Study population. The target population for this study was adolescents in North America, while the actual study population was adolescents attending a middle school and a high school in a small city in Washington State. The sampling frame was students enrolled in health classes at these two schools.

Demographics. According to the Washington State Office of the Superintendent of Public Instruction (2015), the school district site is a relatively small district with a student population of 4,657. The school district draws from two cities. The populations are 10,699 and 4,292 respectively (U.S Census Bureau, 2010). Both communities could

be described as a combination of rural and suburban. Farming and ranching is a large part of both communities' culture, yet they are situated close to heavily populated suburban communities. The district demographics can be found in Table 1. The three secondary schools in the district generally reflect the demographics of the district, though these schools tend to have a lower population of American Indians as compared to the district (WSOSPI, 2015).

Table 1

Population Demographics of Washington State and District Schools

	White	Hispanic	American Indian	Asian	Black	Other
Washington State	63.7	16.1	2.5	7.9	5.6	4.2
School District	78.6	7.8	10.3	1.3	0.8	1.2
Middle School #1	82.9	9	3.2	1.3	1.9	1.7
Middle School #2	83.7	10.7	1.6	2.1	0.8	1.1
High School	88	5.8	2.8	1.5	0.6	1.3

As compared to the demographics of Washington State found in Table 1, the school district is less racially diverse. The district is 78.6% White as compared to 63.7% for Washington State. One exception to this is the population of American Indians in the district, which makes of 10.6% of the students versus 2.5% for Washington State. The district student population has a higher socioeconomic status than the average Washington State student, as represented by a free and reduced lunch participation of 28.9% versus 48.2%. Also of note, the students in the district outperforms statewide academic averages based on statewide testing and graduation rates (WSOSPI, 2015).

In summary, the school district is marginally representative of the student population of Washington State. District schools tend to be less racially diverse, with a lower percentage of Hispanic students and a higher percentage of American Indians. The district's students are significantly higher in SES and more academically successful.

Sampling Procedures

Sampling strategy. The study used a nonprobability sampling strategy. Nonprobability sampling is used when random sampling is not available (Frankfort-Nachmias & Nachmias, 2008). Although random sampling and the use of a randomly assigned control group is desired because it allows for a true experimental design (Campbell & Stanley, 1963), random sampling was not an appropriate design for this study. In this study, the primary predictive variable was peer-to-peer communication. Peer communication is a behavior that cannot be randomly assigned without changing the nature of this communication. Randomly assigning participants to communicate with peers in specific ways would introduce experimental contamination and reduce the external validity of the study (Frankfort-Nachmias & Nachmias, 2008).

The sampling strategy was originally going to be quota sampling, which is a technique that selects a sample that represents the population in question (Frankfort-Nachmias & Nachmias, 2008). Because both gender and age have been shown to influence the incidence of anxiety (Kalpidou, Costin, & Morris, 2011; Pierce, 2009), the goal was to get representative samples of these two characteristics. Given the nature of the sampling frame and the challenges in recruiting adolescents, it was too difficult to recruit enough participants for quota sampling. Because I was unable to recruit sufficient

participants, I shifted to a convenience sampling strategy, which simply accepts the subjects who are willing to volunteer for the study (Frankfort-Nachmias & Nachmias, 2008).

Sample size. To compute sample size, it is necessary to know the desired alpha level, the desired power of a test, and the anticipated effect size (Cohen, 1992). The alpha level, which is the chance of error a researcher is willing to take in determining statistical significance, is commonly set at .05 or .01. For my study, I used .05. The power of an experiment tells us the magnitude of the experimental effect and is commonly set at .80 (Cohen, 1992), the level used for this study. Effect size needs to be estimated before running an a priori test to determine sample size (Cohen, 1992). Cohen's conventions for the effect size in multiple linear regression are .02 for a small effect, .15 for medium, and .35 for a large effect (Cohen, 1992). Because I was unsure of the expected effect size for my study, I chose a medium effect size of .15 for this study. After inputting these parameters in the program G*Power and specifying the four predictive variables in my study, I used a minimum sample size of 80 to achieve .80 power for my test. Field (2013) offered additional guidance regarding sample size in the use of multiple regression. He noted the commonly used rule of thumb of 10 to 15 cases for each predictor to create a reliable model in regression analysis. This would result in a sample size of 40 to 60, given the four predictive variables in this study. Given these perspectives, I took the more conservative route and attempted to recruit 80 subjects for this study.

Recruitment

Recruitment took place in during health classes at a middle school and high school in the district. Each recruitment session occurred during a session at the start of class. Recruitment occurred in the context of a mental health unit. The health teacher briefly introduced the idea of psychology research and then introduced me to the class. I began by introducing the general topic of the study. The study was described as research exploring the relationship between social media, FTF, and psychological well-being. To prevent data contamination, introversion, social skills and social anxiety were not specifically identified. These variables were described in a general sense in the context of personality and friendships, and how these affect social media use and adolescent well-being. These variables were fully explained in a debriefing session after data collection was complete.

I then described the general design of the study to students, including the initial surveys and the daily collection of data for 5 days. I included a description of the data gathering procedures and other information related to subject participation. Students were given the details of time commitments, including time necessary to complete initial data collection and the daily surveys. Students were informed that they would be given a $7 gift card to compensate them for their time if they completed the initial surveys and a minimum of two of the five daily online surveys. It was stressed that students could discontinue the study at any time but needed to complete the minimum requirements to receive the gift card. Care was taken to avoid coercion in the recruitment of participants.

At the end of the presentation, students were given a folder with three documents:

- The first document was a cover letter introducing the information packet (Appendix A).
- The second document was an assent form for participants (Appendix B). It contained a summary of the information needed to give informed consent and a place to sign where they could indicate their desire to participate through a signature. This form provided them written documentation of the nature of the study and ensured they completely understood its details. Name, age, gender, and contact information were collected on this form. Contact information was limited to a cell phone number or e-mail address through which data will be collected. Participant's contact information was deleted as soon as data collection was completed. Information needed to contact the researcher and the Walden University representative was provided on this form.
- The third document was an informed consent document for a parent or guardian (Appendix C). This document contained the same information about the nature of the study as contained in the participant assent form and required the signature of a parent or guardian for student participation. Information needed to contact the researcher and the Walden University representative was also provided on this form.

Students indicated their willingness to participate in the study by returning their assent and consent forms to a box in the school office. Students who returned these forms were sent an e-mail or text containing final details about their participation and a link to access the initial survey.

Participation

Students who returned the informed consent document would be deemed to have expressed a desire to participate in the study. After informed consent was received, participants would complete the first phase of the study. This includes an initial survey that required approximately 30-45 minutes to finish and could be completed using a computer or smartphone. Text and e-mail messages were sent to provide links to the study and to remind students to complete the survey. The second phase included five daily surveys that were completed at the subject's discretion each evening. These required five to seven minutes to complete each day. Text and e-mail prompts were sent to remind students to complete the daily surveys.

There was a follow-up and debriefing session after data collection was complete that took place in the same classes where recruitment occurred. During this follow-up session, the specific details of the study's purpose, hypothesis, and results were provided to the teacher and to the class. Students were given an opportunity to ask any questions they had about the study and its results, and were given the opportunity to e-mail or text questions as well.

Data Collection

This study collected data from junior and senior high students recruited in school health classes with teacher cooperation and supervision. As previously discussed, phase 1 consisted of completing surveys of introversion and social skills. Surveys were hosted on SurveyMonkey and completed using a smartphone or computer. Participants were also asked to provide basic demographic data, including age and gender. Gender and age

data were collected based on research suggesting differences between early and late adolescents and gender in the outcomes associated with their CMC use. Subjects accessed the initial surveys after receiving instructional messages and links from SurveySignal. Phase 2 of the study, the multiwave panel phase, took place during the following week. Each evening at 6:30 PM students received a text message, e-mail, and/or instant message to remind them to complete a survey. A second reminder was sent at 9:00 PM. The data collected during this phase included amounts of daily FTF, daily CMC, and daily social anxiety.

Survey information was downloaded from Survey Monkey and stored on my personal laptop computer, which was password protected and kept in my home. Both SurveyMonkey and SurveySignal were set up to allow anonymity during data collection. The use of these services also allowed for the collection of data without direct contact with the participants after the initial recruiting phase. Identifier codes were used to replace names on the data in order to maintain anonymity of the subjects.

Instrumentation and Operationalization of Constructs

There were two challenges associated with choosing effective instruments to measure the variables in this study. The first included finding tools that measure the constructs involved and are validated and normed for adolescent populations. The second challenge was to find instruments that take a relatively short time to complete. Both missing data and the withdrawal of subjects can be caused by the number and length of surveys or their repeated administration (Marteau & Bekker, 1992). This can be especially true when working with adolescents. Of particular concern was the multiwave

panel design, which necessitated the repeated administration of instruments to measure CMC, FTF, and social anxiety. So, while was relatively easy to find appropriate scales that are validated in adolescent populations, finding instruments that are both valid for this population and fit within the necessary time constraints was challenging. A summary of the variables and instruments chosen can be found at the end of this section in Table 2.

Computer-mediated communication. As defined in Chapter 1, CMC was operationalized as all text-based peer-related communication that is facilitated by technology. Data for this variable was collected during the panel study phase of the study using a self-designed survey. The survey consisted of two questions that asked participants the number of minutes they interacted with peers using social media (SNS, instant messaging, e-mail) and the number of texts they wrote and received during that day (Appendix D). Other studies in this area have used a similar self-designed question for this measurement (Bonetti, Campbell, & Gilmore, 2010; Jelenchick, Eickhoff, & Moreno, 2013).

Data obtained from this survey was measured at the ratio level. Daily levels of CMC were correlated with daily state anxiety. In addition, daily FTF, social skills, and introversion were added to CMC as predictors to explore best model fit.

Face-to-face communication. As defined in Chapter 1, FTF was operationalized as all communication done either in person, over the phone, or using video. Like CMC, this predictive variable was collected on a daily basis using a self-designed survey. The survey used a single question that asked the number of minutes that participants

interacted socially face-to-face with peers during that day (Appendix C). Other studies in this area have used a similar self-designed questionnaire to obtain this data (Kross et al., 2013).

Data obtained from this survey was measured at the ratio level. Daily FTF was added to daily CMC as a predictor and correlated with daily state social anxiety to find best model fit.

Social anxiety. This study measured both trait and daily levels of social anxiety for exploratory purposes, though only daily anxiety was used to address the research questions. Trait anxiety is defined as a relatively stable measure of the anxiety an individual feels in general, while daily levels of anxiety reflect less stable levels of anxiety that are influenced by daily experience (Marteau & Bekker, 1992). Trait social anxiety was measured once at the start of the study. Daily social anxiety was measured five times, once per day, as part of the multiwave panel phase of the study.

Trait social anxiety. Data for trait social anxiety was collected using the social anxiety subscale of the Screen for Child Anxiety Related Emotional Disorders (Appendix E), created by Birmaher et al. (1997). The advantage of the SCARED subscale is that it is specific for social anxiety and already normed for adolescents. In addition, the subscale is brief, being limited to only seven questions. Research in this area has used this subscale (Selfhout et al., 2009). Reliability and validity for this scale are strong. Birmaher et al. (1997) reported Cronbach's alphas of $\alpha = .74$ to .93, and test-retest reliability coefficients of .70 to .90. Essau, Muris and Ederer (2002) reported overall

Cronbach's alpha of .91. Data obtained from the SCARED was measured at the interval level. It will be correlated with combined amounts of CMC and FTF, as well as introversion, and social skills.

State or daily social anxiety. During the panel phase of the study, daily measures of social anxiety were taken. These samples needed to measure daily variations in social anxiety and correlated them with the predictive variables. Although scales that measure true state anxiety were available, such as the Spielberger State-Trait Anxiety Inventory, these reflect momentary emotional states. These scales would not have measured anxiety that reflected the overall impact of a subject's daily experiences.

Fortunately, a scale was created for just this purpose. In order to explore the relationship between social anxiety and daily hedonic activity, Kashdan and Steger (2006) modified the Brief Fear of Negative Evaluation Scale (BFNE) for a study utilizing experience sampling (Appendix F). Their modified scale included the top five loaded items from the BFNE, as well as two items chosen by the International Consensus Group on Depression and Anxiety. The items were rephrased as reflective questions. For example, the original BFNE question "I often worry that I will say or do the wrong things" was changed to "I was worried that I would say or do the wrong things". Hierarchical linear model (HLM) analysis was performed on the scale and resulted in an acceptable reliability of .91. In addition, a principal-components analysis (PCA) was done on the items, with Kashdan and Steger reporting eigenvalues and a scree plots supported a one-factor solution. In addition, the validity of the daily anxiety scale was measured by determining the between-person variance in daily outcomes accounted for in

the trait scales used in the study. The examination of these variances resulted in a correlation between daily and trait anxiety of .56, which the authors determined was indicative of strong convergent validity (Kashdan & Steger, 2006). Given the convergent and discriminant validity of the BFNE (Weeks et al., 2005) and the analysis performed by Kashdan and Steger in their study, this modification of the BFNE seemed to be an appropriate and valid solution to measuring daily social anxiety.

Data obtained from the BFNE was measured at the interval level. A correlation was explored between this data and daily amounts of CMC and FTF, as well as levels of social skills and introversion.

Social skills. One difficulty in measuring social skills is determining a clear definition of the construct. There is a variety of definitions and terminology associated with social skills, with a wide variety of interpretations found in the literature. The body of research does seem to coalesce around two primary factors that constitute social skills: relational competence and emotional intelligence (Wigelsworth, Humphrey, Kalambouka, & Lendrum, 2010). It is important to note that emotional intelligence is significantly less related to success in social relationships as compared to relational competence (Wigelsworth et al., 2010). It seems the ability to identify and manage emotions is less important in successfully relationships than the development of prosocial relational behaviors. In light of these findings, this study focused on relational competence when measuring social skills. As previously discussed, individuals who are either unable or unwilling to leverage the CMC environment to develop peer relationships may be more likely to experience negative outcomes from its adoption.

To measure participant's social skills, the Teenage Inventory of Social Skills (TISS) was used (Appendix G). The TISS was created by Inderbitzen and Foster (1992) specifically for adolescent populations. It consists of 40 items scored on a six point Likert scale, with 20 worded positively and 20 negatively. Unlike most scales measuring social skills, the TISS was specifically designed to identify social incompetence as opposed to measuring eligibility and success of treatment (Inderbitzen & Foster, 1992). In tests, the TISS has shown acceptable reliability. Test-retest Pearson correlations were .90 for the positive questions and.72 for the negative questions (Inderbitzen & Foster, 1992). A Cronbach's alpha of .88 for both scales indicates acceptable internal consistency (Inderbitzen & Foster, 1992). Discriminant reliability was tested by comparing the TISS to several other measures of social skill, with Pearson product-moment correlations ranging from r = .26 to r = .40.

Data from this scale were measured on the interval level. The data were added to CMC as a predictor of daily social anxiety to explore best model fit.

Introversion. Introversion is part of the introversion/extraversion dichotomous continuum found in what is commonly referred to as the "big five" personality dimensions. The field of psychology has largely coalesced around these five broad dimensions as representing the primary traits of personality (John & Srivastava, 1999). While there are numerous definitions and conceptualizations of extraversion, Costa and McCrae assigned six facets to each of the five domains that were found to have excellent internal consistency, temporal stability, and convergent and discriminant validity (John &

Srivastava, 1999). The facets describing extraversion include gregariousness, assertiveness, activity, excitement-seeking, positive emotions, and warmth.

To measure introversion, this study used the Big Five Personality Trait Short Questionnaire (BFPTSQ) extroversion subscale (Appendix H). The BFPTSQ was developed by Julien Morizot as a modification of the Big Five Inventory for use in adolescents (Morizot, 2014). The primary modification made to the BFPTSQ was to adjust the language for appropriateness with adolescents and to add conceptual breadth (Morizot, 2014). Like the BFI, the BFPTSQ is designed to be a time-efficient alternative to longer instruments without sacrificing validity (John & Srivastava, 1999). The scale avoids the use of single adjectives, which tend to be answered inconsistently, using short phrases based on adjectives instead. The BFPTSQ is a 50-item measure that asks for each item to be rated on a five-point Likert scale, ranging from "disagree strongly" to "agree strongly". The extraversion subscale of the BFPTSQ consists of ten items. The validity of the BFI was explored Morizot (2014) in cooperation with a team of experts. A panel of six experts evaluated the BFPTSQ for content validity, and the extroversion subscale received an S-CVI of .949. Convergent validity in a comparison with the NEO-PI-3 was .813, and adequate internal consistency was noted with a Cronbach's alpha of .80. The study reported good discriminant reliability as well, with a Pearson product-moment correlation of $r = .89$.

Data from the BFPTSQ were measured on the interval level. These data were added to daily CMC, along with social skills, as a predictive variable and correlated with

daily social anxiety. A letter granting permission to use the BFPTSQ was obtained from Dr. Morizot (Appendix I).

Table 2

Variables, Instruments, and Measurement Levels

Variable	Type	Instrument	Measurement
CMC Amount	IV	Daily Survey	Ratio
FTF Amount	IV	Daily Survey	Ratio
Trait Social Anxiety	DV	SCARED	Ratio
State Social Anxiety	DV	Modified Version of BFNE	Ratio
Social Skills	IV	TISS	Ratio
Introversion	IV	Introversion Subscale of the BFI	Ratio

Data Analysis

Multiple linear regression was used to analyze the data. This method was employed because of the quasi-experimental nature of the study, the desire to explore correlation between multiple independent and dependent variables, and the measurement of variables on the ratio level. To carry out this analysis, IBM SPSS software was used.

Data cleaning and screening. Multiple regression requires several procedures to prepare the data and to make sure required assumptions are met. In general, a ratio of

either10 or 15cases to each predictor is suggested (Field, 2013), so at least 40-60 participants will be needed given the four predictors in this study. As noted, a minimum sample size of 80 was necessary to achieve the desired effect size and power, so an effort was made to obtain this sample size to ensure a reliable regression model. An a priori scatter plot was used to check for outliers in the data and for the assumption of linearity. In addition, standardized residuals were examined to identify potential outliers. The three general rules identified by Field (2013) were used to identify problematic residuals: (a) Any residuals with an absolute value above 3.29, (b) if more than 1% of cases have a standardized residual with an absolute value above 2.58, and (c) if more than 5% of cases have a standardized residual greater than 1.96. The assumption of multicollinearity was explored using an a priori linear regression, looking for tolerance values of greater than 0.1 and VIF values greater than 10. Case summaries were examined to look for any cases exerting undue influence. After the initial regression was run, residuals were checked for linearity, homoscedasticity, independence, and normality.

Data analysis plan. SPSS was used to create several multiple linear regression models to explore the following research questions and hypotheses:

Research Question 1. What is the strength and nature of the relationship between the amount of computer-mediated communication and social anxiety in adolescents?

$H_0$1: The amount of computer-mediated communication will not significantly predict the level of social anxiety in adolescents.

$H_1$1: The amount of computer-mediated communication will significantly predict the level of social anxiety in adolescents.

Research Question 2. How does the amount of face-to-face communication effect the strength and nature of the relationship between computer-mediated communication and social anxiety in adolescents?

$H_0$2: The amount of face-to-face communication will not significantly predict the relationship between computer-mediated communication and social anxiety in adolescents.

$H_1$2: The amount of face-to-face communication will significantly predict the relationship between computer-mediated communication and social anxiety in adolescents.

Research Question 3. How do introversion and social skills effect the strength and nature of the relationship between computer-mediated communication and social anxiety in adolescents?

$H_0$3 Introversion and social skills will not significantly predict the relationship between computer-mediated communication and social anxiety in adolescents.

$H_1$3 Introversion and social skills will significantly predict the strength and nature of the relationship between computer-mediated communication and social anxiety in adolescents.

Numerous models were built to explore and analyze the data. The goal was to find which variables contributed to best model fit. Three models were created to address each research question, one for each day of data used in the study. To address RQ1, models were created analyzing daily amounts of CMC as a predictor of daily social anxiety. To address RQ2, models were created adding FTF to CMC as a predictive variable to explore best model fit. To address RQ3, models were created adding the participant's levels of introversion and social skills to CMC to explore best model fit. The rationale for including FTF, introversion, and social skills as predictive variables was fully discussed in Chapter 1, and support from the literature for their inclusion is discussed in Chapter 2.

The hierarchical method of entering the variables in SPSS was chosen to address each research question. RQ1 in this study focused on the bivariate relationship between CMC and social anxiety, which required a model with only these two variables. RQ2 and RQ3 required the addition of FTF, introversion, and social skills as predictors to CMC. Separate regressions were created for RQ2 and RQ3. FTF, introversion, and social skills were not added into a single model to isolate their impact on model fit.

Overall model fit was the ultimate goal of this study. In linear regression, model fit is reported in SPSS in several ways. First, it is reported in the model summary table, with R^2 and adjusted R^2 indicating the amount of variance in the criterion variable accounted for by the model. Second, model fit can be assessed using change statistics, which are also reported in the model summary table. Finally, model fit in linear regression is also reflected in the ANOVA table, with an alpha level of $p < .05$ indicating

statistical significance for each model. A table was used to report basic descriptive statistics, including mean, standard deviation, and number of cases. A table was also used to report the correlation coefficients and significance of each individual variable, and a correlation matrix was used to display the coefficients between the variables.

Threats to Validity

Internal Validity

In a quasi-experimental study, there are inherently greater threats to internal validity as compared to a true experimental design (Frankfort-Nachmias & Nachmias, 2008). One threat to internal validity associated with this study was panel conditioning or testing effects. Panel conditioning refers to the impact of repeated testing or exposure to treatments inherent in panel designs (Frankfort-Nachmias & Nachmias, 2008). In this study, subjects were repeatedly tested for daily social anxiety. It is possible that the participants were influenced by their previous responses to give similar answers in subsequent surveys. This effect may have reduced the sensitivity of the daily anxiety survey and change the study's overall results.

Experimental mortality was another threat to internal validity in this study. Experimental mortality refers to a differential loss of subjects or data that changes the results (Campbell & Stanley, 1963). The use of psychosocial distress as a predictor in this study could have been a source of this effect. It is conceivable that introverted or socially anxious subjects were more likely to withdraw from the study if they experienced stress related to participation. It is also possible on days where subjects felt increased social anxiety, the anxiety itself may have resulted in the choice to not

participate on that day, resulting in a subsequent loss of data. Although loss of data is not always an issue, the differential loss of this type of data may have been a threat to the validity of this study.

An additional threat to internal validity was the possibility of selection effects. Selection effects occur when the participants who are selected have characteristics that impact a study's outcome (Creswell, 2009). Convenience sampling was necessary for recruitment in this study. Thus, the students who agreed to participate may have differed from the general population of the school. This effect could have been particularly significant if students who were the most introverted or deficient in social skills participated at lower rates than other students. This could have impacted the study results because these subgroups may be more likely to exhibit negative outcomes from CMC adoption.

External Validity

Because the research design for this study was quasi-experimental, it should have greater external validity than true experimental designs (Frankfort-Nachmias & Nachmias, 2008). As discussed in Chapter 1, though, it is important to note the ability to generalize the results of this quasi-experimental study is limited. Not only did this study lack a true experimental design, but the use of convenience sampling significantly limited the generalizability of its findings.

Another threat to external validity present in this study was expectancy effects. Expectancy effects occur when the researcher or the research arrangement in question

creates an expectation for a specific behavior or reaction and alters a subject's behavior (Creswell, 2009). It is possible that the daily questions about social anxiety in the panel phase increased the participant's awareness of their own socially anxious feelings and influenced their responses to the surveys. This is of particular concern because one of the correlates to social anxiety is increased self-awareness (Bonetti et al., 2010). Although care was taken to describe the experiment in a way that did not prejudice the participant or create expectations, simply discussing CMC and social anxiety may have created an expectation that these two variables were related to one another.

A final threat to external validity in this study was reactivity effects. Reactivity effects occur when a participant's awareness of experimental arrangements creates a change in their behavior (Campbell & Stanley, 1963). In this study, the possibility existed that asking subjects daily to report their CMC and FTF may have caused them to alter these behaviors. If the behavior of participants changed during the study, that change would limit the validity of the results and their generalization to other populations.

There was one potential threat to statistical conclusion validity in this study. There is a relationship noted in the literature between introversion, deficits in social skills, and social anxiety outside of the context of CMC (Heiser, Turner, & Beidel, 2003). While these characteristics are discreet qualities and the correlation between them is limited (Heiser et al., 2003), there is the potential that pre-existing relationships between introversion, social skills, and social anxiety may have been responsible for some of the statistical results observed.

Ethical Procedures

Every effort was taken to protect the participants from psychological or physical harm. This protection is of particular concern in this study because adolescents are members of a vulnerable population (APA, 2010; US Department of Health and Human Services, 2009). The design and execution of this study considered the vulnerability of the adolescent population involved at all times. The first step in protecting the participants was to obtain Walden IRB approval prior to collection of data. Walden University's approval number for this study is 02-05-16-0432867. The recruitment of participants occurred under teacher supervision, and no personal contact was initiated with participants after data collection began.

Informed Consent

Care was taken to inform subjects and their guardians about any potential risks involved. Per APA guidelines, informed assent was required from participants and informed consent required from a parent or guardian. The informed assent and consent documents included: (a) the purpose and duration of the research, (b) the right to decline to participate or withdraw at any time, (c) potential risks, including emotional discomfort associated with thinking about anxiety-producing situations (d) potential benefits of the research, (e) confidentiality arrangements, (f) incentives for participation, and (g) who to contact with questions or concerns (APA, 2010). It is important to note that little or no physical or psychological harm was anticipated, and the research will potentially benefit adolescents. As such, the risks to the participants from this study were considered minimal and appropriate for adolescent subjects (Belmont Report, 1979; DHHS 2009).

Recruitment

The recruitment process was designed keeping in mind the vulnerable status of adolescents (DHHS, 2009). Care was taken to avoid coercion in recruitment. The presentation did not include undue persuasion or pressure to volunteer. Students were informed that participation was not required and did not affect class grading. A $7 incentive was offered to subjects for completing the personality surveys and a minimum of two panel surveys. This incentive was used to encourage recruitment, motivate subjects to complete the panel surveys, and compensate the subjects for their involvement. This amount was not excessive or inappropriate per APA (2010) guidelines.

Treatment of Data

Data collected anonymously using SurveyMonkey and SurveySignal. The contact information used to collect data through these services was destroyed as soon as the data collection process was complete. A code was used to replace each participant's name. The demographic information and survey data collected was stored separately from the participant's names. As such, participation in the study was fully anonymous. Anonymity was important because the collected data included student's social skills and level of social anxiety. This data, if made public, could have harmed the subject's social status among peers.

The collected data were stored on my personal laptop computer, which is limited to my personal use only and is password protected. I am the only one with access to the

data. The data will be disseminated at the completion of the study without participant names. Data will be kept in a password protected file for five years and then destroyed.

Additional Ethical Considerations

One potential ethical concern in this study was the relationship between myself and the curriculum director of the School District, Mr. Parker. Mr. Parker is my brother, and as such, it is important to address any potential ethical conflicts. The concern was the possibility that Mr. Parker could have unduly influenced or coerced participation by teachers. Although Mr. Parker is an administrator in the district, as the curriculum director he does not supervise, evaluate, or have authority over teachers. Mr. Parker's role is limited in the district to developing curriculum and designing programs to assist in teacher training. It is also important to note that Mr. Parker is not directly responsible for the development of the health curriculum in the school district, the classes in where recruitment will take place. As such, his role in the district did not constitute a potential ethical conflict for purposes of this study.

Summary

Chapter 3 described how the relationship between computer-mediated communication and social anxiety was explored with a quantitative, quasi-experimental study using a multiwave panel design. The rationale for including face-to-face communication, introversion, and social skills as additional predictive variables was discussed. The use of a non-probability sampling strategy was presented, and the steps used to determine a sample size of 80 participants were explained. The recruitment procedures used were also detailed.

Next, the operationalization of CMC, FTF, social anxiety, introversion, and social skills in the study was discussed. Data collection strategies were outlined, including the collection methods that were used, the instruments that were chosen to measure each variable, and how each variable was defined. The rationale behind the choice of instruments to measure these variables was given, as well each variable's level of measurement and how it was incorporated in the study. Included in this discussion was the composition and validity of the SCARED, modified version of the BNFE, TISS, and BFPTSQ. Following this, a detailed data analysis plan was presented, which included the use of multiple regression and how model fit would be reported. Finally, external and internal threats to validity were described, and the ethical procedures used to protect the adolescent subjects were detailed.

Chapter 4 includes details and results associated with these procedures. Demographic characteristics of the sample are given, and the results of pre-analysis data screening are detailed. The statistical assumptions relevant to this study are addressed. Finally, detailed results from the regression models are presented.

Chapter 4: Results

Introduction

The purpose of this study was to address contradictory research findings on the implications of computer-mediated communication on adolescent relationships and psychological well-being. This research examined the bivariate relationship between CMC and social anxiety. In addition, it was designed to explore how face-to-face interaction, introversion, and social skills might affect the level of social anxiety in CMC users. The study employed a quantitative, quasi-experimental study design with two phases: Phase 1 consisted of collecting data on participant demographics, as well as introversion/extraversion, social skills, and trait social anxiety. Phase 2 consisted of a multiwave panel design that collected daily experiential data over five days. Data collected in phase 2 included the number of texts per day, time spent each day using social media, time spent each day in face-to-face social interaction with peers, and daily social anxiety.

All surveys were administered to participants online. SurveyMonkey hosted all questionnaires and surveys. SurveySignal was used to communicate to subjects' smartphones and computers using either text or e-mail. The participants were assessed for introversion using the BFPTSQ (Morizot, 2014) and for social skills using the TISS (Inderbitzen & Foster, 1992). A modified version of the BFNE (Kashdan & Steger, 2006) measured daily social anxiety. An analysis was performed using multiple linear regression to identify models with the best fit for predicting daily social anxiety.

The study addressed the following research questions and hypotheses:

Research Question 1

What is the strength and nature of the relationship between the amount of computer-mediated communication and social anxiety in adolescents?

$H_0$1: The amount of computer-mediated communication will not significantly predict the level of social anxiety in adolescents.

$H_1$1: The amount of computer-mediated communication will significantly predict the level of social anxiety in adolescents.

Research Question 2

How does the amount of face-to-face communication affect the strength and nature of the relationship between computer-mediated communication and social anxiety in adolescents?

$H_0$2: The amount of face-to-face communication will not significantly predict the relationship between computer-mediated communication and social anxiety in adolescents.

$H_1$2: The amount of face-to-face communication will significantly predict the relationship between computer-mediated communication and social anxiety in adolescents.

Research Question 3

How do introversion and social skills effect the strength and nature of the relationship between computer-mediated communication and social anxiety in adolescents?

$H_0$3 Introversion and social skills will not significantly predict the relationship between computer-mediated communication and social anxiety in adolescents.

$H_1$3 Introversion and social skills will significantly predict the strength and nature of the relationship between computer-mediated communication and social anxiety in adolescents.

The remainder of Chapter 4 includes a description of the data collection process, with details of the timeline of recruitment and both phases of data collection. Descriptive and demographic characteristics of the sample are presented, and the sample's external validity are explored. A section that addresses pre-analysis data screening and cleaning begins by detailing the treatment of missing data. This section then examines the relevant statistical assumptions associated with this study, including issues of normality, linearity, homoscedasticity, and multicollinearity. This pre-analysis section concludes with details of how the data was converted into variables and charts containing descriptive statistics for the predictive and criterion variables. Finally, a results section describes the outcomes for each of the regression models, and includes an analysis of the impact of individual predictive variables on the results. The results section concludes with a post hoc analysis of these statistical tests, focusing on which predictive variables produce the best model fit.

Data Collection

Time Frame, Recruitment, and Response Rates

Data collection occurred over three weeks in March of 2016. The first week consisted of recruitment. Recruitment was done in health classes, with one day at the

middle school and one day at the high school. In these classes, I first taught a lesson on principles of research in the social sciences, focusing on the role researchers can play in understanding human behavior. The middle school lesson (Appendix J) lasted 7 minutes. The lesson was extended to 25 minutes in high school classes at the school's request (Appendix K). These lessons were integral to the health curriculum at both schools. I followed up each lesson with a 15 to 20-minute recruitment presentation. Students were sent home with a packet containing assent and consent forms and were required to be return by the end of that school week. Approximately 425 middle school and 125 high school students received these classroom presentations. Eighty-six middle school and 37 high school students returned the requisite assent and consent forms by the Friday deadline of 3:30 p.m.

Registration for online data collection occurred that Friday evening. Participants were sent a text or e-mail from SurveySignal to verify their participation. For a participant to successfully register, they needed to respond to select an embedded link within 24 hours. Fifty middle school students and 30 high school students completed the registration process. These 80 participants subsequently received surveys the following week.

To be included in the statistical analysis, subjects needed to fulfill two requirements: (a) complete Phase 1 personality surveys, and (b) complete at least two daily surveys, which included their daily levels of CMC, FTF, and social anxiety. RQ3 necessitated the first requirement, which addressed the impact of introversion and social skills on social anxiety in the context of CMC use. The second requirement was

necessary to explore the effect of changes in daily levels of CMC and FTF on daily social anxiety. This effect was addressed in RQ1 and RQ2. A total of 58 participants fulfilled these two requirements: 34 middle school students and 24 high school students.

It is noteworthy that the attrition rate for middle school participants was much greater than that for high school participants. One possible explanation for this could be differences in how subjects received and completed surveys. In both the high school and middle school groups, the attrition rate for subjects using smartphones and texts was approximately 15%, while those using e-mail was close to 50%. Though speculative, these rates suggest the higher dropout rate for middle school subjects may be related to their greater utilization of e-mail than high school students.

Following registration, surveys were distributed over a 7-day period using SurveySignal and SurveyMonkey. Phase 1 surveys, which focused on participant personality traits, were administered over the first two days. These surveys consisted of the BFPTSQ and TISS. Participants received these surveys Saturday morning and were given until Sunday at midnight for completion. Phase 2 data collection took place over the next five days. Daily surveys were sent to collect data on texting, social media use, face-to-face interaction, and social anxiety. These surveys were received each evening at 6:30, with a deadline of midnight for completion. This deadline was established to ensure participants were as familiar as possible with their behaviors and experiences of the day.

Discrepancies Between Data Collection Plan and Implementation

There were few discrepancies between the original data collection plan and its ultimate implementation. First, as noted, the length of the high school presentations was extended. Two days before recruitment, I visited the high school to check in with the health department head. She informed me that teachers had set aside the entire class period for my presentations and stated that it was expected I would use that time. This expectation necessitated that I expand my lesson on psychology research to 25 minutes for the high school classes. Also, there was a limitation of 52 characters per message imposed by SurveySignal. This limitation necessitated that the initial text messages and e-mails containing instructions to participants be sent directly to participants, not through SurveySignal as originally designed.

Finally, there was a technical issue between SurveyMonkey and SurveySignal that resulted in Day 2 and Day 3's data being excluded. On Day 2, most participants were unable to complete their surveys, receiving a message they had already completed the survey. I received only 18 surveys on Day 2 compared to an average of 49. I became aware of this issue on Day 3 after being contacted by a participant. Prior to the study, I believed it was possible to limit survey responses to one per day but subsequently found this limit did not work as expected. The only solution was to remove a parameter in SurveyMonkey that limited survey completion to one per day for each participant. On Day 3 I sent a message to participants informing them the issue had been resolved, and they could complete their surveys. Subsequently, I received 86 surveys on Day 3, more than the number of participants registered for the study. A review of the data revealed 21

participants had completed two surveys on Day 3. Based on messages from several subjects, I concluded many participants filled out two surveys to "make up" for missing the survey on Day 2. As a result, I decided the inclusion of the results from Day 2 and Day 3 would compromise the data. Day 2's data were excluded due to its small sample size (n=18). Day 3's data were excluded due to uncertainty about which day the responses represented. Because many participants filled out two surveys on Day 3, I could not conclusively determine which surveys represented experiences from this day. I concluded that excluding data from all 21 respondents who filled out multiple surveys would compromise the data as well. The issue of daily survey collection is central to the validity of the data. The multiwave panel design was specifically chosen so data could be collected at the end of each day, which would increase the accuracy of daily experiential data (Pea et al., 2010). As such, I concluded that Day 2 and Day 3's data should be excluded from my statistical analysis. This development did not change my inclusion criteria for participants, though it did require that participants provide a minimum of two of the three days of daily data to be included in the statistical analysis.

Sample Characteristics

Table 3 shows the demographic statistics provided by the respondents during data collection. Demographic questions were limited to information deemed pertinent by past researchers to the relationship between CMC and social anxiety, as discussed in Chapter 3. Table 3 shows the study sample consisted primarily of participants ages 13 to 14, with 51.7% falling within this range. In addition, the majority of the sample (58.6%) attended middle school. As for gender distribution, 63.8% of the participants were female.

Table 3

*Sample Demographic Characteristics (*n = *58)*

Characteristic	Frequency (*n*)	%
Gender		
Male	21	36.2
Female	37	63.8
Age		
11-12	10	17.2
13-14	30	51.7
15-16	15	25.9
17-18	2	3.5
Unknown	1	1.7
School Enrollment		
Middle School	34	58.6
High School	24	41.4

External Validity of the Sample

The external validity of the sample was addressed through a comparison of the demographics of the populations of the general population of schools in Washington State and the population of the two school sites where recruitment took place. The details of this comparison can be found in Chapter 3. As noted in Chapter 3, the populations of the high school and middle school were roughly comparable to the district. A comparison of the demographics of the district and the population of Washington State was also undertaken. This comparison revealed that the district was marginally representative of the student population of Washington State. District schools had a lower percentage of Hispanic students and a higher population of American Indians. The district's students were significantly higher in SES and were more academically successful than the general student population in Washington State.

External validity was also addressed through the choice of classes where recruitment took place. At the high school, recruitment was done in health classes. Health classes at the high school are a required course, as such the population within these classes were likely to be a representative sample of the population of the school. At the middle school, recruitment was also carried out in health classes, but at this school health classes were combined with physical education classes. Because physical education was required for all students, the entire population of the middle school was included in recruitment for this study.

It is important to note that due to the challenge of recruiting minors in numbers large enough to obtain the necessary sample size, convenience sampling was employed for this study. Convenience sampling limits the external validity of research, and as such, it would be inappropriate to extend the results of this research outside the study's sampling frame.

Pre-Analysis Data Treatment

Missing Data and Outliers

Prior to statistical analysis using SPSS? version 23, the data were screened for missing data and outliers. As noted previously, a total of 80 students registered their smartphone or computer with SurveySignal to participate in the study. It was determined before data collection that participants would need to complete the initial personality surveys and at least two of the five daily surveys to be included in statistical analysis. Of the 80 registrants, 22 failed to complete the TISS and BFPTSQ questionnaires and at least two daily surveys. Data from these 22 subjects were omitted from analysis. In

addition to missing surveys, missing data for individual items were also screened. One missing response was identified in the TISS. It is appropriate to replace missing items with a mean score (Schafer & Graham, 2002). Therefore, I replaced the missing item with the participant's mean response for that survey.

Data from the TISS, BFPTSQ, and the BFNE, as well as daily responses for social media use, texting, and face-to-face social interaction were screened for univariate outliers. Boxplots were used to flag potential outliers and to identify which cases contained the outlier. Potential outliers were noted within the day 4 and day 5 data for face-to-face interaction and social anxiety (Figures 2, 3, 4, and 5). Several potential techniques can be used to statistically confirm outliers. These include converting the values to z-scores (Cousineau & Chartier, 2015) or using the outlier labeling rule originally proposed by Tukey (1977). I chose to convert the flagged data points to z-scores. Subsequent analysis found that all outliers fell within the absolute value of 3.29, a typical benchmark for identifying outliers (Cousineau & Chartier, 2015). As such, it was decided the data would retain all potential outliers.

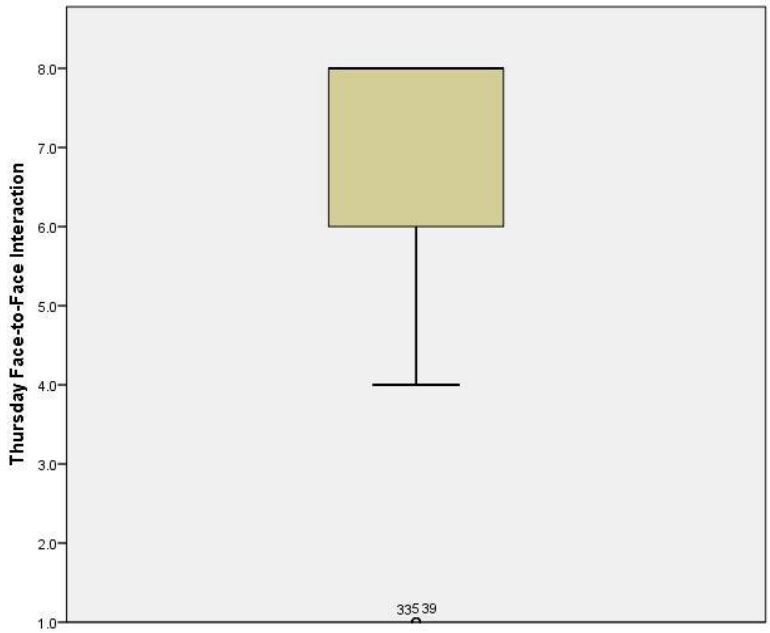

Figure 2. Boxplot of Thursday face-to-face interaction

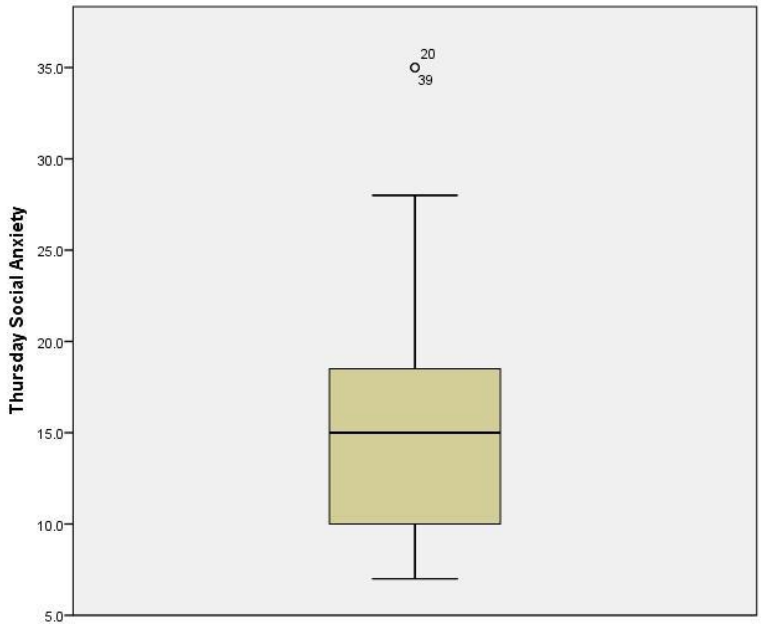

Figure 3. Boxplot of Thursday daily social anxiety.

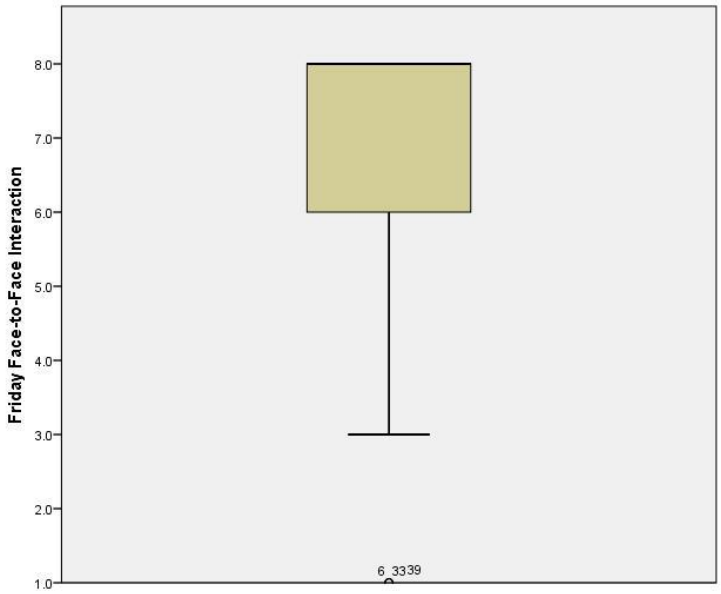

Figure 4. Boxplot of Friday face-to-face interaction.

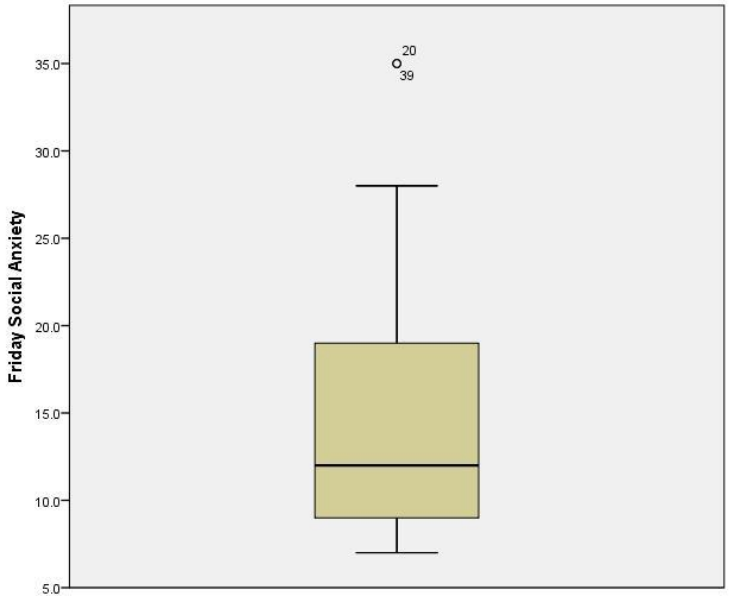

Figure 5. Boxplot of Friday daily social anxiety.

Assumption Testing

Assumption of linearity. One of the underlying assumptions of multiple linear regression is the assumption of linearity. The assumption of linearity refers to the shape of the relationship between the predictor and criterion variables, and it requires that the plane of the mathematical relationship between the variables to be linear (Cohen, Cohen, West & Aiken, 2003). The assumption of linearity is central to multiple regression and must be met to produce reliable significance tests and confidence intervals (Cohen et al., 2003). I chose to test for linearity visually by creating bivariate scatterplots with linear fit lines. Bivariate scatterplots will have an oval shape if the relationship between predictor and criterion variables are linear and will lack this oval shape if the assumption of linearity is violated. Bivariate scatterplots for the relationship between extraversion, social skills, face-to-face interaction, computer-mediated communication, and social anxiety all exhibited an oval shape. Linear fit lines were inserted into the scatterplots that also confirmed the assumption of linearity was met.

Assumption of normality. Another underlying assumption in multiple linear regression is normality. Multiple regression assumes that the residuals around the regression line have a normal distribution (Cohen et al., 2003). Violation of the normality assumption does not necessarily have a negative impact on the coefficients regression. The impact of violating the normality assumption depends on sample size, with smaller samples being more sensitive to the normality of the data (Cohen et al., 2003). I tested normality by first producing frequency histograms for each variable. Visual inspection of the histograms displayed the presence of noticeable skewness and

kurtosis in day 1, 4, and 5's face-to-face interaction data. In addition, the histograms revealed the possibility of slight positive skew in Thursday's and Friday's social anxiety data. These results were further explored by producing skewness and kurtosis statistics, which can be found in Table 4. These statistics revealed a marked negative skew and positive kurtosis in the face-to-face interaction data from Day 4 and Day 5. As previously noted, the impact of violating the assumption of normality depends on the size of the sample size. The central limit theorem posits that if a sample size is large we can assume the data is normal no matter the shape of the data (Cohen et al., 2003). Given a sample of over 40 for each regression in this study, I concluded that the skewness and kurtosis found in the face-to-face interaction data would not negatively impact the regression coefficients in this study.

Assumption of multicollinearity. Another assumption in multiple linear regression is that any two predictor variables will not be highly correlated (Cohen et al., 2003). This requirement is referred to as the assumption of multicollinearity. It is important that two given predictor variables do not have a shared central trait that is responsible for their statistical relationship to the criterion variable (Cohen et al., 2003). I tested for multicollinearity by producing variance inflation factors (VIF) and tolerance coefficients for the predictor variables. These statistics can be found in Table 4. VIF statistics for my data ranged from 1.08 to 1.36, with values over ten typically indicating issues of collinearity. Tolerance values for the predictor variables ranged from .94 to .74, with values below .2 typically viewed as problematic. These results indicate that the assumption of multicollinearity has not been violated for the data.

Independence of errors. An additional assumption in multiple linear regression is that the residuals of the observations should be independent from one another. In other words, the size of one residual does not impact the size of another. A violation of this assumption does not impact the regression coefficients, but it does impact the standard errors (Cohen et al., 2003). It is important to note that the assumption of independence of errors is usually met when using a random sample from a population. In panel designs, though, it is more likely for independence of errors to be violated (Cohen et al., 2003). There are two standard methods for checking for a violation of this assumption: The Durbin-Watson test and through a scatterplot of residuals. I first produced Durbin-Watson statistics for each of my three regression models, which produced results ranging from 1.96 to 2.08. A common benchmark for this test is that values less than 1 or greater than 3 are cause for concern. I produced scatterplots of the standardized residuals and the standardized predicted residuals. These scatterplots each produced a generally rectangular shape with absolute values less than 3, both indications that the residuals were independent of one another.

Assumption of homoscedasticity. A final assumption in multiple linear regression is the assumption of homoscedasticity. This assumption states that at each level of the predictor variables the variance of the residuals should be constant (Cohen et al., 2003), or be homoscedastic. I tested for homoscedasticity by creating a scatterplot with a fit line of the relationship between the standardized residuals and the criterion variable for each of my models. Visual inspection of these scatterplots revealed a

consistent distance between the fit line and the residuals, indicating the assumption of homoscedasticity had been met.

Table 4

Normality and Multicollinearity Statistics for Variables

Variable	Skewness	Kurtosis	Tolerance	VIF
Social Skills	-0.08	-0.57	0.93	1.07
Extraversion	-0.07	-0.83	0.90	1.11
Monday FTF	-0.75	-1.20	0.88	1.14
Thursday FTF	-1.79	1.95	0.74	1.36
Friday FTF	-1.60	1.62	0.84	1.19
Monday CMC	0.50	-1.02	0.92	1.09
Thursday CMC	0.51	-1.00	0.86	1.16
Friday CMC	0.11	-1.22	0.92	1.09
Monday Social Anxiety	0.14	-0.92		
Thursday Social Anxiety	1.07	0.92		
Friday Social Anxiety	1.12	0.84		

Reliability of Scales and Conversion of Data

To confirm the reliability of the scales used in this study as reported in Chapter 3, I used the data collected and obtained Cronbach's alpha scores for the TISS, BFPTSQ, and BFNE. The conventional rule for estimating a scale's reliability is a Cronbach's alpha score of .70 or above (Cronbach, 1951). Using the collected data, the TISS (α = .78) and the BFNE (α = .81) produced scores that would reflect acceptable reliability. The score for BFPTSQ (α = .69) fell just below the .70 convention. Given the reliability of α = .91 reported by the BFPTSQ authors discussed in Chapter 3, I consider the reliability of this scale to be acceptable. Calculating Cronbach's alpha requires at least two items, and the texting and social media questionnaires consisted of a single question each. As a result, reliability statistics were not obtained for these questionnaires.

Table 5

Descriptive and Reliability Statistics for TISS, BFPTSQ, and BFNE

Measure	Min	Max	*M*	*SD*	*α*
TISS	33.00	71.00	50.41	8.79	0.78
BFPTSQ	18.00	45.00	31.69	31.69	0.69
BFNE	7.00	30.00	16.78	5.92	0.81

Answers for each question from the TISS, BFPTSQ, and BFNE were transferred from SurveyMonkey to an Excel spreadsheet. Using procedures outlined by the authors of the constructs (Inderbitzen & Foster, 1992; Kashdan & Steger, 2006; Morizot, 2014), the individual responses for each scale were summed to create a participant's total score for that scale. The scores were calculated using automatic formulas in Excel to minimize errors. It was necessary to design the formulas to reverse score ten items on the TISS and three items on the BFPTSQ. Responses from the daily surveys of texting, social media use, face-to-face interaction, and daily social anxiety were also transferred to Excel. The scores were then totaled using automatic formulas. All data were subsequently imported into SPSS and converted into an SPSS data file using the import function in SPSS.

A single variable, referred to as *computer-mediated communication*, was generated by transforming the data from daily texting and social media use. This variable was created in SPSS by first converting the daily texting and social media data into z-scores. Each day's z-scores for texting and social media were then added together, resulting in a single variable that represented a participant's daily texting and social media use. The creation of a single CMC variable was done for two reasons: First,

combining texting and social media use allowed for the exploration of the study's research questions. The research questions address the overall impact of computer-mediated communication on social anxiety, not the individual impact of texting or social media. Although isolating them during analysis could be interesting, the research questions focus on CMC as a whole. Second, changes in the nature of texting and social media use have resulted in a blurring of the lines between an operational definition of social media and texting. Most platforms commonly referred to as social media consist of a combination of text-like short messages accompanied by pictures or video clips. At the same time, the current process of text messaging includes pictures, audio clips, or video along with text. As such, not only did creating a CMC variable address the research questions, but treating texting and social media as separate variables would have required arbitrary categorization of these behaviors.

Descriptive Statistics for Predictive and Criterion Variables

Descriptive statistics for variables in this study can be found in Table 6. There are two observations from these statistics worth noting. First, the sample size for FTF, CMC, and social anxiety varies each day (n = 43, 46, 49) based on how many participants filled out the day's survey. Second, FTF had a potential range of 1 to 8, with the mean ranging from 5,74 to 6.67. This result is indicative of the previously discussed issue of non-normal distribution of this data.

Table 6

Descriptive Statistics for Predictive and Criterion Variables

Variable	*n*	Min	Max	M	SD
Social Skills	58	33	71	50.41	8.79
Introversion	58	18	45	31.69	6.49
Monday FTF	49	1	8	5.74	2.86
Thursday FTF	43	1	8	6.65	2.3
Friday FTF	46	1	8	6.67	2.1
Monday CMC	49	-2.23	3.43	0.00	1.81
Thursday CMC	43	-2.04	3.53	0.00	1.77
Friday CMC	46	-2.50	2.80	0.00	1.74
Monday Social Anxiety	49	7	30	16.78	5.92
Thursday Social Anxiety	43	7	35	15.51	7.11
Friday Social Anxiety	46	7	35	15.02	7.23

Results

Overview

One purpose of this study was to explore the predictive relationship between computer-mediated communication and adolescent social anxiety. The second purpose of the study was to examine the impact of face-to-face interaction, social skills, and extraversion on social anxiety in CMC users. SPSS 23.0 was employed to create predictive models using the hierarchical method of multiple linear regression, with the goal of finding the best model fit. Because the study was designed to measure and correlate daily social anxiety with daily amounts of CMC and FTF, it was necessary to create separate regression models from each day's data to analyze these correlations.

Hierarchical regression was selected to best address RQ2 and RQ3. RQ1 is relatively straightforward, requiring a simple bivariate correlation between CMC and

social anxiety. RQ2 and RQ3 include the addition of FTF, introversion, and social skills as predictors in addition to CMC. The hierarchical method in SPSS allows for the creation of an initial model of CMC's relationship with anxiety and subsequently, the addition of the variables from RQ2 and RQ3. This method can also provide change statistics, which are useful in determining the statistical significance of the impact of these additional variables on model fit.

RQ2 and RQ3 were posed to determine if FTF, social skills, and introversion improved our ability to predict social anxiety in CMC users. As discussed in Chapter 1, they were also intended to determine if the failure to control for these variables helped to explain contradictory findings in past research. Unfortunately, the wording of RQ2 and RQ3 can be interpreted to suggest their purpose was to explore the variables' role as a potential moderator of CMC's relationship to social anxiety. It is therefore useful to reword RQ2 and RQ3 as follows:

RQ2: What is the effect of face-to-face communication on social anxiety in adolescent users of CMC?

RQ3: What is the effect of introversion and social skills on social anxiety in adolescent users of CMC?

The remainder of Chapter 4 and Chapter 5 uses this revised wording of RQ2 and RQ3. The analysis, discussions, and conclusions that follow reflect this understanding of these research questions and focus on model fit and its implications. Nevertheless, it is worth noting a moderation analysis are reported and discussed. This analysis was done to

fully explore the relationships among introversion, social skills, and face-to-face communication.

Research Question 1

What is the strength and nature of the relationship between the amount of computer-mediated communication and social anxiety in adolescents?

$H_0$1: The amount of computer-mediated communication will not significantly predict the level of social anxiety in adolescents.

$H_1$1: The amount of computer-mediated communication will significantly predict the level of social anxiety in adolescents.

To explore the strength and nature of the relationship between CMC and social anxiety, regression models were created using the hierarchical method. Three models were created, one each using the data from Day 1, 4, and 5. CMC was the lone predictive variable in each model.

RQ1 day 1 results. The step 1 model using data from Day 1 (n = 49) accounted for 7% of the variation in social anxiety (adj. R^2 = .07). The effect size was calculated using Cohen's f^2 method, the most widely accepted method of calculating effect size in multiple regression (Selya, Rose, Dierker, Hedeker, & Mermelstein, 2012). The f^2 value for this model was .08, indicating a small effect size (Cohen, 1992). The nature of the relationship between CMC and social anxiety was positive, meaning as CMC increased social anxiety also increased. This model significantly improved our ability to predict social anxiety, R^2 = .09, $F(1, 46) = 4.37$, p = .04. Table 7 shows the coefficients of the

Step 1 Day 1 model. The results suggest CMC was a significant predictor of social anxiety on day 1.

Table 7

Day 1 Model 1: CMC as a Predictor of Social Anxiety

Source	*b*	*SE B*	*β*	*p*
Constant	16.78	0.83		0.00
Mon CMC	0.97	0.46	.29	0.04

Note. Adj. R^2 = .07

RQ1 day 4 results. A model was created to explore RQ 1 using data from Day 4 (n = 43). Step 1 of this model accounted for only 2% of the variation in social anxiety for this day (adj. R^2 = .02). The f^2 value for this model was .02, indicating a small effect size. The results of the proposed model for Day 4 were non-significant R^2 = .02, $F(1, 38)$ = 1.91, p = .17. The nature of the relationship between CMC and anxiety was positive. The coefficients for this model can be found in Table 8. These results of the model suggest on Day 4 the amount of CMC was a limited predictor of social anxiety levels, but this relationship failed to reach statistical significance.

Table 8

Day 4 Model 1: CMC as a Predictor of Social Anxiety

Source	*b*	*SE B*	*β*	*p*
Constant	14.49	0.91		0.00
Thurs CMC	0.73	0.53	.22	0.17

Note. Adj. R^2 = .02

RQ1 day 5 results. A model was also created to explore RQ1 using data from day 5 (n = 46). Step 1 of this model accounted for only 5% of the variation in social anxiety (adj. R^2 = .05). The f^2 value was .08, indicating a small effect size. The results of the model for Day 5 were non-significant, R^2 = .07, $F(1, 41) = 3.25$, p = .08. Though the results approached significance, the model failed to predict social anxiety at the .05 level. The nature of the relationship between CMC and anxiety was positive. The coefficients from this model can be found in Table 9. These results of the model from Day 5 suggest CMC as a limited predictor of social anxiety, but the relationship failed to reach statistical significance at the .05 level.

Table 9

Day 5 Model 1: CMC as a Predictor of Social Anxiety

Source	*b*	*SE B*	*β*	*p*
Constant	14.11	0.89		0.00
Fri CMC	0.95	0.53	.27	0.08

Note. Adj. R^2 = .05

Research Question 2

What is the effect of face-to-face communication on social anxiety in adolescent users of CMC?

$H_0$2: The amount of face-to-face communication will not significantly affect the prediction social anxiety in adolescent users of CMC.

$H_1$2: The amount of face-to-face communication will significantly affect the prediction social anxiety in adolescent users of CMC.

To explore how FTF affects the level of social anxiety in the context of CMC, I created a two-step hierarchical regression model. Step 1 used CMC as the lone predictor, while Step 2 added daily FTF along with CMC. The research pointing to face-to-face interaction as potential contributors in the outcomes associated with CMC is preliminary at best (Erwin, Turk, Heimberg, Fresco, & Hantula, 2004; Pierce, 2009). As such, FTF was added after CMC. Separate hierarchical regressions were performed to explore RQ2 and RQ3. Introversion, and social skills were not added to FTF as predictors to create a single 3-step hierarchical regression to isolate the impact of FTF from introversion, and social skills.

RQ2 Day 1 results. Step 2 of the model from Day 1 accounted for 5% of the variation in social anxiety (adj. $R^2 = .05$). The f^2 value was .10, indicating a small effect size. The nature of the relationship between FTF and social anxiety was positive in this model, meaning that as FTF increased social anxiety also increased. The results were non-significant, $R^2 = .09$, $F(2, 45) = 2.25$, $p = .12$. The coefficients for this model can be found in Table 10.

Table 10

Day 1 Model 2: CMC and FTF as a Predictors of Social Anxiety

Source	*b*	*SE B*	*β*	*p*
Constant	15.96	2.02		0.00
Mon CMC	0.91	0.49	.28	0.07
Mon FTF	0.14	0.32	.07	0.66

Note. Adj. $R^2 = .05$

To better gauge the impact of FTF on social anxiety in the context of CMC, I produced statistics in SPSS that measure the change between the Step 1 and Step 2 models after adding FTF as a predictor. The model summary change statistics for Step 2 were non-significant, R^2 change = .00, $F(1, 45) = .20$, $p = .12$. These results suggest that on Day 1, the amount of FTF had little or no relationship to the level of social anxiety in the context of CMC use and did not improve the model fit.

RQ2 Day 4 results. An additional model was created to explore RQ2 using data from Day 4. The model using data from Day 4 accounted for 10 % of the variation in social anxiety (adj. $R^2 = .10$). The f^2 value for this model was .18, indicating a medium effect size. The proposed model significantly improved our ability to predict social anxiety, $R^2 = .15$, $F(2, 37) = 3.15$, $p = .05$. These coefficients for these results can be found in Table 11.

Table 11

Day 4 Model 2: CMC and FTF as a Predictors of Social Anxiety

Source	*b*	*SE B*	*β*	*p*
Constant	20.39	2.10		0.00
Tue CMC	1.09	0.54	.33	0.05
Tue FTF	-0.88	0.43	-.33	0.05

Note. Adj. $R^2 = .10$

Unlike Day 1, the model summary change statistics for Step 2 from Day 4 were significant, R^2 change = .10, $F(1, 37) = 4.23$, $p = .05$. The relationship between FTF and social anxiety was negative in this model, meaning that as FTF decreased social anxiety

increased. These results suggest that on Day 4, lower FTF was significantly related to higher levels of social anxiety in the context of CMC use and significantly improved the model fit.

RQ2 Day 5 results. A model was also created to explore RQ2 using data from Day 5. Step 2 of the model using Day 5 data accounted for 17 % of the variation in social anxiety (adj. $R^2 = .17$). The f^2 value for this model was .27, indicating a medium effect size. The proposed model significantly improved our ability to predict social anxiety, $R^2 = .21$, $F(2, 40) = 5.19$, $p = .01$. The coefficients for this model can be found in Table 12.

Table 12

Day 5 Model 2: CMC and FTF as a Predictors of Social Anxiety

Source	*b*	*SE B*	*β*	*p*
Constant	22.81	3.47		0.00
Thurs CMC	1.27	0.51	.36	0.02
Thurs FTF	-1.27	0.49	-.37	0.01

Note. Adj. $R^2 = .17$

The model summary change statistics for Step 2 of the model from Day 5 were also significant, R^2 change = .13, $F(1, 40) = 6.69$, $p = .01$. The relationship between FTF and social anxiety was negative in this model. These results suggest that on Day 5, lower FTF was significantly related higher levels of social anxiety in the context of CMC use and significantly improved the model fit.

Research Question 3

What is the effect of introversion and social skills on social anxiety in adolescent users of CMC?

$H_0$3 Introversion and social skills will not significantly affect the prediction of social anxiety in adolescent users of CMC.

$H_1$3 Introversion and social skills will significantly affect the prediction of social anxiety in adolescent users of CMC.

To measure the impact of introversion and social skills on the level of social anxiety in the context of CMC use, I created a two-step hierarchical regression model. Step 1 included CMC as the lone predictor of social anxiety, with step 2 adding participant introversion and social skills as predictors.

RQ3 Day 1 results. Step 2 of the model using data from Day 1 accounted for 51% of the variation in social anxiety (adj. $R^2 = .51$). The f^2 value for this model was 1.04, indicating a large effect size. The nature of the relationship of social skills to social anxiety was negative, meaning as social skills decreased social anxiety increased. The nature of the relationship of introversion to social anxiety was positive for all models, meaning that as introversion and social skills increased social anxiety increased as well. (Note: The BFPTSQ treats introversion and extraversion as dichotomous constructs and measures them on a continuum. As such, higher scores on the BFPTSQ reflect lower levels of introversion.) The results were significant, $R^2 = .55$, $F(3, 44) = 17.63$, $p < .01$. The coefficients for this model can be found in Table 13.

Table 13

Day 1 Model 2: CMC, Introversion, and Social Skills as Predictors of Social Anxiety

Source	*b*	*SE B*	*β*	*p*
Constant	30.79	5.68		0.00
Mon CMC	1.06	0.33	.32	0.03
Introversion	-0.59	0.09	-.64	0.00
Social Skills	-0.09	0.08	-.12	0.25

Note. Adj. $R^2 = .55$

To assess the impact of introversion and social skills on social anxiety in the context of CMC use, model summary change statistics were created in SPSS to measure the change between the models created in Step 1 and Step 2 of the regression. The model summary change statistics were significant, R^2 change = .46, $F(2, 44) = 22.24$, $p < .01$. These results suggest that on Day 1, higher introversion and lower social skills were significantly related to higher levels of social anxiety in the context of CMC use and significantly improved the model fit.

RQ3 Day 4 results. A second model was created to explore RQ3 using data from Day 4. The model using data from Day 4 accounted for 30 % of the variation in social anxiety (adj. $R^2 = .30$). The f^2 value for this model was .54, indicating a large effect size. The proposed model significantly improved our ability to predict social anxiety, $R^2 = .35$, $F(3, 36) = 6.53$, $p < .01$. The coefficients for this model can be found in Table 14.

Table 14

Day 4 Model 2: CMC, Extraversion, and Social Skills as Predictors of Social Anxiety

Source	*b*	*SE B*	*β*	*p*
Constant	26.47	6.91		0.00
Thurs CMC	0.98	0.45	.29	0.04
Introversion	-0.46	0.12	-.52	0.01
Social Skills	-0.05	0.09	-.09	0.55

Note. Adj. R^2 = .29

The model summary change statistics for Step 2 of the model from the Day 4 data were also significant, R^2 change = .30, $F(2, 36) = 8.47$, $p < .01$. These results suggest that on Day 4, higher introversion and lower social skills were significantly related to higher levels of social anxiety in the context of CMC use and significantly improved the model fit.

RQ3 Day 5 results. An additional model was created to explore RQ3 using data from Day 5. The model using data from Day 5 accounted for 37 % of the variation in social anxiety (adj. R^2 = .37). The f^2 value for this model was .69, indicating a large effect size. The proposed model significantly improved our ability to predict social anxiety, R^2 = .41, $F(3, 39) = 9.12$, $p < .01$. The coefficients for this model can be found in Table 15.

Table 15

Day 5 Model 2: CMC, Extraversion, and Social Skills as Predictors of Social Anxiety

Source	*b*	*SE B*	*β*	*p*
Constant	33.58	6.46		0.00
Fri CMC	1.00	0.43	.28	0.03
Introversion	-0.55	0.12	-.59	0.00
Social Skills	-0.03	0.09	-.05	0.68

Note. Adj. R^2 = .39

The model summary change statistics for Step 2 of the model taken from Day 5 data were also significant, R^2 change = .34, $F(2, 39) = 11.25$, $p < .01$. These results suggest that on Day 5, higher introversion and lower social skills were significantly related to higher levels of social anxiety in the context of CMC use and significantly improved the model fit.

Moderation Analysis

The possibility that FTF, introversion, and social skills could have a moderating effect on CMC's relationship to social anxiety was explored using a moderation analysis. A moderation analysis consists of performing a linear regression with three predictor variables: one is the original predictor, the second is the potential moderator, and the third variable is generated by combining the first two (Cohen et al., 2003). The variables are combined by centering the first two predictor variables then multiplying them together. In SPSS, it is possible to perform a moderation analysis by using the PROCESS tool, an SPSS add-on program created by Andrew Hayes and Kristopher Preacher (Field,

2013). There are two outputs from a PROCESS analysis used to examine a potential moderating role: (a) The significance of the interaction effect, and (b) the conditional effect of the third variable at values above and below the mean (Field, 2013). It was necessary to create three separate PROCESS analyses to explore FTF as a moderator, one for each day of data. Only one analysis was necessary for introversion and social skills, as they reflect personality traits that remained constant for all days of the study.

Interaction effects. The interaction effects produced in the PROCESS moderation analysis failed to consistently reach significance for all variables. The significance of the interaction effects for FTF on Day 5 was significant at the .05 level, $p = .04$. Day 5 was the only day that the interaction effects for FTF approached significance. The results were $p = .96$ on Day 1 and $p = .92$ on Day 4. The interaction effects for introversion and social skills failed to reach significance, $p = .37$ and $p = .59$ respectively.

Conditional effects. As discussed, conditional effects measure the change in significance at varying levels of the potential moderator. The conditional effects of FTF on the relationship between CMC and social anxiety were inconsistent. The analysis of the data from Day 1 and 4 revealed that as FTF levels increased, the significance of the relationship between CMC and social anxiety increased, indicating a potential moderating role for FTF. On the other hand, the opposite was true for the data from Day 5. The coefficients for these analyses can be found in Table 16, 17, and 18.

Table 16

Conditional Effects of FTF Day 1

FTF Day 1	*Effect*	*se*	*t*	*p*
-2.86	0.84	1.58	0.53	0.60
0.00	0.89	0.69	1.28	0.21
2.27	0.93	0.51	1.81	0.08

Table 17

Conditional Effects of FTF Day 4

FTF Day 4	*Effect*	*se*	*t*	*p*
-2.17	1.23	1.76	0.70	0.49
0.00	1.11	0.64	1.73	0.09
1.24	1.04	0.48	2.16	0.04

Table 18

Conditional Effects of FTF Day 5

FTF Day 5	*Effect*	*se*	*t*	*p*
-1.95	2.46	0.73	3.37	0.00
0.00	1.26	0.49	2.58	0.01
1.23	0.51	0.63	0.81	0.42

The conditional effects from the PROCESS analysis of social skills also revealed a potential moderating role. The analysis found when social skills were above the mean, the significance of the relationship between CMC and social anxiety was $p = .59$. Yet when a subject's social skills were below the mean, the significance of the relationship between CMC and anxiety increased to $p = .09$. The coefficients for this variable can be found in Table 19. The conditional effects produced in this analysis suggest lower social skills could play slight moderating role between CMC and social anxiety.

Table 19

Conditional Effects of Social Skills

TISS Score	*Effect*	*se*	*t*	*p*
-7.95	1.32	0.77	1.72	0.09
0.00	0.95	0.45	2.13	0.04
7.95	0.58	0.85	0.69	0.50

In summary, the results of the SPSS moderation analysis showed mixed results. The interaction effects of the analysis were insignificant, suggesting a lack of a moderating role for FTF, introversion, or social skills. The conditional effects of these variables, though, did show some support for moderation.

Summary

The purpose of this study was to explore the relationship between CMC and social anxiety. It also sought to explore the impact of FTF, introversion, and social skills on the level of social anxiety in the context of CMC use. I administered personality

surveys and gathered daily data from a sample of middle school and high school adolescents (n = 58). I used a series of multiple linear regressions to examine the relationship between CMC and social anxiety in adolescents, as well as the impact of face-to-face communication, introversion, and social skills on best model fit. Separate regression models were created using the data collected on Day 1, 4, and 5. Three different regression models were created from each day's data using the hierarchical method to address each of the three research questions. Correlation matrixes for the variables from each day can be found in Tables 20, 21, and 22. A summary of model fit and change statistics for each day can be found in Table 23.

Table 20

Correlation Matrix for Study Variables Day 1

Variable		Day 1 Anxiety	Day 1 CMC	Day 1 FTF	Social Skills	Introversion
Day 1 Anxiety	*R*					
	p					
Day 1 CMC	*R*	.297*				
	p	.038				
Day 1 FTF	*R*	.150	.302*			
	p	.302	.035			
Social Skills	*R*	.291*	.023	-.089		
	p	.044	.874	.546		
Introversion	*R*	-.624**	.073	.257	-.323*	
	p	.000	.619	.074	.015	

Note. Correlations are Pearson's *R*. *$p < .05$, (two-tailed); **$p < .01$ (two-tailed).

Table 21

Correlation Matrix for Study Variables Day 4

Variable		Day 4 Anxiety	Day 4 CMC	Day 4 FTF	Social Skills	Introversion
Day 4 Anxiety	*R*					
	p					
Day 4 CMC	*R*	.028				
	p	.860				
Day 4 FTF	*R*	-.290	.328*			
	p	.059	.032			
Social Skills	*R*	.240	-.204	-.124		
	p	.126	.195	.435		
Introversion	*R*	-.539**	.214	.419**	-.323*	
	p	.000	.167	.005	.015	

Note. Correlations are Pearson's *R*. *$p < .05$, (two-tailed); **$p < .01$ (two-tailed).

Table 22

Correlation Matrix for Study Variables Day 5

		Day 5 Anxiety	Day 5 CMC	Day 5 FTF	Social Skills	Introversion
Day 5 Anxiety	*R*					
	p					
Day 5 CMC	*R*	.073				
	p	.627				
Day 5 FTF	*R*	-.266	.332*			
	p	.074	.024			
Social Skills	*R*	.140	-.089	-.029		
	p	.359	.562	.848		
Introversion	*R*	-.555**	.153	.375*	-.323*	
	p	.000	.311	.010	.015	

Note. Correlations are Pearson's *R*. *p < .05, (two-tailed); **p < .01 (two-tailed).

Table 23

Summary of Regression Model Fit and Change Statistics

						Change Statistics		
Model	R^2	*Adj* R^2	*F*	f^2	*p*	R^2	*F*	Sig. *F*
RQ1								
Model 1 Day 1	0.09	0.07	4.37	0.08	0.04			
Model 1 Day 4	0.05	0.02	1.91	0.02	0.17			
Model 1 Day 5	0.07	0.05	3.25	0.08	0.08			
RQ2								
Model 2 Day 1	0.09	0.05	2.25	0.10	0.12	0.00	0.20	0.66
Model 2 Day 4	0.15	0.10	3.15	0.18	0.05	0.10	4.23	0.05
Model 2 Day 5	0.21	0.17	5.19	0.27	0.01	0.13	6.69	0.01
RQ3								
Model 3 Day 1	0.55	0.51	17.62	1.04	0.00	0.46	22.24	0.00
Model 3 Day 4	0.35	0.30	6.53	0.54	0.00	0.30	8.47	0.00
Model 3 Day 5	0.41	0.37	9.12	0.69	0.00	0.34	11.25	0.00

The results of the regression models varied by data set and research question. Some significant results and trends were observed, though. The regression models created to explore RQ1 (the bivariate relationship between CMC and daily social anxiety) produced small to medium effect sizes. They also found a consistently positive relationship between CMC and social anxiety. The results were significant for one of the three days examined. The results provided some evidence of a modest, inconsistent relationship between CMC and social anxiety.

The results from the models exploring RQ2 (the impact of FTF on the relationship between CMC and social anxiety) were also mixed. But taken as a whole, these models did provide an overall improvement in our ability to predict social anxiety. The regression models with both CMC and FTF as predictors produced larger effect sizes than with CMC alone, significantly improving the model fit on two of three days

analyzed. The change statistics were significant for these two days as well. The results of the moderation analysis on FTF showed significance on Day 5, and the data for potential conditional effects were contradictory. So, while the impact of FTF on the models was not consistent, its addition as a predictor improved the model fit more often than not, providing support for the rejection of the null hypothesis for RQ2.

The results from the regression models exploring RQ3 (the impact of introversion and social skills on the relationship between CMC and social anxiety) were both significant and consistent for all sets of data. Adding introversion and social skills to the model produced medium to large effect sizes, and the results were highly significant. In addition, the change statistics were all highly significant, indicating a substantial improvement in model fit. The interaction effect from the moderation analysis for social skills failed to reach significance, though the conditional effects suggested a potential moderating role. The moderation analysis for introversion was insignificant. Overall, the results showed introversion and social skills accounted for additional unique variance in the models exploring RQ3. These models suggested introversion and social skills were significantly related to the level of social anxiety in the context of CMC use. The results supported the rejection of the null hypothesis for RQ3.

In Chapter 5, I will discuss the implications of these statistical analyses. I will comment on the findings as they relate to each of the research questions. I will provide my interpretations of the results and will discuss the implications of my conclusions. I will also address potential limitations of the results of the study, how they relate to the

body of literature in this area, and discus any implications the results may have on future research and social change.

Chapter 5: Discussion, Conclusions, and Recommendations

Since 2005, adolescent use of computer-mediated communication has nearly doubled, with over 92% of teenagers currently utilizing CMC to relate to their peers (Lenhart, 2015). The adoption of mobile technology is a significant factor in these relationships. The use of smartphones by adolescents has increased from 21% in 2009 to 73% in 2015 (Lenhart, 2015). In short, CMC has now been largely integrated into adolescent peer communication.

Purpose and Nature of the Study

Results of past research into the impact of CMC on psychological well-being have been mixed. Various negative outcomes have been associated with CMC use, including a decline in subjective well-being and depression (Best et al., 2014; Huang, 2010; Rosen et al., 2013). Other researchers have argued that CMC has a positive impact on peer relationships and the well-being of its users (Lloyd, 2014; Valkenburg & Peter, 2009). This study was an attempt to explain these inconsistencies by identifying specific groups that may be more likely to experience negative outcomes with CMC use.

The purpose of this study was to examine the relationship between adolescent peer-related CMC and social anxiety. It also sought to explore the impact of face-to-face communication, introversion, and social skills on social anxiety in the context of CMC use. Several gaps in the body of literature were addressed. First, the current use of CMC was conceptualized and measured. The clear majority of researchers in this area measured CMC as primary social media website use, yet current adolescent CMC consists mostly of instant messaging and texting. The study addressed this issue by

including instant messaging and texting in the research design. Second, few researchers explored how concurrent levels face-to-face communication could impact outcomes associated with CMC use. FTF was included as a predictor in this study and addressed in RQ2. Finally, there was an attempt to explore if personality traits may influence the outcomes associated with CMC use. Past researchers suggest that individuals who are psychosocially distressed may be more likely to experience negative outcomes with CMC (Anderson et al., 2012). As such, RQ3 addressed social skills and introversion by including these variables as predictors in this study.

Daily social anxiety was chosen as the criterion variable for several reasons. First, this study hypothesized that CMC use could negatively affect the quality of peer relationships, and social anxiety is an indicator of relational quality. Second, research indicated social anxiety may be associated with the reduced social cues inherent in CMC. Finally, measuring daily social anxiety made it possible to measure a construct that reflected both a subject's well-being and the quality of their peer relationships.

The choice of a multiwave panel design was based on the desire to measure daily changes in social anxiety and how they were related to daily CMC and FTF amounts. Mobile and online surveys were employed to facilitate recruitment, improve participant response rates, and minimize direct contact between the researcher and subjects. Junior high and high school students were recruited from health classes in two schools, with 58 providing enough data to be included in the statistical analysis. The data from Day 2 and Day 3 were excluded due to technical issues with SurveyMonkey that resulted in data loss and potential corruption. Separate multiple linear regressions were performed on the

three days of data that were included. Change statistics were produced from two separate hierarchical regressions to address RQ2 and RQ3. A potential moderating role for FTF, introversion, and social skills was explored through a moderation analysis.

Key Findings

Research Question 1. RQ1 addressed the bivariate correlation between daily CMC use and daily levels of social anxiety. The results of RQ1 were measured by R^2, effect size using Cohen's f^2, statistical significance, and the nature of the relationship. Results varied by measurement and data set. CMC accounted for 9% of the variation in social anxiety (R^2 = .09) on Day 1, 5% on Day 4 (R^2= .05), and 7% on Day 5 (R^2 = .07). The effect sizes ranged from small to medium, .08 for Day 1, .02 for Day 4, and .08 for Day 5. The results were statistically significant at the .05 level for only one of the three days of data. The nature of the relationship was positive between CMC and social anxiety on all days, indicating that as CMC use increased daily social anxiety increased as well.

Research Question 2. RQ2 examined the impact of FTF on the level of social anxiety in adolescent CMC users. The goal of RQ2 was to explore whether FTF improved the model fit in comparison to the Step 1 model with only CMC as a predictor. The results of RQ2 were measured using R^2, Cohen's f^2, significance, the nature of the relationship, and by the change statistics between the step 1 model and the Step 2 model. CMC and FTF accounted for 9% of the variation in social anxiety on Day 1, 15% on Day 4, and 21% on Day 5, an improvement over CMC alone. Models adding FTF as a predictor had larger Cohen's f^2 than for RQ1, .10 on Day 1, .18 on Day 4, and .27 on Day

5. The results were significant at the .05 level for two of the three days of data, an improvement over Step 1. Day 1 was non-significant (p = .12), Day 4 was significant (p = .05), and Day 5 results were significant (p = .01). The nature of the relationship between FTF and social anxiety was negative on all days, meaning as FTF amounts decreased daily social anxiety increased.

The results of the change statistics measuring the impact of adding FTF to the relationship between CMC and social anxiety were also significant for two of the three days of data. Day 1 was insignificant at the .05 level, R^2 change = .00, $F(1, 45) = .20$, p = .12. The results from Day 4 were significant, R^2 change = .10, $F(1, 37) = 4.23$, p = .05. The results from Day 5 were also significant, R^2 change = .13, $F(1, 40) = 6.69$, p = .01.

Research Question 3. RQ3 examined the impact of the social skills and introversion on the level of social anxiety in adolescent CMC users. The goal of RQ3 was to explore whether these personality traits improved the model fit in comparison to the Step 1 model with only CMC as a predictor. The results of RQ3 were measured using R^2, Cohen's f^2, significance, the nature of the relationship, and by the change statistics between the Step 1 model and the Step 2 model. CMC, social skills, and introversion accounted for 55% of the variation in social anxiety on Day 1, 35% on Day 3, and 41% on Day 5, a large improvement over CMC alone. Models adding social skills and introversion as predictors had uniformly large effect sizes, 1.04 on Day 1, .54 on Day 4, and .69 on Day 5. The results were significant at the .05 level on all three days of data, with all three days reaching a significance of $p < .01$. The nature of the relationship between social skills and social anxiety was negative on all days, while the nature of the

relationship between introversion and social skills was positive. As social skills decreased and introversion increased, there was a corresponding increase in social anxiety.

The change statistics measuring the impact of adding introversion and social skills as predictors along with CMC were significant for all three days. Day 1 was significant at the .05 level, R^2 change = .46, $F(2, 44) = 22.24$, $p < .01$. Day 4 was significant as well, R^2 change = .30, $F(2, 36) = 8.47$, $p < .01$, as was Day 5, R^2 change = .34, $F(2, 39) = 11.25$, $p < .01$.

Moderation Analysis. A moderation analysis was performed using PROCESS in SPSS to explore a potential moderating role of FTF, introversion, and social skill on the relationship between CMC and social anxiety. The results of this analysis were measured using the significance of interaction effect and the conditional effects at values above and below the mean. The results of the analysis failed to indicate a moderating effect for most variables, except for a modest potential moderating effect for social skills. The interaction effects for all variables failed to reach significance at the .05 level, and the conditional effects for FTF and introversion failed to show a noteworthy change at values above and below the mean. There were, however, noticeable conditional effects for social skills on CMC and its relationship to social anxiety. The analysis revealed a noteworthy change in statistical significance between CMC and social anxiety when a participant's social skills were below and above the mean. When a subject's social skills were low, the significance of the relationship between CMC and social anxiety was much greater ($p = .09$) than when social skills were high ($p = .50$). So, while the interaction

effects of social skills failed to reach significance, conditional effects on CMC's relationship to anxiety may indicate a slight moderating effect.

Interpretation of the Findings

Results from research into the outcomes associated with CMC use has been mixed. As discussed in Chapter 2, some researchers have reported CMC negatively impacts intimacy, social support, subjective well-being, depression, and anxiety (Best et al., 2014; Huang, 2010; Rosen et al., 2013). Other researchers have argued that CMC enhances social relationships and failed to find any association with declines in subjective well-being or other measures of mental health (Lloyd, 2014; Valkenburg & Peter, 2009). Researchers have now moved on to explore specific populations or related behaviors that may increase the likelihood of negative outcomes when adopting CMC (Anderson, Fagan, Woodnutt, & Chamorro-Premuzic, 2012).

This study was an attempt to re-examine the question of outcomes associated with CMC adoption. I sought to identify specific populations that may have a greater likelihood of negative outcomes with CMC use. As presented in the conceptual model of the study (Figure 6), I proposed several potential variables for exploration. Concurrent FTF, social skills, and introversion were included to determine if they would improve our ability to predict social anxiety. The rationale for including these variables was in large part based on Ned Kock's *media naturalness theory*. Kock's theory provides a framework for the inherent differences between CMC and FTF, arguing that FTF communication has evolved as the natural medium for social relationships. Media naturalness theory maintains that FTF is a more effective medium than CMC for

developing intimacy and social support in human relationships. Therefore, FTF was included as a predictive variable both to control any positive impact it might have on the quality of peer relationships, but also to explore its role in improving our ability to predict anxiety in the context of CMC use. Kock also argued that for CMC to be as effective as FTF in relationships, it takes greater effort, time, and social skill (Kock, 2004). Social skill was included as predictive variable based on research indicating individuals with lower social skills may lack the ability to successfully capitalize on CMC in their social relationships. Introversion was included based on the supposition that those higher in introversion may lack the motivation to translate CMC-based interactions into offline relationships.

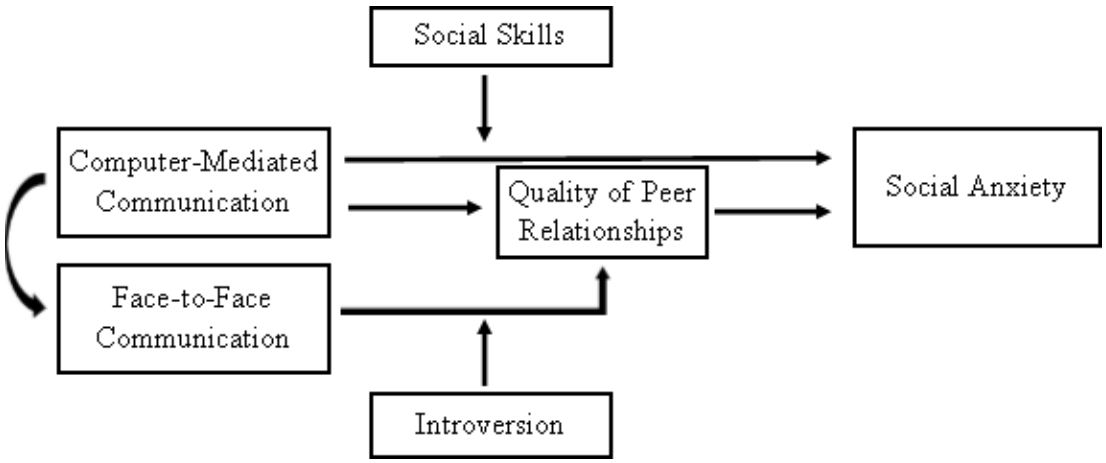

Figure 6: The conceptual model of the study.

The purpose of this study was to improve the model fit produced when analyzing the relationship between CMC and social anxiety. Although the conceptual model of the study proposes potential processes that may explain why FTF, social skills, or introversion may help us to better predict anxiety associated with CMC use, this study was not designed to establish the exact mechanisms involved. The processes represented

in the conceptual model are speculative, and exactly how the variables in this study work to impact levels of social anxiety would be left to future research.

It is important to note one difficulty in interpreting the results of this study. Measuring and analyzing daily FTF, CMC, and social anxiety necessitated separate data sets and regression models for each day of the study. With three different regression models for each research question, there was a greater potential for inconsistent or contradictory results. In fact, inconsistent results did occur for both RQ1 and RQ2. As such, the rationale for the acceptance or rejection of null hypothesis for each research question was based on overall trends from the three data sets. Although there were notable trends revealed in the results, it was challenging to unequivocally reject or accept the null hypothesis of a particular research question.

Research Question 1

RQ1 addressed daily CMC amounts as a sole predictor of daily social anxiety. CMC accounted for 9%, 2%, and 5% of the variance in social anxiety over the three days of the study, and the effect sizes were .08, .02, and .08. Cohen's (1992) interpretation of effect size for linear regression identifies .02 as a small effect, .15 as a medium effect, and .30 as a large effect. Cohen described a medium effect size as noticeable by a careful observer, and an effect size of .02 or greater as not inconsequential (Cohen, 1992). Using Cohen's conventions, the results of this analysis suggest a small but consequential effect size for CMC on the level of social anxiety. The results of RQ1 reached significance at the .05 level on one of the three days of data. It is worth noting, though, the results approached significance at the .05 level on Day 5, $p = .08$.

The results seem to indicate CMC was a very modest though inconsistent predictor of social anxiety. Given this result, there is an argument for rejecting the null hypothesis for RQ1. It is true the results failed to achieve statistical significance in all datasets. Yet the smaller sample sizes used in this study reduced its statistical power and the likelihood of observing statistical significance (Cohen, 2003). As noted in Chapter 3, a power analysis determined that a sample size of 80 was needed to achieve .80 power. Although 80 participants were recruited, attrition resulted in different sample sizes for Day 1 (n = 49), Day 4 (n = 43), and Day 5 (n = 46). A post hoc analysis using the program G*Power (Faul et al., 2007) found that due to the smaller sample size and differing number of predictors, the actual power achieved for Days 1, 4, and 5 was .75, .58, and .54 respectively. This analysis indicated the smaller sample size in this study may have negatively impacted its ability to achieve statistically significant results on Days 4 and 5. It is important to note the data analysis found a consistently positive relationship between CMC and anxiety and at minimum a small effect size on all days. It is also important to avoid the tendency to overvalue statistical significance at the expense of effect size in research (Cohen, 1992). It is also important to consider the analysis found at least a small effect size on all three days. While it is typical for studies in the social sciences to produce medium effects, small effect sizes are not inconsequential (Cohen, 1992). Given these factors, and given that the null hypothesis for RQ1 states there is no effect of CMC on social anxiety, the null hypothesis must be rejected. However, I hesitate to overstate the results from RQ1 too far beyond a rejection of null

hypothesis. The evidence does suggest, though, CMC as a modest, inconsistent predictor of social anxiety.

The tenuous nature of the relationship between CMC and social anxiety is not completely unexpected. As noted, past research has found both positive outcomes from CMC adoption (Valkenburg & Peter, 2009) as well as negative outcomes (Best et al., 2014). Although the results of this study did not vary to that degree, the correlations found were modest. As noted in Chapter 1, one of the study's goals was to identify traits and behaviors that may improve our ability to predict social anxiety in the context of CMC and help explain contradictory findings. This goal assumes a certain difficulty in establishing CMC as a clear predictor of negative outcomes. As such, the failure to consistently produce medium effect sizes or reach statistical significance in all models with CMC as the lone predictor is unsurprising.

In summary, CMC had at least a small impact on the level of social anxiety in all models, and the nature of its relationship with anxiety was consistently positive. The results of RQ1 are supportive of the conceptual model of the study, which proposed an increase in social anxiety would result from CMC use. The data also supports previous studies finding a negative impact on psychological well-being from CMC use (Best et al., 2014; Huang, 2010; Rosen et al., 2013). It must be emphasized this study did not provide evidence for a strong relationship between CMC and anxiety. The results found a modest yet inconsistent relationship between CMC use and daily levels of social anxiety in the population of this study.

Research Question 2

RQ2 explored the impact of adding face-to-face interaction to models exploring the relationship between CMC and social anxiety. Adding FTF to CMC as a predictor of social anxiety improved the model fit for each day of data and increased our ability to predict social anxiety over the course of the study, as measured by R^2, effect size, significance, and model change statistics. The percentage of variance explained increased in each model after adding FTF. Effect sizes increased for all three days as well. Using Cohen's conventions, the effect size for RQ2 on Day 1 was small, though larger than the results for RQ1 Day 1. Effect sizes for Days 4 and 5 were both medium and larger than RQ1. As noted, the results were significant at the .05 level for Days 4 and 5, and the change statistics were significant for these days as well.

The RQ2 models produced one incongruent result: FTF had a positive relationship with social anxiety on Day 1, in contrast to the negative relationship between these variables on Days 4 and 5. To understand this inconsistency, I performed a post hoc analysis of the data that was rejected from Days 4 and 5 to look for insight or some larger pattern. Models from these data sets revealed a negative relationship between FTF and social anxiety, similar to Days 4 and 5. In short, the only time FTF was positively related to social anxiety was on Day 1. It is difficult to explain this variance given the effect sizes and significant results for Days 4 and 5. It is possible that the Day 1 results may have been related to some testing effect, where the subjects became more self-aware of their anxiety levels or FTF amounts after Day 1. Another possibility is an effect caused by differences related to the day of the week, with Day 1 falling on the first day of

the school week. For example, Monday could be more anxiety-producing for students than other days of the week. The result could have also been caused by some unknown problem with the research design. Finally, the incongruities could reflect accurate data representative of some unknown pattern that could be revealed by sampling significantly more days of data or using a larger sample size. Additional research is needed to explore these possibilities and to better understand the issue.

Even taking into account the incongruous result associated with Day 1, collectively there was an overall improvement in the ability to predict social anxiety by adding FTF as a predictor to the models. Adding FTF to CMC increased the percentage of variance accounted for by the models and increased effect sizes. For two of the three models in RQ2, the results reached statistical significance at the .05, level. On the day results were non-significant, FTF accounted for 9% of the variance in social anxiety and the effect size was .10. Indeed, adding FTF to CMC as a predictor of social anxiety improved the fit of all models. As such, there is support for rejecting the null hypothesis. This is argued, though, with some reservation. Due to the inconsistent nature of the results reported for Day 1, further research is needed to confirm the role of concurrent FTF in a CMC environment.

The results of the models exploring RQ2 indicated concurrent FTF may influence levels of social anxiety in adolescent social relationships. The data from Day 2 and Day 3 are consistent with conceptual model of the study, which proposed the replacement of FTF with CMC would result in increased social anxiety. If the amount of concurrent FTF does indeed impact outcomes associated with CMC use, it could help explain

contradictory research in this area. Researchers have largely failed to control for FTF in related studies, which may be a factor explaining both the positive and negative outcomes found with CMC adoption. The results also are in line with research showing FTF may be more effective than CMC in fostering relational intimacy, social support, and psychological well-being (Buote et al., 2009; Rauch et al, 2014). It is possible that a loss of peer-related FTF in adolescent users of CMC causes a reduction of intimacy and social support, which in turn impacts the quality of peer relationships and increases social anxiety.

Research Question 3

RQ3 addressed the impact of adding introversion and social skills as predictors to models exploring the relationship between CMC and social anxiety. Adding levels of introversion and social skills to CMC improved the model fit in all three data sets. The amount of variation in social anxiety accounted for by the model increased considerably, and the effect sizes were uniformly large. The results were statistically significant at the .01 level for all three days of data, and the change statistics for all three days were significant as well. The moderation analysis found no interaction effects for introversion or social skills, but the conditional effects revealed a possible moderating role for social skills. Based on these results, the null hypothesis for RQ3 is rejected. In this study population, a combination of higher introversion, lower social skills, and higher amounts of CMC was associated with increased social anxiety.

These results are consistent with the conceptual model of the study, which proposed a role for introversion and social skills in determining CMC outcomes. As

noted in Chapters 1 and 2, past research indicates CMC users in psychosocial distress may have a higher likelihood of negative outcomes when adopting CMC (Buote et al., 2009; Bazarova, 2012). It is possible CMC users with lower social skills may be unable to leverage CMC to improve the quality peer relationships. Unlike those with lower social skills, CMC users higher in introversion may have the social skills needed to leverage CMC to improve their social relationships. They may, though, be unwilling to do so. In both cases, this could reduce the number or quality of peer relationships in in the social circles of CMC users in psychosocial distress. This possibility was addressed as part of the conceptual model of the study. While it is conjecture, these mechanisms may be responsible for the large effect sizes and highly significant results found in the models associated with RQ3. It is important to note, though, there is little research identifying the specific mechanisms by which psychosocial distress impacts CMC's relationship to psychological well-being. This study does not purport to do so. If confirmed, though, this research would help identify personality characteristics such as introversion and social skills as factors in the outcomes associated with CMC adoption. These results would provide an explanation for contradictory research into CMC outcomes, suggesting that CMC outcomes may not be generalized, but dependent on the personality characteristics of the population studied.

Another interpretation of the results of RQ3 should be considered, one that does not necessarily support the conceptual model of this study. There is a close relationship between introversion and social anxiety outside the context of CMC use. Evidence of this relationship can be observed in the bivariate correlational matrixes shown in Tables

21, 22, and 23. As noted in Chapter 2, introversion is a separate construct from social anxiety, marked by a preference for less social interaction versus a feeling of anxiety about social interactions. Yet introversion has been found to be associated with higher levels of social anxiety (Heiser, Turner, & Beidel, 2003). When interpreting the large effect sizes and the highly significant results produced in the models associated with RQ3, it is important to consider that some of this effect could be due to the inherent relationship between introversion and social anxiety. The lack of a significant result in the moderation analysis of introversion may be evidence of this.

Limitations of the Study

There are several limitations in interpreting the results of this study that should be noted. First, the generalizability of the sample is limited, though care was taken to recruit a representative sample. Health classes were chosen for recruitment due to their mandatory nature, and the entire school body was included in the recruitment process at the middle school. Yet the use of convenience sampling in selecting participants necessarily limits the external validity of the study (Creswell, 2009). As such, the results of the study should not be generalized outside the population of these two schools.

It is also important to note the purely correlational nature of regression (Campbell & Stanley, 1963). The findings of this study do not establish a cause/effect relationship between the predictors and social anxiety. Some argue that multiwave panel designs establish temporal relationships between variables and can be used to establish cause and effect (William, Shadish, Cook, & Campbell, 2002). I do not argue for such a conclusion. Although the design used in this study did establish a daily temporal

relationship between the predictive and criterion variables, I believe a true experimental research design would be necessary to establish causal relationships.

Another limitation is related to the smaller sample size used than originally planned. As noted in Chapter 3, a sample size of 80 was required to achieve a power of .80 given an estimated medium effect size. Though 80 participants were recruited, the data from only 58 were included in the study. Furthermore, the number of surveys completed on any given day varied from 43 to 48. As previously discussed, a post hoc analysis found the power achieved on Days 4 and 5 were well below .80, indicating the small sample reduced the study's ability to observe statistically significant results.

The final limitation in this study is related to the interpretation of the results. Multiple days of data produced inconsistencies in the results. The RQ1 and RQ2 results were not uniform. The RQ1 effects sizes were significant for only one of three days. The RQ2 effects sizes ranged from medium to large and were significant for two of three days. As such, it is important to limit the interpretation of the RQ1 and RQ2 results and over-extend or over-generalize their implications. The issues with data from Day 2 and Day 3 also limit the interpretation of the results, reducing the datasets available to interpret.

Recommendations

The results of this study points to the adoption of CMC in adolescent peer relationships as a modest predictor of social anxiety. Lower amounts of FTF interaction combined with higher amounts of CMC were associated with elevated levels of social anxiety. The study also found lower social skills and higher levels of introversion

combined with increased CMC to be associated with higher levels of social anxiety. This research provides evidence to suggest both concurrent FTF interactions and personality characteristics may influence the impact of CMC on psychological well-being in adolescents.

Based on these results, I would make several recommendations. First, it is recommended that further research be conducted using the research design employed in this study. The daily collection of data on CMC and face-to-face interaction provided unique insight into the social interactions of adolescents. The multiwave panel design facilitated the measurement of daily changes in CMC's impact on psychological well-being. I am unaware of any previous CMC researchers successfully collecting daily experiential data from adolescents. The use of smartphones and texting for surveys matched current trends in adolescent instant messaging and mobile phone use. This more closely resembles actual adolescent patterns of CMC, and may have resulted in more externally valid data. The use of texting and smartphones may have also improved participant recruitment and retention. It is worth noting the attrition rate for subjects using text-delivered surveys was less than those who used e-mail. A smartphone-based multiwave panel design could be used to study other possible CMC outcomes, particularly those that may be sensitive to daily changes in CMC amounts. Depression and subjective well-being are two CMC outcomes that reflect psychological well-being and fluctuate daily. Both would be potential candidates for future research using some of the research design features employed in this study.

Next, it is recommended the results of this study be replicated and confirmed. This study produced interesting results, yet the sample size was relatively small and two days of data were excluded from the analysis. This study needs to be replicated using a minimum sample size of 80 to increase the power of the analysis. It would also be beneficial to increase the number of days that daily data is collected from participants. The additional data would help identify patterns that could explain inconsistencies in this study and improve internal validity.

It is also recommended that the results of RQ2 and RQ3 be further explored to identify specific mechanisms involved. As previously discussed, the conceptual model of the study was speculative, suggesting possible processes that could explain the impact of FTF, introversion, and social skills on CMC outcomes. It would be valuable to use dedicated research to identify the mechanisms responsible for the impact FTF, introversion, and social skills on social anxiety. I would suggest three areas of exploration for this research: First, there is a need to separate the bivariate relationship between introversion on social anxiety from its impact in the context of CMC. Second, it could be beneficial to understand the mechanism behind the impact of FTF on social anxiety. Is it the result of FTF's positive influence on the quality of peer relationships, or is it caused by some ameliorating effect FTF has directly on social anxiety? Third, it would be valuable to know if social skills help determine the quality of relationships over CMC, as suggested by media naturalness theory, or is there some other mechanism involved?

Finally, future studies are needed to identify any additional variables that may help determine the impact of CMC on psychological well-being. The results of this study suggest a combination of factors work together to determine outcomes associated with CMC use. It is important to identify other behaviors or personality characteristics that may be involved in these outcomes.

Implications

Adolescents are adopting computer-mediated communication at a higher rate than any other age group, and mobile technology has facilitated its full integration into daily interactions with peers. This study contributed to the body of knowledge into the impact of CMC on adolescent psychological health by sampling their daily CMC and FTF interactions and identifying specific behaviors and personality characteristics that may impact outcomes associated with the adoption of CMC. There are several implications from this study that may lead to positive social change.

First, this study helps to explain previous contradictory research into CMC outcomes. These results indicate that CMC isn't necessarily beneficial or harmful to all users. The results of this study may encourage researchers to move beyond the generalized question of whether CMC is beneficial or harmful, and to explore which specific populations may benefit or be harmed by its use. This type of research, suggested by Anderson et al. (2012) and others, hopefully will lead to better understanding among researchers as to who may benefit or be harmed by CMC use.

Second, if the results are confirmed, there are implications for the well-being of adolescents who are using CMC in their peer relationships. These results suggest the

adoption of CMC is not necessarily harmful, and when used as to augment offline relationships it has the potential to be beneficial. Yet this study did find that higher amounts of CMC combined with a reduction in offline social interaction seem to increase the likelihood of psychological harm. The results also suggest lower social skills or greater introversion increase the likelihood of negative outcomes. These results suggest that to reduce the negative impact from CMC on their psychological well-being, adolescents refrain from replacing their face-to-face interactions with online relationships. Instead, they should focus on strengthening their relationships through face-to-face interactions with peers, and whenever possible, leverage their CMC-based interactions into offline friendships.

The final implication of this study applies to parents, educators, and clinicians who work with adolescents. For parents and educators, the results point to an opportunity to teach adolescents about the benefits and drawbacks of adopting CMC in their peer relationships. These findings inform parents and educators on how to encourage their children and students to use CMC to enhance their offline peer relationships, and how to avoid allowing CMC to take the place of their face-to-face interactions with friends.

There are also important insights from this study for clinicians who adolescents for disorders such as depression and anxiety. Many evidence-based treatment regimens for these disorders include social skill building and relational problem-solving (Weisz & Kazdin, 2010). As clinicians work to improve their patient's social skills and the quality of their peer relationships, it would be valuable to understand the interactions between

FTF, social skills, introversion, and outcomes associated with CMC. This understanding is particularly important in treating depression and anxiety, disorders that often occur in individuals with lower social skills and higher introversion (Segrin, 2000). Clinicians may benefit from understanding how patients can best utilize CMC in their relationships and which types of patients would benefit from developing relationships in an offline environment.

Conclusion

Adolescents are adopting CMC in their peer relationships at higher rates than any other age group, and this change has potentially important implications for the quality of these relationships and their psychological well-being. Based on the conflicting results from past research, this study theorized CMC as a lone predictor would have only a modest effect on social anxiety. It also theorized that lower concurrent FTF interaction, lower social skills, and higher introversion would be related to increased social anxiety in the context of CMC use.

The study found that CMC was a modest and inconsistent predictor of social anxiety. The study found that adding FTF interaction to CMC improved the model's ability to predict social anxiety. The study also found that adding introversion and social skills to CMC as predictors resulted in a highly significant and consistent ability to predict social anxiety.

There are several takeaways from the results of this study. First, additional research is needed to confirm and extend the findings. Second, this study provides some direction for researchers in identifying specific populations that may be more susceptible

to negative outcomes in CMC use. If confirmed, the results could become a source of information for adolescents to understand how to better take advantage of the potential benefits of CMC in their peer relationships. It also could help other adolescents avoid the potential pitfalls that may await some types of users, particularly those in psychosocial distress. Finally, this study could provide much-needed guidance for parents, educators, and clinicians on how to guide their charges in the healthy use of CMC in peer relationships.

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Appendix A: Cover Letter for Information Packet

Hello!

Enclosed is information about a project your son or daughter has been introduced to at their school. They have been invited to voluntarily participate in a psychology study being conducted in cooperation with School District.
The project consists of research into the impact of social media on adolescents. It will study how much teenagers use social media, how it effects their friendships, and the impact it has on their psychological well-being. Participation in the research will take approximately one hour of your child's time over a period of a week. If they are willing to complete the study, they will be compensated for their time with a $10 gift card.
We would like your permission to allow your child to participate. Please read the details about the research you'll find inside this packet, and consider signing the parental consent form. If you have any questions, please don't hesitate to contact me using the contact information provided inside.

Thank you so much!
Neil Parker

Ph.D. in Psychology Student
Walden University

Appendix B: Participant Assent Form for Research

Hello, my name is Neil Parker. I am doing a study about how social media and texting effects teenage friendships and well-being. This study is not an assessment. The purpose is to better understand social media and its effects. I am inviting you to join my research. I am asking up to 85 students who have access to a computer or smartphone to be in the study. I want you to learn about the project and decide if you want to participate.

WHO I AM:

I am a doctoral student at Walden University. I am working on my Ph.D. in psychology.

ABOUT THE PROJECT:

If you agree to be in this project, you will receive email or texts with links to confidential surveys. These messages will be through a company called SurveySignal. After an initial instructional message, no direct communication will be received from the researcher. The surveys ask how teenagers feel about themselves, friendships, and their social media use. You can choose to fill out these surveys using a smartphone or a computer.

- After you return your consent form, you will receive a link to verify your mobile number or email address. This must be responded to by Friday midnight.
- The first survey will be filled out over the weekend. This will take 20-30 minutes to complete.
- Five short surveys will be taken Monday - Friday the following week. These can be done any time between 6:30 and midnight each evening. Each will take 5-7 minutes to complete.
- Additional messages will be sent to remind you to complete your surveys.
- There will be a follow up in class two weeks after completing the study. You will have the chance to ask questions, and the results will be shared.

Here are some sample questions from the surveys:

- Approximately how many minutes did you spend on social media (social networking sites such as Facebook, Snapchat, Twitter, Instagram, etc.) today? _____
- On a scale from 1-6, rate how well the following statement describes you: “I ignore classmates when they tell me to stop doing something.” ____
- On a scale of 1-3, rate how often the following statement is true of you “I feel shy with people I don’t know well." ____
- On a scale from 1-5, rate the extent this statement is true of you today “I was afraid that others did not approve of me.” ____

IT’S YOUR CHOICE:

You don't have to be in this study if you don't want to. This study will not affect your grade, and it is not being run by your school. If you decide you want to join the study, you can still change your mind later. If you want to stop, you can at any time. While it's important that you want to volunteer for this study, a parent must also give permission.

Being in this study involves the risk of experiencing the minor discomforts you feel in daily life. The study might make you feel stressed, like when you think about problems in your relationships with friends. It also might make you feel tired, like when you have to fill out forms. It's possible you might think some of the questions are pointless. But I am hoping this project will help understand more about how social media affects teenage friendships and well-being. You will be told about the results of this study and how you helped researchers understand the impact of social media.

As a way to repay you for your time and for helping my research, anyone who completes the minimum requirements will receive a $7 gift card (choices below). In order to receive this card, you will need to fill out the first survey and at least 2 of the 5 daily surveys.

PRIVACY:

Everything you tell me during this project will be kept private. No one else will know your name or your answers. Your contact information will be destroyed after the study is complete. The only time I have to say anything to anyone is if I learn about something that could hurt you or someone else.

ASKING QUESTIONS:

You can ask me any questions you want now. If you think of a question later, you can reach me on my cell phone at 403-829-8440. You can also email me at neil.parker@waldenu.edu. If you or your parents would like to ask my university a question, call Dr. Leilani Endicott. Her phone number is 612-312-1210. You can keep the information section of this form if you wish. If you should feel the need for support or mental health counseling, you can contact Valley Cities Mental Health Center at 253-833-7444. You can also contact the King County Crisis line at 800-244-5767.

Please fill out this form, sign your name below, and return it by Friday if you want to join this project:

Name of Participant _____

Age _____ Gender M / F

Please provide one type of contact information to complete the study online. If you would like to complete the study using a smartphone, provide your cell phone number. If you would like to complete the study using a computer, provide an email address.

Cell phone number _____
or
Email address _____

Choose the type of $7 gift card you would like to receive after the study:

Subway ____ McDonalds _____ Starbucks _____

Participant/Student Signature _____

Date _____

Researcher Signature _____

Appendix C: Parent or Guardian Consent Form for Research

Your child is invited to take part in a psychology research study. The research is on the impact of texting and social media on adolescent psychological well-being. The researcher is inviting up to 85 students from the School District who have access to a computer or smartphone to be in the study. This form is part of a process called "informed consent". It will help you to understand the study and decide whether to allow your child to take part.

A researcher named Neil Parker, who is a doctoral student at Walden University, is conducting this study. The study is recruiting volunteers at _____H.S. and _____Middle School, but is not being conducted by the schools. It is included as part of the health curriculum and will teach students about psychology research. It will not affect their grade.

Background Information:

The purpose of this study is to learn about the impact of texting and social media on teenage friendships and well-being. This study is not an assessment of your child. It seeks to understand teenage use of social media and its consequences.

Procedures:

If you agree to allow your child to be in this study, your child will receive email or texts with links to surveys. These messages will be through a company called SurveySignal. After an initial instructional message, no direct communication will be received from the researcher. The surveys will ask questions related to how teenagers feel about themselves, their friendships, and how often they text and use social media.

- One survey will be filled out at the start of the study. The first survey will be take approximately 20-30 minutes to complete.
- Five short daily surveys will be taken during the following week. These surveys can be done any time in the evening and will take 5-7 minutes to complete.
- Emails or texts will be sent to your child to remind them when to complete these surveys.
- There will be a follow up at your child's school two weeks after completing the study. Students will have the chance to ask questions, and initial results will be shared. These results will be sent home with your child.

Here are some sample questions from the surveys:

- Approximately how many minutes do you spend using social media today? (social networking sites such as Facebook, Snapchat, Twitter, Instagram, etc.) _____
- On a scale from 1-6, rate how well the following statement describes you: "I ignore classmates when they tell me to stop doing something" ____
- On a scale of 1-3, rate how often the following statement is true of you "I feel shy with people I don't know well." _____
- On a scale from 1-5, rate the extent this statement is true of you today "I was afraid that others did not approve of me." ____

Voluntary Nature of the Study:

This study is voluntary. Everyone will respect your decision whether you want your child to be in the study. Of course, your child's decision is also an important factor. In addition to obtaining parental permission, the study has been explained to your child and they may choose to volunteer if they wish.

No one at _____ High School will treat you or your child differently if your child is not in the study. It will in no way will it affect their grade or coursework in school. If you decide to consent now, you or your child can still change their mind later. Your child may stop the study at any time.

Risks and Benefits of Being in the Study:

Being in this study involves the risk of experiencing the type of minor discomforts your child encounters in daily life. The questions might make your child feel stress like when they think about difficulties in relationships with friends. They also might make them feel tired like when they have to fill out forms. It's also possible they might think some of the questions are pointless. But I am hoping this project will help researchers understand more how social media affects teenage friendships and well-being. You and your child will be informed of the results of this research when it is complete.

Payment:

As a way to thank your child for their time and for helping researchers better understand this issue, volunteers who complete minimum requirements will receive a $7 gift card. In order to receive this card, your child will need to fill out the initial survey and at least 2 of the 5 daily surveys.

Privacy:

Any information your child provides will be kept confidential. The researcher will not use your child's information for any purposes outside of this research. Your child's contact information will be erased after the survey is complete. The researcher will not include your child's name or anything else that can identify your child in any reports. The only time the researcher would need to share your child's name or information would be if the researcher learns about possible harm to your child or someone else. Data will be kept secure by being placed in a password protected electronic file away from any identifying information that would risk their privacy. Research results will be kept for a period of 5 years, as required by the university, then destroyed.

Contacts and Questions:

You may ask any questions you have now or later. You may contact the researcher via cell phone at 403-829-8440 or by email at neil.parker@waldenu.edu. If you want to talk privately about your child's rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University staff member who can discuss this with you. Her phone number is 612-312-1210. Walden University's approval number for this study is 02-05-16-0432867.

If your child should feel the need for support or mental health counseling, you can contact Valley Cities Mental Health Center at 253-833-7444. You can also contact the King County Crisis line at 800-244-5767.

If you would like to allow your child to participate, please have your child return the form below and their own assent form to their classroom within 3 days. You may keep the above information for your records if you wish.

Statement of Consent:

I have read the above information and I feel I understand the study well enough to make a decision about my child's involvement in this optional research project. By signing below, I understand that I am agreeing to the terms described above.

Printed Name of Parent _____

Printed Name of Student _____

Date of Consent _____

Parent Signature _____

Researcher Signature _____

Appendix D: CMC and FTF Daily Survey

Please provide information about your social interactions with peers today. Answer every question to the best of your ability.

1. How many texts did you send and receive with your peers today? (Check one)
   - 0-10
   - 10-20
   - 20-35
   - 35-50
   - 50-75
   - 75-100
   - 100-150
   - More than 150

2. How many minutes do you spend using social media (social networking sites and instant messaging) with your peers today? (Check one)
   - 0-10
   - 10-20
   - 20-30
   - 30-40
   - 40-50
   - 50-60
   - 1 to 2 hours
   - More than 2 hours

3. On average, how many minutes do you spend socially in face-to-face communication with peers today? (Includes in person, video, and phone calls) (Check one)
   - 0-10
   - 10-20
   - 20-30
   - 30-40
   - 40-50
   - 50-60
   - 1 to 2 hours
   - More than 2 hours

Appendix E: Social Anxiety Subscale of the Screen for Child Anxiety Related Disorders

Directions:

Below is a list of sentences that describe how people feel. Read each phrase and decide if it is "Not True or Hardly Ever True" or "Somewhat True or Sometimes True" or "Very True or Often True" for you. Then, for each sentence, fill in the one circle that corresponds to the response that seems to describe you *for the last 3 months*.

	0 **Not True or Hardly Ever True**	**1** **Somewhat True or Sometimes True**	**2** **Very True or Often True**
1. I don't like to be with people I don't know well.	O	O	O
2.I feel nervous with people I don't know well.	O	O	O
3.It is hard for me to talk with people I don't know well.	O	O	O
4.I feel shy with people I don't know well.	O	O	O
5.I feel nervous when I am with other children or adults and I have to do something while they watch me (for example: read aloud, speak, play a game, play a sport).	O	O	O
6.I feel nervous when I am going to parties, dances, or any place where there will be people that I don't know well.	O	O	O
7.I am shy.	O	O	O

Appendix F: Modified Brief Fear of Negative Evaluation Scale

Read each of the following statements carefully and indicate how characteristic it is of you according to the following scale:

1 = Not at all characteristic of me
2 = Slightly characteristic of me
3 = Moderately characteristic of me
4 = Very characteristic of me
5 = Extremely characteristic of me

____ 1. I worried about what other people thought of me.

____ 2. I was afraid other people noticed my shortcomings.

____ 3. I was afraid that others did not approve of me.

____ 4. I was worried that I would say or do the wrong things.

____ 5. When I was talking to someone, I worried about what they were thinking of me.

____ 6. I felt uncomfortable and embarrassed when I was the center of attention.

____ 7. I found it hard to interact with people.

Appendix G: Teenage Inventory of Social Skills

Read each of the following statements carefully and indicate how characteristic it is of you according to the following scale:

1. does not describe me at all
2. describes me very little
3. describes me a little
4. describes me somewhat
5. describes me mostly
6. describes me totally

____ 1. I tell jokes and get other classmates to laugh

____ 2. I try to get other classmates to do things my way when working on a group project

____ 3. I stick up for others when somebody says something nasty behind their backs

____ 4. I forget to return things that others loan me

____ 5. I make jokes about others when they are clumsy at sports

____ 6. I ask other friends to go places with me

____ 7. I help other people with their homework when they ask me for help

____ 8. I ignore classmates when they tell me to stop doing something

____ 9. I offer to help classmates do their homework

____ 10. When I don't like the way other people look, I tell them

____ 11. I listen when other friends want to talk about a problem

____ 12. I laugh at others when they make mistakes

____ 13. I push people I do not like

____ 14. When I want to do something, I try to talk others into doing it, even if they don't want to

____ 15. I make sure that everyone gets a turn when I am involved in a group activity

____ 16. I talk only about what I'm interested in when I talk to other guys

____ 17. I ask other people for advice

____ 18. I tell other people that they are nice

____ 19. I ignore others when I am not interested in what they are talking about

____ 20. I lie to get out of trouble

____ 21. I always tell other classmates what to do when something needs to be done

____ 22. When I am with my best friend, I ignore others

____ 23. I flirt with another guy's girlfriend when I like her

____ 24. I make up things to impress other people

____ 25. I tell other classmates they played a game well when I lose

____ 26. I offer to share something with others when I know that they would like it

____ 27. I lend friends money when they ask for it

____ 28. I hit others when they make me mad

____ 29. I tell classmates I'm sorry when I know I have hurt their feelings

____ 30. I tell the truth when I have done something wrong and others are being blamed for it

____ 31. I talk more than others when I am with a group of guys

____ 32. I ignore other people when they give me compliments

____ 33. I throw things when I get angry

____ 34. I offer to loan friends my clothes for special occasions

____ 35. I thank other people when they have done something nice for me

____ 36. I do my share when working with a group of classmates

____ 37. I call classmates bad names to their faces when I am angry

____ 38. I keep secrets private

____ 39. I tell other people how I really feel about things

____ 40. I share my lunch with classmates when they ask me to

Appendix H: Extroversion Subscale of the Big Five Personality Trait Short Questionnaire

Here is a list of characteristics that persons can manifest in their everyday life. We would like you to indicate to what extent each of these characteristics applies to you. Do not think about particular situations or persons, but simply indicate to what extent these characteristics apply to you usually. Everybody can be different for all of these characteristics, so there are no good or wrong answers.

Please indicate to what extent you agree or disagree with each of the following items. If you are uncertain about a response and you hesitate, choose nevertheless the one that is most representative of you.

Disagree Strongly (DS)	Disagree a Little (DL)	Neutral Opinion (N)	Agree a Little (AL)	Agree Strongly (AS)

I see myself as someone who ...

1. Likes to talk, expresses his/her opinion.	DS	DL	N	AL	AS
2. Is reserved or shy, has difficulty approaching others.	DS	DL	N	AL	AS
3. Is full of energy, likes to always be active.	DS	DL	N	AL	AS
4. Is a leader, capable of convincing others.	DS	DL	N	AL	AS
5. Is rather quiet, does not talk a lot.	DS	DL	N	AL	AS
6. Shows self-confidence, is able to assert himself/herself.	DS	DL	N	AL	AS
7. Is timid, shy.	DS	DL	N	AL	AS
8. Is extraverted, sociable.	DS	DL	N	AL	AS
9. Has few artistic interests.	DS	DL	N	AL	AS
10. Has a tendency to laugh and have fun easily.	DS	DL	N	AL	AS

Appendix I: Permission Letter for BFPTSQ

Gmail by Google

Neil Parker
<neil.parker@waldenu.edu>

RE: The use of the BFPTSQ for research

Julien Morizot julien.morizot@umontreal.ca Thu, Oct 22, 2015 at 6:16 AM

To: Neil Parker
<neil.parker@waldenu.edu>

Hi Neil,

thanks for your interest. Of course, you are welcome to use the questionnaire for research purposes any way you want. Attached you will find the questionnaire and scale content. I also attach basic SPSS syntax that may be helpful to do some preliminary psychometric checks and compute the scores. Note that we scored the raw items 0 through 4, but some researchers prefer avoiding zeros and score 1 through 5; it doesn't change anything in terms of variance, so both scoring are alright.

Let me know if I can be of any more help.

Best regards,

Julien

==========

Julien Morizot, Ph.D.

School of Psychoeducation

University of Montreal

Adolescent Personality Development Research Lab

University of Montreal Public Health Research Institute

C.P. 6128, Succ. Centre-Ville

Montreal, Quebec, Canada

H3C 3J7

From: Neil Parker [mailto:neil.parker@waldenu.edu]
Sent: October-21-15 6:33 PM
To: julien.morizot@umontreal.ca
Subject: The use of the BFPTSQ for research

Dear Dr. Morizot,

I am a doctoral student working on my dissertation exploring the relationship between computer-mediated communication and social anxiety in adolescents. One variable I am addressing in the level of extraversion and its impact on this relationship.

After reading several articles on measuring the Big Five in adolescents, including your article Construct validity of adolescents' self-reported big five personality traits: Importance of conceptual breadth and initial validation of a short measure, I've concluded I would like to use the BFPTSQ to measure extraversion in my research participants.

I would like your permission to use the BFPTSQ in my dissertation and obtain a copy for my research.

Thank you for your assistance in this matter,

Neil Parker

Appendix J: Middle School Curriculum and Participant Recruitment Script

I. Introduction
   a. Why am I up here
      i. I've been told some of you have just completed a big research paper for school. How many of you?
         1. I'm a student like you. I'm doing a giant research paper so I can graduate.
         2. I've been working on it for 1 ½ years
         3. I used to be a teacher. Now I'm studying to be a psychologist. Anyone know what psychology is?
         4. So I'm here to complete my own research paper, called a dissertation. So far, mine is 150 pages long!
      ii. What's that have to do with you?
         1. How many people here use texting / social media to stay in touch with friends? What types to you use?
         2. You may not realize this, but you are part of one of the biggest changes to ever occur in how teenagers relate to their friends…
         3. You might be interested because I'm about to give you a chance to be involved in real-world research into how texting and social media affects teenager's friendships and find out if it's good for friendships, bad, or both.
      iii. How many here like McDonalds? Subway Starbucks?
         1. If you complete the minimum requirements for the study, you'll have the chance to get a free gift card for $7 to one of those places.
   b. So, basically I'm here because I need your help.
      i. I need to tap your experiences with texting and social media in order to understand what's going on.
      ii. I'm here to find 85 volunteers to complete my research study.
      iii. My hope is that this research can make a difference for teenagers around the world.
      iv. Cool thing is I get to come back in 2 weeks and share the results

II. Health Curriculum Instruction: Understanding Psychology Research
   a. Goal of Psychology Researchers:
      i. Understanding how people tick. Our behavior is not random, and it is not totally unique. There are patterns and likelihoods to what

we do, and there are reasons for what we do. Psychology research tries to find out what the patterns are and why we behave/think the way we do.

ii. I didn't realize how much psychology research impacts so much of what you experience: How teachers teach, advertisement strategies, how a mall is designed, the color they paint Starbucks.

iii. It also impacts how psychologists treat their patients for things like depression or schizophrenia. Evidence-based treatment.

III. So do you guys want to hear what it would be like if you volunteer?

a. There are very specific laws and regulations that are meant to protect you and your privacy.

b. Hand out recruitment packets

c. These forms are the written form of what I'm saying to you.

i. Consent forms for you and a parent to read and sign

ii. Examples of the kinds of questions you'll have

IV. Recruitment of Participants

a. Introduction

i. My study topic and goal

1. Social media and texting and its impact on the quality of teenager's relationships and their well-being.
2. Is it good for friendships or not?

b. Things you need to know

i. There's some official documents and rules that I have to follow.

1. I've got to explain this to you in a way that you understand how your privacy and rights will be protected.
2. Two consent forms that need to be filled out, and they are long and legal. Basically the paperwork and legal process is there to ensure your privacy is completely taken care of and that the process is safe.
3. There is a thing for a parent to read and sign, and one for you to read and sign. It even has examples of the kinds of questions you'll be asked.

ii. Totally anonymous. No one will know your answers, and your teacher will not even be told who is participating. (Explain why)

iii. Not required for this class and will not affect your grade.

iv. Your contact information will be destroyed after you are done.

v. It's just filling out surveys. The kinds of questions are about how much you use social media and texting and how you feel about friends on that day. The only stress you'll feel would be what you normally feel each day.

c. If you choose to volunteer…(description)
    i. You will receive a series of texts or emails with links to confidential surveys. The surveys ask how teenagers feel about themselves, friendships, and their social media use.
    ii. These messages will be through a company called SurveySignal. You can fill out these surveys using texting with a smartphone or using email and a computer.
    iii. So if you don't have a smartphone, no problem. As long as you have an email address you can use, and you can get access to a computer once a day for a week you can participate.
    iv. It's ok if you don't text much or use social media. I need people of all types to compare with each other.
    v. After an initial instructional message, no direct communication will be received from me.
d. The process
    i. After you return your consent form, you will receive a link to verify your mobile number or email address. This must be responded to by Friday midnight.
    ii. The first survey will be filled out over the weekend. This will take 20-30 minutes to complete.
    iii. Five short surveys will be taken Monday - Friday the following week. These can be done any time between 6:30 and midnight each evening. Each will take 5-7 minutes to complete.
    iv. Additional reminder messages will be sent to help you remember to complete your surveys.
e. I'll be back in 2 weeks
    i. I'll tell you the details of what I'm trying to learn
    ii. I'll share with you the results
    iii. You can ask any questions
    iv. Participants who complete the first survey and at least 2 of the 5 daily surveys will receive a $7 gift card to Starbucks, Subway, or McDonalds

V. Next Steps
a. Take your packet home. Two forms: one for a parent and one for you. Both must be signed
b. Return **by Friday** to office (or class if you want). Explain why!
c. You'll get an introduction information text/email on Friday, and a verification message Friday evening.

Appendix K: High School Curriculum and Participant Recruitment Script

I. Introduction
   a. Why am I up here? I think you might be able to relate.
      i. You all have graduation projects required for you to finish school.
      ii. My goal is to become a psychologist and help teenagers who are hurting. Specifically, I am training to help teenagers dealing with depression, anxiety and suicide.
      iii. Part of becoming a psychologist is getting a PhD. Just like you, I have a graduation project. Mine is a thing called a dissertation. It's a giant research project. I've been working on this for a year and a half, and right now it's up to 150 pages long. It's basically a graduation requirement for me to do psychology research.
   b. So what does this have to do with you
      i. How many people here use texting or social media to stay in touch with friends in ways that you never could without it?
      ii. You are experiencing a revolution. Thousands of years of civilization, you are first generation to have social media and texting to be such a large part of how you communicate with your friends.
      iii. Psychologists around the world are going nuts trying to figure out if this huge change is a good thing, a bad thing, a mixure of both, and for who.
      iv. The topic of my research project is to figure out how texting and social media impacts teenage peer relationships and their psychological well-being.
   c. So, basically I'm here because I need your help.
      i. I need your help and I need to tap your experiences with texting and social media in order to complete this study.
      ii. In order to accomplish this, I'm looking to recruit 85 volunteers to complete this research study.
   d. So why would you want to be involved?
      i. It might be an interesting topic
      ii. It might make a difference for teenagers around the world.
         1. When was the last time you got to do something that could make a difference in the world?
         2. The plan for this study is to publish it for other researchers around the world to read.

3. The hope is that this research may help inform ahow psychologists and educators teach about social media, It's possible that this study could impact how the next generation of teenagers use texting and social media in their friendships. Maybe how the next generation of parents raise their kids.

iii. I've got one last reason: In order to thank you for your time, if you complete the minimum requirements of the study, you'll receive a Subway, McDonalds, or Starbucks card for $7.

II. So here's the plan for today
   a. As part of your mental health unit, I'm going to give you a quick background in psychology research
   b. Go through an official recruitment process for psychology research
   c. I'll come back in two weeks, give you your cards and let you know what we learned.

III. Health Curriculum Instruction: Understanding Psychology Research
   a. Goal of Psychology Researchers:
      i. Understanding how people tick. Our behavior is not random, and it is not totally unique. There are patterns and likelihoods to what we do, and there are reasons for what we do. Psychology research tries to find out what the patterns are and why we behave/think the way we do.
      ii. I didn't realize how much psychology research impacts so much of what you experience: How teachers teach, advertisement strategies, how a mall is designed, the color they paint Starbucks.
      iii. It also impacts how psychologists treat their patients for things like depression or schizophrenia. Evidence-based treatment.
   b. How do people come up with this stuff?
      i. Research. Thousands of researchers. Every major university has research in social science.
         1. The goal of this research is to sort out the variables. Every human behavior is influenced by one or more variables.
            a. *Example with class: True story: Big city. Late at night. Woman being attacked. Called for help. Hundreds of people heard, no one called the police. Why?
               i. Afraid. That's a variable
               ii. Didn't know what was happening.
               iii. People don't care.
               iv. Thought someone else was calling.

b. What caused this behavior? Psychology researchers found out it was a result of being in a large group. "Diffusion of responsibility". Our sense of responsibility weakens in large groups.

2. What researchers do is to set up a situation to test variables and see which one is the primary cause of the way people act.

IV. Recruitment of Participants

a. Introduction

i. My study topic and goal

1. Social media and texting and its impact on the quality of teenager's relationships and their well-being.
2. The goal is to find out how this revolution in social media impacts how you relate to your friends and your psychological health.

ii. The basic idea of the study is for you to fill out a series of small surveys about how you relate to your friends. Then to ask how much social media and texting you do for five days, and how you feel about your friendships for those five days

iii. And in order to take care of your time, I will send them to you with text or email.

b. Things you need to know

i. This study is being supervised and monitored.

1. I've got to be very careful to explain this to you in a way that you understand how your privacy and rights will be protected.
2. *Hand out recruitment packets
3. The paperwork is kinda involved, because it contains all the information I legally am required to give you.
    a. You can read more details and the types of questions in the surveys.
    b. Two consent forms that need to be signed.

ii. Not required for this class and will not affect your grade.

iii. Totally anonymous. No one will know your answers, and your teacher will not even be told who is participating. (Explain why).

iv. After the first welcome message with instructions, all communication will be through a company called SurveySignal

v. Your contact information will be destroyed after you are done.

vi. Minimum requirements: Complete the first survey and at least 2 of the 5 daily surveys.

c. Study Overview. If you choose to volunteer…
    i. You will receive a series of texts or emails with links to confidential surveys. The surveys ask you about yourself, your friendships, and your social media use.
    ii. You can fill out these surveys using texting with a smartphone or using email and a computer.
        1. So if you don't have a smartphone, no problem. As long as you have an email address you can use, and you can get access to a computer once a day for a week you can participate.
        2. If you don't use social media, that's great. I need comparisons.
d. The process
    i. After you return your consent form, you will receive a link to verify your mobile number or email address. This must be responded to by Friday midnight.
    ii. The first survey will be filled out over the weekend. This will take 20-30 minutes to complete.
    iii. Five short surveys will be taken Monday - Friday the following week. These can be done any time between 6:30 and midnight each evening. Each will take 5-7 minutes to complete.
    iv. Additional reminder messages will be sent to help you remember to complete your surveys.
e. I'll be back in 2 weeks
    i. I'll tell you the details of what I'm trying to learn
    ii. I'll share with you the results
    iii. You can ask any questions
    iv. Participants who complete the first survey and at least 2 of the 5 daily surveys will receive a $7 gift card to Starbucks, Subway, or McDonalds

V. Next Steps
a. Take your packet home. Two forms: one for a parent and one for you. Both must be signed
b. Return **by Friday** to office. (Explain why)
c. You'll get an introduction information text/email on Friday, and a verification message Friday evening.