9-25-2024

Child Technology Use during the COVID-19 Pandemic: A Longitudinal Study

Disha Rawal
University of Windsor

Child Technology Use during the COVID-19 Pandemic: A Longitudinal Study

By

Disha P. Rawal

A Thesis
Submitted to the Faculty of Graduate Studies
through the Department of Psychology
in Partial Fulfillment of the Requirements for
the Degree of Master of Arts
at the University of Windsor

Windsor, Ontario, Canada

2024

Child Technology Use during the COVID-19 Pandemic: A Longitudinal Study

by

Disha Pooja Rawal

APPROVED BY:

____
D. Kane
Faculty of Nursing

____
R. Menna
Department of Psychology

____
K. Babb, Advisor
Department of Psychology

September 9, 2024

DECLARATION OF ORIGINALITY

I hereby certify that I am the sole author of this thesis and that no part of this thesis has been published or submitted for publication.

I certify that, to the best of my knowledge, my thesis does not infringe upon anyone's copyright nor violate any proprietary rights and that any ideas, techniques, quotations, or any other material from the work of other people included in my thesis, published or otherwise, are fully acknowledged in accordance with the standard referencing practices. Furthermore, to the extent that I have included copyrighted material that surpasses the bounds of fair dealing within the meaning of the Canada Copyright Act, I certify that I have obtained a written permission from the copyright owner(s) to include such material(s) in my thesis and have included copies of such copyright clearances to my appendix.

I declare that this is a true copy of my thesis, including any final revisions, as approved by my thesis committee and the Graduate Studies office, and that this thesis has not been submitted for a higher degree to any other University or Institution.

ABSTRACT

During the COVID-19 pandemic, government-mandated lockdowns led to a rise in technology use, and they also significantly impacted children's social interactions. Technology use can be categorized as process-oriented (i.e., using technology for non-social purposes) or social-oriented (i.e., using technology to communicate with others). As part of a larger investigation on children's mental health during the pandemic, this study investigates how children in Southwestern Ontario, ages 8-13, used technology during the pandemic and its impact on mental health and social support. Reports from 178 caregiver and 147 children, assessing demographics, virtual school attendance, child technology use, social support, family stress, and mental health, were collected monthly from June 2020 to January 2021 and again in March 2021.

Fluctuations in technology use, particularly computer use, were observed. Children who attended school virtually for majority of the study period reported engaging in greater amounts of technology use than those who attended virtual schooling less often. Children who reported lower friend social support engaged in higher levels of technology use across time; however, they engaged in social-oriented technology use less than other technologies. TV, internet, video game, and computer use was greater for children who reported lower friend social support. Additionally, perceived social support, particularly family support, predicted lower levels of anxiety, depression, and PTSD symptomatology, while social media use predicted higher levels of these internalizing symptoms. Overall, the findings suggest that technology use was multifaceted across the early pandemic. Children appeared to engage in greater amounts of distraction-based technology use, which may have been a helpful strategy for coping with stress of an uncontrollable event, such as a global pandemic. On the other hand, social-oriented technology use did not appear to have strong effects across the early pandemic.

Keywords: COVID-19, children, technology use, social support, virtual school, mental health.

DEDICATION

I would like to dedicate this thesis to Neha, Priya, Krrisha, Maanya, Shivani, Kareena, Riya, and Dhruv Rawal.

ACKNOWLEDGEMENTS

Firstly, I'd like to thank my research supervisor, Dr. Kim Babb, for her support throughout this project. Thank-you for the long days and late nights, getting me to where I am today. I am so grateful to have your support. Thank-you to my committee members, Dr. Rosanne Menna and Dr. Debbie Kane, for your insightful feedback and support. I appreciate your help in making this project a success. Additionally, I would like to thank Dr. Lance Rappaport, Dr. Rosanne Menna, and Dr. Kim Babb for allowing me to work with this dataset for my thesis. I have always had an interest in the ways that we engage with technology, and it has been such a pleasure to pursue my academic interests with your support.

Importantly, I would like to thank the people who kept my head straight while working on this project. To my parents and sister, who always offer a helping hand when I feel stuck, and to my friends, Michelle, Kenzie, Tayo, Harpreet, Emma, and Morgan, who always know how to make me feel better, thank you immensely for your never-ending support. Every FaceTime, every text, every late-night visit has helped me keep pushing to get to where I am today. Thank you.

Preliminary analyses investigating child reports of technology use during the early COVID-19 pandemic were presented at the Canadian Psychology Association Annual Convention on June 21st, 2024.

This study was supported by funding support from the Government of Ontario Ministry of Health and Long-Term Care COVID-19 Rapid Response Fund, the WE-SPARK Health Institute, and the University of Windsor. The views expressed in the publication are the views of the authors and do not necessarily reflect those of the Province of Ontario.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

Introduction

Online interactions are a major component of a child's social world. Ontario youth spend an average of 7.5 hours per day looking at a screen, whether it be for finishing homework, chatting with friends, or playing video games, and between 83% to 87% of Canadian youth use a smartphone, daily (Canadian Pediatrics Society, 2019; Statistics Canada, 2018). During the COVID-19 pandemic, government-mandated lockdowns led to a rise in technology use, and they also significantly impacted children's social interactions (Seguin et al., 2021, Rappaport et al., 2023).

Technology use can be categorized as *process-oriented* (i.e., using technology for non-social purposes) or *social-oriented* (i.e., using technology to communicate with others) (Song et al., 2004; Barnes, 2024). Social-oriented technology use (e.g., social media, texting) may have been an important coping strategy during the COVID-19 pandemic as children relied on technology to connect with their peers. This study aims to examine fluctuations in child technology use and their relations to mental health symptoms and perceived social support throughout the pandemic.

As part of a larger investigation on children's mental health during the pandemic, this study investigated how children in Southwestern Ontario, ages 8 to 13, used technology during the pandemic and its impact on mental health and social support. Parent and child reports from 178 families, assessing child technology use, social support, and mental health, were collected monthly from June 2020 to January 2021 and again in March 2021.

I used ANCOVAs to assess how technology use changed over time. Multiple regression analyses were used to determine relations between technology use, social support, and mental health outcomes. Findings are discussed in terms of whether social-oriented technology use can help mitigate the impact of social isolation and foster social support.

CHAPTER 2

Review of the Literature

Context of the Pandemic: COVID-19 in Ontario

COVID-19 was first reported in Wuhan, China in December 2019. Due to the virus's highly contagious nature, it quickly spread across the world, leading to a global pandemic (Zheng et al., 2020). At the outset of the pandemic, Canada implemented many public health orders to reduce the spread of COVID-19 to vulnerable populations, such as elders and those who are immunocompromised, as a vaccine had yet to be developed (Wilder-Smith & Freedman, 2020). Measures such as social distancing—alongside closures of schools, workplaces, and non-essential businesses —limited contact among community members. When infection and death rates increased, city- and province-wide lockdowns permitted only essential movement outside of the home (Wilder-Smith & Freedman, 2020).

The first case of COVID-19 in Ontario was reported on January 25, 2020 (Silverstein et al., 2020). On March 17, 2020, Ontario Premier Doug Ford declared a state of emergency during which indoor recreational facilities, libraries, daycares, bars, restaurants, theatres, and concert venues were ordered to close, and gatherings of more than 50 people were banned (Government of Ontario, 2020). One week later, non-essential businesses in Ontario were ordered to close, and schools in Ontario remained online for the remainder of the school year (Nielsen, 2020). In September 2020, students in Ontario had the option to attend classes in-person or virtually. Many school boards adopted a hybrid model (i.e., classes delivered partially in-person and online) to accommodate for outbreaks within cities and schools (Ontario Ministry of Health, 2022). Large outbreaks occurring in fall 2020 led to school closures in December 2020 (Ontario

Ministry of Health, 2022). As vaccines were made public in the summer of 2021, lockdown policies and social distancing measures started to decrease.

The present study examined child technology use within the context of the COVID-19 pandemic. The data for the present study started to be collected during the first few months of the pandemic and continued through the early months of 2021. During this period, lockdown mandates fluctuated, and vaccines were not widely available. Children experienced different types of schooling, ranging from fully virtual classes to a mix of virtual and in-person classes. Schooling depended on several factors, such as local lockdown mandates, eases in restrictions, and parental choice of their child's schooling.

COVID-19 and Social Isolation

During the COVID-19 pandemic, researchers began studying the effects of lockdown mandates on socioemotional well-being. According to Banerjee and Rai (2020), Google Trends found that the term "loneliness" peaked in searches during the pandemic in 2020. Although lockdown measures were developed to reduce COVID-19 infections and deaths, school closures — alongside stay-at-home orders, social distancing, and the cancellation of extracurriculars — meant that youth in Ontario experienced extensive periods of isolation from friends, family, and loved ones.

Virtual Schooling and Loneliness

Virtual schooling involves delivering classes through technology (e.g., Zoom, Microsoft Teams, Google Classrooms) to students physically separated from their peers and teachers (Black et al., 2020). Online classes became prevalent, particularly during the early months of the pandemic, to reduce the spread of the COVID-19 virus. Virtual schooling changed the social dynamics typically seen within schools. Schools are a social environment where children can learn to socialize by physically interacting with their same-aged peers (Wentzel, 2015), and in-person schooling offers opportunities for social development that cannot be captured through virtual schooling.

Wentzel (2015) points out several features of in-person schooling that facilitate socialization. For example, teachers and peers can be viewed as socialization agents that create social opportunities for a child in person (e.g., team sports, group classwork, collaborative seating arrangements, etc.). Social interactions can teach children about themselves and societal expectations; specifically, children learn what behaviours are considered acceptable and inappropriate in social settings. For example, children may learn about the importance of sharing materials (e.g., working on a collaborative art project and sharing scissors, glue, and crayons) and asking for help in the classroom (e.g., raising one's hand to ask for clarification about a math problem written on the board). Children also learn to attribute motivational significance to their interpersonal relationships. For example, children may learn to listen to and follow classroom instructions, so that they do not disappoint their teacher. Lastly, schools provide a setting for children to practice and reinforce skills and values learned at home (Wentzel, 2015). For instance, a child may learn to practice patience while waiting to play with a toy at school, which can be reinforced when sharing toys with siblings at home. In sum, schools are an important environment in which children learn to interact with others and develop peer relationships.

In contrast, virtual schooling makes it more challenging for children to explore complex peer relationships (e.g., problem-solving in groups). The opportunity to collaborate with peers on class projects is difficult in online settings, and as a result, teachers often relied on individual assignments for assessments during the pandemic (Hoofman & Secord, 2021). Furthermore, social events such as graduations, extracurriculars, and athletic events were difficult to organize in online settings and were often cancelled or postponed during the pandemic (Hoofman & Secord, 2021). Limiting social interactions during school does not give children the chance to practice their face-to-face social skills by socializing with their peers. Instead, children may turn to digital media, such as social media, to facilitate social interactions. This can limit their opportunity to practice their social skills face-to-face. Virtual schooling relies on the use of a camera to facilitate face-to-face interactions. The camera limits what one can view of a person, as it is typically directed at the face. This makes it difficult for children to learn nonverbal communication through body language. Additionally, some children may turn off their cameras, limiting their ability to connect with their peers through nonverbal facial expressions.

Research suggests the pandemic led to reports of greater loneliness and social isolation in children. In particular, the switch from in-person to online schooling led to increased feelings of loneliness. Larsen and colleagues (2021) investigated the impact of COVID-19-related school closure and social isolation on 442 children (M = 11.43 years) in Norway during spring 2020, compared to a pre-pandemic period (i.e., December 2017 to July 2019). The Norwegian government closed schools in March and virtual schooling was introduced. Children completed self-report measures about psychopathology (i.e., anxiety, depression), virtual schooling, social isolation, and reactivity. Researchers found that children reported feeling less sad, scared, unsafe, and angry, but reported more difficulties with sleep and concentration under COVID-19 lockdowns with home school and social isolation, compared to the pre-pandemic period. Children who reported missing their friends and worrying about contracting COVID-19 also reported higher levels of emotional reactions compared to their peers. There were no significant differences in psychopathology (i.e., depression and anxiety symptoms), however.

Given that data were collected early into the pandemic, the transition to virtual schooling may have provided children with a break from school-related worries (e.g., social and test anxiety) as children could remain at home and assignment formats were adjusted, explaining the overall decrease in emotional reactions (Larsen et al., 2021). The researchers suggested differences in somatic/cognitive reactions may be related to changes in daily routines, such as shifting wake/sleep cycles. The findings also suggest social isolation and worry about COVID-19 may have impacted child well-being.

Houghton and colleagues (2022) investigated the impact of COVID-19-related school closures on 785 children and adolescents (ranging from 10 to 17 years) in Western Australia. Data were collected across four time points: twice before the pandemic, once as schools closed due to COVID-19, and once after the reopening of schools. Participants completed self-report measures about loneliness, depression, and mental well-being. Compared to the pre-pandemic periods, researchers found significant increases in depression symptoms, other internalizing, and externalizing symptoms. They also found a significant decrease in positive mental well-being during school closures and reopening compared to the pre-pandemic period. These changes were greater for those low in initial severity. The findings suggest that social isolation due to COVID-19-related school closures adversely affected mental health and led to feelings of loneliness that persisted upon schools reopening.

Additionally, Vaillancourt and colleagues (2022) examined how in-person versus virtual schooling affected how students perceived themselves as mattering to others, such as their parents, teachers, and peers, during the pandemic in a sample of 6,578 Canadian students (ranging from grades 4 to 12). Students' perceptions that they matter to others are often enhanced in subtle ways, such as a smile from a teacher or small talk with their peers. Students were randomly assigned to a "pre-pandemic" or "pandemic" condition. Students in the "pre-pandemic" condition retrospectively reported their experiences from September 2019 to March 2020 during in-person schooling, whereas students in the "pandemic" condition reported their current experiences from September 2020 to November 2020 during virtual schooling. Researchers found students in the "pandemic" condition reported feeling like they mattered to others less than those in the "pre-pandemic" condition. Vaillancourt and colleagues (2022) suggest that the small social feedback signals people use to indicate that others matter to them are harder to read and perform in online communication compared to in-person interactions.

Overall, the research highlights the negative impact of virtual schooling during the COVID-19 pandemic on children and adolescents. Studies consistently showed that virtual schooling was perceived negatively by students, leading to increased feelings of loneliness and difficulties engaging with others in online classes. The shift to online classes deprived students of essential in-person social interactions, potentially hindering their socioemotional development and mental health.

Child Mental Health and COVID-19

In addition to loneliness as a result of school closures, there has been a documented effect of the COVID-19 pandemic on child mental health. Research suggests that the pandemic has adversely affected child mental health. For example, Ellis and colleagues (2020) investigated the impact of COVID-19 on mental health in a sample of 1,054 Canadian adolescents (ranging from 14 to 18 years) during spring 2020. Adolescents completed self-report measures about COVID-19-related stress, depression, screentime, and loneliness six months before lockdowns and over the past three weeks. The researchers found that adolescents reported increased concerns about schooling and peer relationships during the lockdown compared to the pre-pandemic period. COVID-19-related stress was associated with higher depression symptomatology, particularly for those spending more time on social media.

Mactavish and colleagues (2021) investigated the impact of COVID-19 on children's mental health by surveying 190 families with a child, aged 8 to 13, from Southwestern Ontario. Caregivers and children reported on child psychopathology, emotional distress, and social support, retrospectively, three months prior to the pandemic, as well as during the pandemic in June/July 2020. Researchers found that both caregivers and children reported worsened child psychopathology (i.e., anxiety, depression, post-traumatic stress symptomatology) and irritability during the pandemic, compared to the prior three months. Additionally, perceived social support was associated with lower symptom severity during the pandemic and an attenuated increase in psychological distress. The findings indicate a protective role of social support to mitigate the negative psychological impact of the pandemic.

There are some conflicting findings suggesting that for some, there were no differences in child mental health during the pandemic. For example, Larsen and colleagues (2021) found no significant differences in psychopathology symptoms in children during the early stages of the pandemic, compared to pre-pandemic periods. This may suggest that the pandemic did not affect mental health symptomatology. However, researchers suggested the findings may be due to the timing of data collection, as school closures may have provided children with a break from school-related worries.

Taken together, the research indicates that the COVID-19 pandemic adversely affected child mental health, leading to increased stress about school and peer relationships, worsened psychopathology, and irritability, with varying findings suggesting both negative effects and potentially mitigating factors. This emphasizes the need to take a nuanced approach to studying the effects of the pandemic on child mental health.

Fluctuations in Mental Health during the COVID-19 Pandemic

Longitudinal studies examining the effects of COVID-19 on youth mental health have shown fluctuations throughout the pandemic. Hawke and colleagues (2021) investigated emotional distress and substance use during the pandemic in 619 Ontario youth (ranging from 14 to 28 years). Data were collected bimonthly from April 2020 to October 2020. Participants completed self-report measures about mood, mental health, substance use, and COVID-19 worries. They found that mood (i.e., sadness, irritability), mental health (i.e., depression and anxiety symptoms), and worries about COVID-19 increased early in the pandemic, decreased during the summer, and increased again in autumn. The researchers suggested that returning to school in September, whether it was virtual or in-person, may have been related to reports of worsening mental health during autumn. Additionally, COVID-19 infection rates sharply increased in September 2020, which may also explain the increase in mental health concerns and worries (Hawke et al., 2021).

In addition to these fluctuations, other demographic characteristics seemed to be associated with greater adversities during the pandemic. For example, latent class analysis identified that youth identifying as female, youth living in urban/suburban areas, youth living in large households, and/or with poor baseline mental and physical health were the most likely to report worsening mental health symptoms and worries across the pandemic (Hawke et al., 2021). Substance use remained stable across time points. The findings suggest that certain individuals, such as girls, those from lower SES backgrounds, and those with pre-existing mental and physical health conditions, may have been more vulnerable to the negative mental health effects of the pandemic.

Rappaport and colleagues (2022) investigated children's mental health by surveying 319 families with a child, aged 8 to 13, from Southwestern Ontario. Families completed six monthly assessments between June 2020 through December 2021. Researchers examined caregiver and child self-report measures about COVID-19 impacts and child psychopathology. Like Hawke and colleagues (2021), they found fluctuations in mental health (i.e., anxiety, depression, post-traumatic stress symptoms) throughout the study. Specifically, elevations in local COVID-19 hospitalizations and deaths were associated with elevations in children's reported worry about contracting COVID-19 and in stress related to stay-at-home orders. These reported worries were, in turn, associated with monthly elevations in reports of children's emotional distress and mental health symptomatology (Rappaport et al., 2022).

Together, the findings demonstrate the importance of investigating the pandemic longitudinally. Differences in lockdown policies, school closures, and infection rates may have impacted child mental health during the pandemic. Additionally, stress and worry driven by the pandemic seems to have played a significant role in these negative consequences. As research has linked worries about COVID-19 to emotional distress, irritability, and mental health symptomatology in children and adolescents (Ellis et al., 2020; Larsen et al., 2021; Rappaport et al., 2022), it is important to consider factors that can mitigate the effects of stress, such as coping strategies.

COVID-19, Stress, and Coping

Lazarus and Folkman (1984) suggest that stress arises when individuals perceive that their environmental demands exceed their resources to cope with those demands. This perception triggers a series of psychological and physiological responses that are part of the sympathetic nervous system's response to stress, such as increased heart rate, sweating, and anxiety.

Global disasters, such as the COVID-19 pandemic, often invoke stress responses. Children have reported feeling stressed about the pandemic for many reasons, such as worry about themselves or a loved one contracting COVID-19, alongside stress about online schooling and stay-at-home orders (Ellis et al., 2020; Larsen et al., 2021; Rappaport et al., 2022).

Qualitative studies have provided other types of indicators of how children experienced stress during the pandemic. Abdulah and colleagues (2021) conducted an arts-based qualitative study with 15 children (ranging from 6 to 13 years) in Iraq during the pandemic in spring 2020. Researchers interviewed children about their experiences being confined at home and asked them to create a painting about their feelings, reflections, and responses to the pandemic. Researchers conducted a content analysis based on the interviews and paintings. They identified that children experienced worries about contracting COVID-19, feared for their safety when leaving home, felt depressed being confined at home, and worried about their relationships with friends and family.

O'Sullivan and colleagues (2021) interviewed 48 families to understand the experiences of children and adolescents in Ireland during the first lockdown of the pandemic. Researchers used a thematic approach to interpretative phenomenological analysis to code the interviews. They found that children felt stressed about home-schooling and independent learning expectations, COVID-19-related news, and social isolation. Together, these findings suggest children experienced stress about many different facets of the pandemic.

How people cope with stress varies, and one way they do this is through cognitive appraisal, in which individuals assess the meaning and importance of a stressor for themselves (Lazarus & Folkman, 1984). Appraisal can be influenced by a variety of factors, such as the individual's past experiences, personal beliefs, and cultural context. Research suggests that children who placed greater significance on COVID-19-related stressors experienced worse mental health outcomes (Larsen et al., 2021; O'Sullivan et al., 2021; Rappaport et al., 2022). Therefore, a person's appraisal of the pandemic can also determine their emotional and behavioral responses, as well as their choice of coping strategies.

Coping refers to the psychological and behavioural strategies that individuals use to manage or adjust to stressful situations, challenges, or life events (Folkman & Lazarus, 1980). Coping strategies can be classified into two categories: problem-focused and emotion-focused coping (Lazarus & Folkman, 1984). Problem-focused coping attempts to problem-solve or change the stressor. Examples of problem-focused coping include requesting help from others, making plans, self-regulated learning, and coordinating multiple activities (Skinner et al., 2003). In contrast, emotion-focused coping attempts to regulate one's emotional responses associated with the stressor (Lazarus & Folkman, 1984). Examples of emotion-focused coping include distracting oneself, seeking comfort from others, or avoiding the stressor (Skinner et al., 2003). Although researchers make the distinction between the two types of coping strategies, in practice, individuals often use both problem- and emotion-focused strategies to cope with a stressor (Folkman & Lazarus, 1980).

Problem-focused coping is often considered to be more adaptive than emotion-focused coping. Problem-focused coping directly targets the stressor, which often reduces stressful feelings long-term, whereas emotion-focused coping targets stressful feelings but not the stressor, itself. Thus, it is thought that emotion-focused coping only provides temporary relief from the stressor (Ben-Zur, 2009).

Ben-Zur (2009) investigated the impact of coping styles on affect in a sample of 140 adolescents (M = 16.50), 172 university students (M = 24.52), and 168 adults (M = 48.59) from Israel. Participants completed self-report questionnaires about their trait coping and affect styles. Coping was categorized as problem-focused (e.g., active coping, planning), emotion/support-focused (e.g., emotional support, ventilation), or avoidance-focused (behavioural disengagement, denial). Researchers found that problem-focused coping was associated with increased positive affect and decreased negative affect, whereas both emotion-focused and avoidance-focused coping were associated with increased negative affect. Avoidance-focused coping was also associated with decreased positive affect. Additionally, problem-focused coping moderated the effects of avoidance-focused coping on affect; engaging in problem-focused coping reduced the effect of the association between avoidant-focused coping and both positive and negative affect.

Social Support as a Coping Strategy

Social support can serve as both a problem- and emotion-focused coping strategy. According to Wills (1991), social support is the perception or experience that one is loved and cared for by others, esteemed and valued, and part of a social network of mutual assistance and obligations. While there are many forms of social support – such as informational, instrumental, and emotional -- they always involve relying on another person. Informational support involves giving another person information to better understand and deal with a stressor. Instrumental support involves directly giving someone resources for support (e.g., helping an individual move by physically assisting with packing and transporting belongings). Emotional support involves providing warmth and reassurance to another person. Additionally, social support does not need to be transactional — it can also be perceived. Knowing that another person cares about you can be enough to foster feelings of social support (Friedman, 2011). There are subtleties to social support. Individuals can have a lot of social interactions, but the support one gets may not always be positive. It's important to consider the type of social support one is receiving.

The stress-buffering hypothesis states that social support protects against the negative effects of stress (Cohen & Wills, 1985). Social support may reduce the likelihood of an individual appraising stressful situations as harmful, as they may feel their support networks can help them cope with these experiences. This, in turn, may decrease the perceived impact and physiological reaction to the stressor, protecting against negative psychological outcomes such as anxiety and depression. For example, Mactavish and colleagues (2021) found that social support was associated with less distress and reduced depression, anxiety, and irritability symptoms in children over the COVID-19 pandemic.

A Review of Child Coping Patterns

According to Zimmer-Gembeck and Skinner (2016), developmental stages influence a child's coping patterns. During infancy, caregivers play a critical role in helping infants cope by responding to their needs. For example, caregivers are responsible for feeding and comforting an infant, as they cannot act on their own accord. As children age, they gain more bodily autonomy and can act for themselves using self-regulation strategies. Children begin to use cognitive coping strategies when they begin schooling, such as distraction and problem-solving. During adolescence, meta-cognitive coping strategies, such as goal-setting and thinking about future consequences, become more common. Thus, children use a variety of strategies to cope with stressors, depending on their developmental capabilities.

Children have been shown to use a variety of problem-focused coping strategies. *Problem-solving* is a common and effective strategy that involves adjusting one's actions to effectively deal with the stressful problem (Zimmer-Gembeck & Skinner, 2016), including strategizing, planning, and requesting instrumental aid (e.g., asking for help to reach the top shelf). *Information-seeking* is another problem-focused strategy that involves trying to find sources of information about a stressor (Zimmer-Gembeck & Skinner, 2016), including reading information, observing the stressor, and asking others for information. Both problem-solving and information-seeking coping strategies tend to increase in complexity with age. For example, preschoolers will ask limited others for information while adolescents will seek information from multiple sources and integrate them together (Zimmer-Gembeck & Skinner, 2011).

There are also many emotion-focused coping strategies used by children. *Escape* involves removing oneself from the environment with the stressor (Zimmer-Gembeck & Skinner, 2016), such as behavioural avoidance (physically avoiding the stressor) and denial that the stressor is bothering them. *Accommodation* involves changing one's perception of the stressor (Zimmer-Gembeck & Skinner, 2016), including distracting oneself, minimizing the stressor, and acceptance of the stressor. *Distraction* is a more common coping strategy than avoidance in children and adolescents, as they may not have the means to leave stressful situations. Behavioural distraction is more common in younger children, whereas cognitive distraction (i.e., thinking of something else to do) is more common in older children and adolescents (Zimmer-Gembeck & Skinner, 2011).

Support-seeking is a form of social support, a common coping strategy in children. It involves using available social resources to cope (Compas et al., 2017).

Examples include seeking contact or comfort from others and asking others for information and resources. In early development, infants seek aid from their caregivers through reflexive responses and eye gazing (Zimmer-Gembeck & Skinner, 2011). Children view parents as a primary source of social support during childhood, but this gradually declines as they age; older children and adolescents tend to seek social support from their peers (Zimmer-Gembeck & Skinner, 2011). However, when put in uncontrollable situations or when in a situation with an authority figure, they will often seek a caregiver for social support.

In summary, research suggests that children's coping strategies change as they age, starting with a reliance on caregivers in infancy and progressing to self-regulation and cognitive strategies like distraction and problem-solving as they grow older. Problem-focused coping strategies, including problem-solving and information-seeking, become more sophisticated with age. Emotion-focused strategies like escape and accommodation vary, with younger children using behavioural distractions and older children employing cognitive distractions. Support-seeking transitions from caregivers in childhood to peers during adolescence; however, caregivers remain a key support during uncontrollable situations or when authority figures are involved. Overall, child coping strategies are complex and vary according to one’s developmental stage and environment.

Coping and Psychopathology

Research suggests that coping and psychopathology are bidirectionally related to each other. According to Zimmer-Gembeck and Skinner (2016), stress interferes with one’s ability to cope and to access resources, leading to the development of psychopathology. This, in turn, can lead to the later development of stress and further interfere with coping strategies.

Coping styles can influence the development of psychopathology. Evans and colleagues (2014) investigated the longitudinal relation between stress, depression, and coping in a sample of 227 children and adolescents (ranging from 7 to 17 years old) in the United States. Participants completed self-report measures and clinical interviews at four timepoints across two years. Measures assessed depression, stressful life events, and coping styles. Coping was categorized as primary control (problem-focused; social support), secondary control (emotion-focused; positive reinterpretation of stressor), and disengagement coping (emotion-focused; avoidance, distraction). Researchers found that primary and secondary coping styles were associated with lower depressive symptoms over time. Engaging in primary control and disengagement coping mediated the relationship between experiencing stress and depressive symptomatology. Researchers suggested that children who use less primary control coping and more disengagement coping during stressful events are more likely to develop depressive symptoms.

Richardson and colleagues (2020) examined the longitudinal relations between coping styles and psychopathology in a sample of 532 youth (ranging from 11 to 14 years) from Australia. Youth and caregivers completed questionnaires about youth coping and psychopathology at two time points over one year. Coping was categorized into three categories: active problem-solving (problem-focused), problem avoidance (emotion-focused), and social support seeking. Researchers found that avoidant coping at T1 predicted increases in anxiety symptoms and eating pathology at T2, whereas depression symptomatology at T1 predicted increased engagement in avoidant coping and decreased engagement in problem-solving coping. The findings suggested that avoidance-based coping patterns may play a role in maintaining psychopathology. Additionally, the researchers suggested that children may be more likely to use problem-solving strategies during controllable situations, but in cases where children do not perceive being in control, such as feeling helpless, they may be more likely to use avoidance strategies (Richardson et al., 2020).

Coping during the COVID-19 Pandemic

Many studies have examined coping styles that individuals used during the COVID-19 pandemic. For example, Minahan and colleagues (2021) investigated how coping styles during the pandemic impacted psychosocial outcomes in a sample of 1,318 adults (ranging from 18 to 92 years old) from the United States. Participants completed self-report measures about pandemic-related stress, mental health, social support, and coping styles. Coping styles were categorized as approach-focused (i.e., problem-focused coping; help-seeking) and avoidant-focused (i.e., emotion-focused coping; avoidance of stressor). Researchers found that avoidant-related coping was associated with increased depression, anxiety, and loneliness. This relates to how individuals tend to use emotion-focused coping strategies when they cannot leave the stressful situation or environment (Zimmer-Gembeck and Skinner (2016). Additionally, avoidant-related coping positively mediated the relation between stress and depression, suggesting this coping style may have been particularly maladaptive during the pandemic. In contrast, social support was associated with better psychosocial outcomes, supporting the stress-buffering hypothesis.

Further studies suggested that individuals used a range of strategies to cope with the stress of the pandemic. Fluharty and Fancourt (2021) investigated coping patterns during the pandemic in a sample of 26,016 adults (ranging from 18 to over 60 years old) from the United Kingdom. Participants completed self-report measures about coping styles, various psychosocial predictors (i.e., personality traits, mental health) and adversity predictors (e.g., COVID-19 status, financial adversities). Coping was categorized into four categories: problem-focused (i.e., planning, active coping), emotion-focused (i.e., acceptance, humour, religion, positive reframing), avoidant (i.e., behavioural disengagement, denial, substance use), and socially-supported (i.e., emotional support, instrumental support, venting) coping. Researchers found that problem-focused, emotion-focused, and socially-supported coping styles were used more frequently by women than men. Individuals with a diagnosed mental health condition were more likely to use avoidant and socially-supported coping styles. Previous research states that engaging in avoidant coping may be maladaptive, as the stressor is not changing and that may maintain negative affect (Evans et al., 2014; Richardson et al., 2020). Therefore, these findings suggest that avoidance coping may be associated with the negative outcomes of those with mental health challenges, while socially-supported coping may have been a strategy for individuals to receive help from others during the pandemic. Additionally, experiencing COVID-19 adversities (e.g., contracting COVID-19, losing loved ones to COVID-19, experiencing financial difficulties due to COVID-19) was associated with engaging in less socially-supported coping, whereas worries about these adversities were associated with engaging in a range of coping strategies (Fluharty & Fancourt, 2021). This finding suggests that individuals may feel more empowered when envisioning handling adversities compared to actually experiencing them. So, whereas individuals may have felt prepared for handling a stressor such as the

COVID-19 pandemic, individuals felt less equipped when actually experiencing the pandemic.

A common thread in the coping literature demonstrates a relation between emotion-focused coping strategies and mental health symptomatology. Mariani and colleagues (2020) examined coping strategies during the pandemic in a sample of 98 Italian adults (*M* = 39.3 years). Participants completed self-report measures about mental health, coping, and social support. Coping was categorized as task-oriented (problem-focused; attempts to solve the stressor), emotion-oriented (emotion-focused; self-oriented emotional reactions such as self-preoccupation), and avoidance-oriented (emotion-focused; avoiding the stressor). Similar to previous literature, researchers found that depressive symptomatology was associated with engaging in both emotion-oriented and avoidance-oriented coping, as well as having low scores of social support. Engaging in problem-focused coping strategies was not associated with mental health symptomatology. This suggests that emotion-focused coping may have been maladaptive for individuals coping with the pandemic.

Similar to Mariani and colleagues (2020), Cortez and colleagues (2023) examined coping strategies during the pandemic in a sample of 211 (*M* = 37.07 years) Brazilian adults. Like Mariani and colleagues (2020), they found that partaking in problem-focused coping strategies (i.e., self-monitoring emotions and behaviour, responding to adversities with self-awareness, gathering information) was associated with reports of higher quality of life and work. Additionally, engaging in emotion-focused coping strategies (i.e., feeling nervous, tense, experiencing disruptive cognitions about the future) was associated with reports of increased stress and anxiety.

Overall, research on coping during the COVID-19 pandemic consistently shows that emotion-focused and avoidant coping strategies were generally maladaptive, leading to increased mental health issues like depression, anxiety, and loneliness (Mariani et al., 2021; Minahan et al., 2021). On the other hand, problem-focused coping strategies, such as active problem-solving and seeking social support, were linked to better psychosocial outcomes and a higher quality of life (Cortez et al., 2023; Fluharty & Fancourt, 2021). Given how child coping strategies differ across developmental stages, it is important to consider how child coping patterns during the pandemic differed from adult coping patterns.

Child and Youth Coping during the COVID-19 Pandemic

Child coping patterns during the pandemic appear similar to the coping patterns of adults. Vallejo-Slocker and colleagues (2022) examined coping strategies in a sample of 1,647 Spanish children and adolescents (ranging from 8 to 18 years old) in the welfare system or in at-risk families. Participants were recruited in two waves between 2020 and 2021. Participants completed self-report measures about coping, mental health, and other psychosocial outcomes. Coping was categorized into 10 categories: distraction, social withdrawal, cognitive restructuring, self-criticism, blaming others, problem-solving, emotional regulation, wishful thinking, social support, and resignation. Researchers found the most frequently used coping strategies were cognitive restructuring and social withdrawal, both nonactive (i.e., emotion-focused) coping strategies. The use of nonactive coping strategies (e.g., self-criticism) predicted worse mental health and perceived quality of life, whereas the use of active coping strategies (e.g., problem-solving) predicted better mental health and perceived quality of life. These findings align with those found in adults (Cortez et al., 2023; Mariani et al., 2021).

Liang and colleagues (2020) also examined coping patterns at the beginning of the pandemic in a sample of 584 youth (ranging from 14 to 34 years old) in China. Participants completed self-report questionnaires about their general health, coping, and post-traumatic stress symptomatology. Coping was categorized into active coping (i.e., problem-focused) and negative coping (i.e., emotion-focused; avoidance and distraction). Researchers found that engaging in negative coping was associated with greater post-traumatic stress symptomatology, aligning with the findings of Vallejo-Slocker and colleagues (2022).

Findings of child coping patterns begin to differ from adults when looking across developmental stages. Delvecchio and colleagues (2022) investigated psychopathology and coping during the pandemic in a sample of 385 preschoolers (3 to 5 years), 739 children (6 to 12 years), and 356 adolescents (13 to 18 years) from across Europe. Parents completed measures about how their child's psychopathology and coping patterns had changed during the lockdowns. Coping was categorized into task-oriented (problem-focused), emotion-oriented (emotion-focused; sharing emotions) and avoidance-oriented (emotion-focused; distraction and avoidance) coping. Parents of preschoolers and children reported that their children were more likely to engage in emotion-oriented coping, compared to the reports from parents of adolescents. Because emotion-oriented items involved seeking attention from others and adolescents rely less on parents for emotional support, researchers suggested that this coping strategy may not have been captured from parental reports for adolescents. Overall, the findings begin to demonstrate how coping strategies may differ across development.

Additionally, Delvecchio and colleagues (2022) found that engaging in task-oriented coping was associated with fewer changes in irritable behaviour and mood across age groups. Although findings showed that avoidance-oriented coping was associated with reports of lower anxiety, genuine relief from COVID-19-related stressors was not demonstrated because this coping style was also associated with reports of increased externalizing symptoms, such as sleeping and eating patterns, which may put individuals at risk of future psychopathology.

There are mixed findings on the effects of emotion-focused coping and mental well-being in adolescents. Hsieh and colleagues (2021) investigated the impact of the pandemic on emotional well-being in a sample of 146 high school students (ranging from 9^{th} to 11^{th} grade) from the United States. Students completed self-report measures about COVID-19-related stress and coping. Coping was categorized into active coping (i.e., problem-focused) and disengagement coping (i.e., emotion-focused). Students reported feeling unfocused, anxious, and experiencing negative thoughts about the pandemic. Researchers found that students who used disengagement coping reported lower emotional distress, whereas active coping was not associated with any outcomes. These findings contradict research suggesting disengagement and avoidance increase the risk of negative psychological outcomes (e.g., Liang et al., 2020; Vallejo-Slocker et al., 2022). In response to these counterintuitive findings, the authors suggested that the results may have been due to the uncontrollability of the stressor (Hsieh et al., 2021). Emotion-focused strategies may be more effective if a stressor cannot be controlled or solved.

Conversely, problem-focused strategies may be ineffective in the face of an uncontrollable stressor, increasing emotional distress (Zimmer-Gembeck & Skinner, 2016). Therefore, emotion-focused strategies may be adaptive for some children due to the uncontrollable nature of the pandemic.

Additionally, social support has been shown to buffer the effects of stress and promote positive mental health outcomes for children during the pandemic. Mactavish and colleagues (2021) found that social support was associated with lower symptom severity and an attenuated increase in psychological distress in a sample of children, aged 8 to 13. The findings suggested that social support mitigated the negative psychological impact of the pandemic.

Further studies have shown that children used social support to cope with the stress of the pandemic. Zhu and colleagues (2021) investigated the impact of social support during the pandemic in a sample of 2,863 children and adolescents (ranging from 9 to 17 years old) in China. Participants completed self-report measures about social support, lifestyle changes, and perceived vulnerability during the pandemic. Researchers found that participants who reported higher perceived vulnerability during the pandemic also reported experiencing increased social support from friends and family. The researchers suggested that youth may be more likely to seek social support to cope when experiencing pandemic-related stress compared to coping during typical stressors during non-pandemic times.

In summary, research on children and adolescents during the COVID-19 pandemic suggest that coping patterns are similar to adults but vary depending on the developmental context and controllability of the situation. Emotion-focused and avoidant coping strategies were typically associated with worse mental health outcomes, while active coping strategies like problem-solving were associated with better mental health outcomes (Vallejo-Slocker et al., 2022). However, coping strategies differed across developmental stages, with younger children more likely to engage in emotion-oriented coping — such as seeking attention from parents — than adolescents (Delvecchio et al., 2022). Emotion-focused coping sometimes appeared adaptive due to the uncontrollable nature of the pandemic, suggesting that coping strategies' effectiveness can vary depending on the context (Hsieh et al., 2021). Social support consistently emerged as a protective factor against pandemic-related stress, highlighting its importance in promoting positive mental health outcomes for youth (e.g., Mactavish et al., 2021; Zhu et al., 2021).

Unfortunately, global disasters often disrupt external social support systems (Prime et al., 2020). Stay-at-home orders mean that youth may physically be cut off from friends and family. Given the context of the pandemic, social support could be maintained through virtual interactions (e.g., video calls, texting).

Child Technology Use

Today, online interactions are a major component of a child's social world. Ontario youth spend an average of 7.5 hours per day looking at a screen, whether it be for finishing homework, chatting with friends, or playing video games, and between 83% to 87% of Canadian youth use a smartphone, daily (Canadian Pediatrics Society, 2019; Statistics Canada, 2018). During the COVID-19 pandemic, child technology use increased. Ontario parents reported that non-school-related screen time in Ontario youth increased by more than three hours per day since the onset of COVID-19, compared to pre-pandemic periods (Seguin et al., 2021).

Nagata and colleagues (2022) identified sociodemographic correlates of different types of technology in a sample of 8753 youth (ranging from 10 to 14 years old) in the United States. Using self-report questionnaires about technology use and various sociodemographic factors (e.g., gender, race/ethnicity, household income), the researchers found that boys reported higher levels of video game use, whereas girls reported higher social media and phone use. Youth who identified as Indigenous, Black, and Latinx scored higher on all screen time measures compared to White youth. Additionally, living with a single parent was associated with higher social media use. Higher household income predicted lower screen time, but these associations were stronger for White than Black youth. The findings suggest that sociodemographic factors are associated with child technology use patterns.

Parental Reports of Child Technology Use

Studying child technology use can be tricky, as parental reports of their child's technology use may be prone to inaccuracies. Parents may unintentionally underestimate or overestimate the time their child spends using technology for numerous reasons, such as having limited awareness of what their child engages in online, or potential challenges in monitoring screen time across multiple devices (Wood et al., 2019). Additionally, children may not provide accurate information when reporting their technology use to parents (Wood et al., 2019). Understanding these factors is important for promoting a more accurate assessment of children's screen time.

Wood and colleagues (2019) explored discrepancies between parent and child reports of children's technology use in a sample of 114 families with a child, aged 9 to 11, in the United States. Children and parents completed questionnaires about the child's computer and television use. The researchers found parent and child reports were similar; however, parents reported less television use than children, particularly when children had a television in their bedroom. These findings suggest that environmental factors and ease of access to technologies may impact parental perceptions and awareness of their child's technology use.

On top of access to technology, parent-child relationship factors may also influence parental perceptions of their child's technology use. Marciano and colleagues (2020) investigated the discrepancies between parent and child reports of children's screen time in a sample of 854 families in Switzerland who had an 11-year-old child. Children and parents completed questionnaires about child screen time, parent-child communication behaviours, and relationship quality. Findings suggested that children's ease of self-disclosure (i.e., the comfort a child has in disclosing information to a parent) and secrecy behaviours (i.e., the willingness of a child to hide information from a parent) were significantly associated with parental knowledge of their child's technology use. Specifically, a high ease of self-disclosure and low secrecy behaviours were associated with greater consistency between parent and child reports of child technology use. Additionally, a positive parent-child relationship was linked to increased self-disclosure and decreased secrecy behaviours by children. This suggests that having open parent-child communication may play a role in reducing secretive technology use behaviours.

Overall, there are both environmental and family-level factors that may affect parental perceptions of child technology use.

Effects of Family Stress on Child Technology Use

Family and parental stress may play a role in a child's exposure to technology and subsequent parental reports of child technology use. Brauchli and colleagues (2024) investigated the relationship between child screen time, parental stress, and parental attitudes towards screen time in a sample of 462 families with children up to 3 years old in Switzerland. Data were collected at four time points across ten months. Participants completed questionnaires about their child's screen time, their attitudes towards screen time, and parental stress. Researchers found positive associations between parenting stress, positive parental attitudes towards screen time, and child screen time across all time points. Additionally, positive parental attitudes towards screen time were found to increase the correlation between parental stress and child screen time. The findings suggest that parents may use child screen time as a coping strategy for parenting stress. The study emphasizes the need to consider the impact of parental stress on children's technology use.

Like Brauchli and colleagues (2024), Cost and colleagues (2020) assessed the association between parental stress and child screen time in a sample of 1085 families with children, aged 18 months to 7 years, in Ontario, Canada. Parents completed questionnaires about their child's screen time, parental stress, and behaviours while eating. Results indicated that both high parenting stress levels and older child age were linked to reports of greater child screen time. Researchers suggest that child screen time, particularly during mealtimes, may be used to help families cope with parenting stress by providing parents time to rest while their child is preoccupied with eating and consuming media.

During the COVID-19 pandemic, many parents reported high levels of family stress, given the shift to virtual schooling and increased parental involvement in this schooling (Seguin et al., 2021). Katzman (2022) conducted a thematic analysis of interviews with 11 parents of children, aged 4 to 7, from Ontario, Canada to understand the relation between parenting practices and child technology use during the pandemic. She identified that parents experienced stress due to their new role as teachers during lockdowns, as well as increased stress from parenting due to spending more time at home with their children, events being cancelled, social isolation, and a general lack of support. Additionally, parents described the increase in their child's screen time and using technology as a "babysitter." For example, giving a child technology to use would allow parents time to work on other tasks or take a break. The findings align with Cost and colleagues (2020), suggesting that stress during the pandemic led parents to allow an increase their child's screen time as a way to cope with the need for increased child monitoring.

Taking a quantitative approach, Seguin and colleagues (2021) investigated the impact of parental stress and parenting styles on child screen time during the pandemic in a sample of 104 families with a child, aged 6 to 12, in Ontario, Canada. Participants completed questionnaires about their child's screen time, school closures, and parental stress. Researchers found a significant increase in children's screen time from 2.6 to 5.9 hours per day during pandemic-related school closures. Greater parental involvement was associated with fewer changes in children's screen time, whereas parental stress significantly predicted increased screen time. The findings suggested that parents used child screen time to cope with increased parental stress when children remained in the home during lockdowns. The findings align with Katzman (2022), showing the relation between parenting stress and screen time during the pandemic.

Overall, parental reports of child technology use can be influenced by factors such as challenges in monitoring screen time and ease of access to technology. Family stress, as highlighted in various studies, is associated with increased child screen time, particularly during challenging periods like the COVID-19 pandemic. These findings underscore the need for a broader understanding of child technology use, considering both child and parent factors.

Technology Use and Mental Health

It is important to understand how technology use changes over time as it may be related to other variables, such as mental health symptomatology. The link between technology use and mental health has long been debated. According to the displacement hypothesis by Kraut and colleagues (1998), the time people spend using technology may displace time that could be spent engaging in in-person social or cognitively enriching activities, and the mental health benefits of those "displaced" activities are lost. On the other hand, some argue that there is not sufficient evidence to support the effects of technology use on mental health and other factors, such as age, race, or socioeconomic factors, may better explain the relationship between technology use and mental health (Jensen et al., 2019).

Studies have investigated the effects of specific forms of technology use on mental health. Sampasa-Kanyinga and Lewis (2015) explored the association between time spent on social media use and mental health outcomes in a sample of 753 adolescents (*M* = 14.1 years) in Ottawa, Canada. Students completed self-report measures about their social media use and mental health. Researchers found that 25.2% of students reported using social media for over 2 hours daily, 54.3% for 2 hours or less, and 20.5% infrequently or not at all. Students who reported needing access to mental health services were more likely to report using social media for over 2 hours compared to those not needing access. Additionally, reports of high levels of social media use were associated with poor self-reported mental health, high levels of psychological distress, and increased suicidal ideation. The findings suggest youth in need of mental health services may turn to social media as a coping strategy for their distress. Additionally, using social media may be related to increases in mental health symptomatology.

Other studies have taken a broader approach to studying technology use, focusing on a wide range of technologies. George and colleagues (2017) investigated the effects of technology use on mental health in a sample of 151 at-risk adolescents (*M* = 13.1 years) in the United States. Participants completed self-report questionnaires about their technology use (i.e., Internet, social media, and texting), callous-unemotional traits, and mental health symptomatology. Data were collected using 30-day ecological momentary assessments and an 18-month follow-up. Similar to Sampasa-Kanyinga and Lewis (2015), researchers found that daily reports of technology use and the number of text messages sent were associated with increased symptoms of attention-deficit-hyperactivity disorder (ADHD) and conduct disorder (CD). Furthermore, reported technology use and text messaging were associated with lower self-regulation skills and increased callous-unemotional traits between the baseline and follow-up assessments. These findings suggest a potential link between technology use and adverse mental health outcomes, particularly among at-risk adolescents.

Taking a broad approach to studying technology use, Nagata and colleagues (2023) investigated the associations between screen time and disruptive behaviour disorders in a population sample of 11,875 children, aged 9 to 11 years old, in the United States. Participants completed self-report questions about their screen time (i.e., streaming TV shows or movies, streaming videos (e.g., YouTube), playing video games, texting, video calls, and social media), conduct disorder symptoms, and oppositional defiant disorder symptoms. Participants reported an average of 4 hours of total screen time per day. Each hour of social media use per day was associated with a 62% higher prevalence of conduct disorder. Additionally, exposure to more than 4 hours of total screen time per day was linked to a higher prevalence of both conduct disorder (69%) and oppositional defiant disorder (46%). These findings align with George and colleagues (2017), suggesting a potential relation between screen time and problematic externalizing behaviours.

While many are concerned about the impact of technology use on mental health, some studies argue that there is insufficient evidence to establish a clear link between the two. Jensen and colleagues (2019) investigated the association between technology use and mental health symptoms in a sample of 388 children and adolescents from the United States, ranging from 9 to 15 years old. Participants completed self-report questionnaires about their technology use (i.e., social media, cell phone use), alongside measures of internalizing and externalizing symptomatology. Data were collected using 14-day ecological momentary assessments. Contrary to other studies, researchers found that the amount of technology use reported at baseline did not predict subsequent mental health symptoms. Additionally, they did not find strong evidence to support the idea of a U-shaped relation between technology use and mental health symptoms, in which either very little or excessive use would lead to worse mental health (Jenson et al., 2019). Interestingly, even youth at a higher risk for mental health problems did not show an increased risk of experiencing these problems on days when they used technology more. Those who reported engaging in higher levels of texting also reported lower average depression symptoms. The findings contradict those of previously mentioned studies which found relations between technology use and mental health symptoms (George et al., 2017; Nagata et al., 2023). Furthermore, they suggest that using technology in a social-focused way (i.e., texting) may be beneficial for youth.

In another study demonstrating mixed findings, Vuorre and colleagues (2021) longitudinally investigated the relations between technology use and mental health in a population-based sample of 430,561 youth, aged 10 to 15 years old, in the United States and United Kingdom. Participants completed self-report questionnaires about technology use (i.e., TV, social media, video games, computer use) and mental health as a part of large-scale studies. Data were collected over 10 years across 6 time points. Researchers found that whereas overall technology use showed weaker associations with depression across time, social media use exhibited stronger associations with emotional problems. However, there was no consistent change over time in the relationship between technology use and mental health. For example, associations between technology use with conduct problems and suicidality appeared stable over time. Therefore, the findings suggested little evidence for increased associations between youth technology use and mental health over time.

Overall, findings on the associations between technology use and mental health are mixed. One reason may be that technology is a broad category encompassing many types of usage (e.g., playing video games on a computer versus reading news articles on a laptop). For example, Sampasa-Kanyinga and Lewis (2015) focused specifically on social media use while Vuorre and colleagues (2021) assessed a broad range of technologies. It may be that specific types of technology use (e.g., using social media to compare one's self to others; social comparison) may be more harmful than others (e.g., using a computer to complete homework). It is difficult to know if the results of studies focused on a specific type of technology use are transferrable to other forms of technology use. Therefore, researchers should consider ways to categorize specific uses for different types of technology.

Categorizing Technology Use

One possible approach to categorizing technology use is to differentiate between different types of usage. Process-oriented technology use involves the act of using the medium itself, mainly for non-social purposes. This can include using the internet to search for information, using a laptop to attend classes or meetings, or using the television to watch movies as entertainment. On the other hand, social-oriented use involves using technology for creating and maintaining social relationships. This can include using social media to interact with others, texting friends, and video-calling family members (Elhai et al., 2017; Song et al., 2004).

Although this distinction between process- and social-oriented technology use is not universal, it has been adapted to the context of digital media and smartphone use (e.g., Elhai et al., 2017; van Deursen et al., 2015). This differentiation in studying technology use is particularly relevant in the context of the COVID-19 pandemic, which impacted children through social isolation and lockdown procedures. Because of this, using technology for social purposes may have protected children against the effects of social isolation by fostering social support.

Social-Oriented Technology Use and Social Support

Social-oriented technology use may have the ability to facilitate social support. While the displacement hypothesis states that using technology may displace time that could be spent engaging in social activities, it does not account for situations when an individual is socially isolated (Kraut et al., 1998). According to the rich-get-richer hypothesis, time online can be seen as an extended space for socialization, during which offline connections are maintained and further developed (Valkenburg & Peter, 2007). In the absence of opportunity for in-person connection, this extension of the social world may serve an important function as a primary source of socialization. The "richness" in the theory refers to the quality of one's social relationships. The richer one's offline social supports are, the more positive one's online social support will be. In contrast, if one has poor social supports offline, they are more likely to also have poor social support in online spaces.

In their seminal study investigating the rich-get-richer hypothesis, Valkenburg and Peter (2007) explored the relationship between online communication and friendship quality in a sample of 794 youth, aged 10 to 16 years old, in the Netherlands. Researchers aimed to investigate the efficacy of the rich-get-richer hypothesis and the social compensation hypothesis (i.e., online communication may help individuals with social anxiety overcome inhibitions they face during in-person interactions). Participants completed self-report questionnaires about technology use, friendship closeness, and online communication. Researchers found positive associations between online communication and friendship quality, particularly for youth who communicated online with existing friends. They also found that youth with social anxiety engaged in less online communication, supporting the rich-get-richer hypothesis. However, youth reported perceiving the internet as important for self-disclosure which led to increased reports of online communication, supporting the social compensation hypothesis. The findings provided support for both hypotheses, in contrast to the displacement hypothesis. This suggests that online communication can be used to foster social support for those with and without social anxiety.

Building off Valkenburg and Peter's (2007) work, Desjarlais and Willoughby (2010) also investigated the relation between online communication and friendship quality in a sample of 1050 Canadian adolescents (*M* = 14.27 years at T1; *M* = 17.29 years at T2). Participants completed self-report questionnaires about technology use, online communication, and friendship quality. Data were collected when participants were in grade 9 and grade 11/12. Researchers found that there was a main effect of using computers with friends on friendship quality for girls, wherein girls who used computers reported higher friendship quality than those who did not use computers, supporting both the social compensation and rich-get-richer hypotheses. For boys, social anxiety moderated this relation, supporting the social compensation hypothesis. These results were consistent for online communication and remained stable throughout adolescence. Similar to Valkenburg and Peter (2007), the findings suggest that technology can help adolescents with social anxiety interact with their peers, fostering social support.

During the COVID-19 pandemic, individuals were unable to socialize face-to-face, leaving technology as the only method for individuals to communicate. Consistent with the rich-get-richer hypothesis, many individuals used technology to maintain offline relationships during this time period (e.g., using social media to connect with peers, texting to communicate with others; Valkenburg & Peter, 2007).

Technology Use during the COVID-19 Pandemic

Child technology use in Canada significantly increased during the COVID-19 pandemic (Li et al., 2021; Seguin et al., 2021; Barnes, 2022). Bergmann and colleagues (2022) investigated the impact of the first COVID-19 lockdown on screen time on 2,209 younger children (8- to 36-month-olds) from 12 countries. Caregivers completed questionnaires about sociodemographic factors, their toddler's screen time, and language development. Data were collected across two periods: during the beginning of the first lockdown (i.e., March 2020) and when restrictions loosened in participants' respective countries (i.e., May to September 2020). Researchers found that caregivers reported an increase in screen time for toddlers during the lockdown. This finding was more pronounced in countries with longer lockdowns, such as Canada.

Studies investigated the relationship between increased screen time during the pandemic and child mental health symptoms. Kim and colleagues (2020) assessed the relation between screen time and mental health during COVID-19 in a sample of 2,320 Canadian adolescents, aged 12 to 17 years old. Participants completed self-report questionnaires about their passive screen time (i.e., computer, tablet, cell phone use unrelated to schoolwork), depressive symptoms, and anxiety symptoms. Researchers found that adolescents with 4 or more hours of passive screen time daily were three times more likely to meet the DSM-IV-TR criteria for major depressive episode, social phobia, and generalized anxiety disorder. Active screen time did not appear to be related to depression and anxiety disorders. The findings suggest that passive screen time negatively impacted youth mental health during the COVID-19 pandemic. Previously cited studies suggest that avoidance coping was prominent in children and adolescents during the pandemic (Liang et al., 2020; Vallejo-Slocker et al., 2022). Therefore, youth may engage in passive screen time as a form of avoidance coping to escape from real-life events (e.g., watching television to avoid doing homework; Zimmer-Gembeck, 2007).

Li and colleagues (2021) also explored the association between screen time and mental health symptoms during the pandemic in a sample of 2,026 children and adolescents, aged 2 to 18 years old, in Ontario, Canada. Parents completed questionnaires about their child's technology use (i.e., TV or digital media, video games, virtual schooling, video chatting), health behaviours, and mental health symptomatology. Data were collected longitudinally from May 2020 to April 2021. Similar to Kim and colleagues (2020), researchers found that higher levels of screen time were associated with poor mental health. In younger children, increased TV or digital media time correlated with higher levels of conduct problems and hyperactivity/inattention. In older children, higher levels of TV or digital media time were associated with depression, anxiety, and inattention, whereas video game time was linked to depression, irritability, inattention, and hyperactivity. Additionally, greater electronic learning time was associated with higher levels of depression and anxiety. The findings suggest that different types of technology had differing effects on mental health symptomatology. For example, increased electronic learning time suggests children may have lacked in-person social connections, whereas increased television use may suggest that children were passively trying to pass the time or avoid real-life events, reflecting the need to understand technologies by their uses.

Given the reliance on digital media during the pandemic, children without access to technology may have been at a disadvantage compared to their peers. Metherell and colleagues (2022) investigated the impact of digital exclusion on mental health in a sample of 1,387 youth, ranging from 10 to 15 years old, in the United Kingdom. Participants completed self-report questionnaires about their access to technology and the internet, as well as psychological difficulties. Data were collected across three periods as part of a larger study: July 2020, November 2020, and March 2021. Researchers found that mental health symptoms increased early in the pandemic, peaking around November 2020, then subsequently decreased by March 2021. This inverted U-shaped relation was more pronounced among those without access to a computer, suggesting that digital exclusion is a significant risk factor for youth during periods of social isolation. Researchers suggest that stress from managing schooling during lockdowns, alongside struggles to maintain social connections during lockdowns without digital access may explain this result.

The findings suggest technology access may have been a protective factor for youth during the pandemic. This may be related to technology's ability to allow youth to communicate with their peers during periods of social isolation. Therefore, while passive forms of technology use, such as television use, were associated with poorer mental health outcomes, social-oriented technology use may have been useful for children during the pandemic.

Social-Oriented Technology Use during COVID-19

Social-oriented technology use may have compensated for the lack of in-person social interactions during the COVID-19 pandemic. According to the 'benefits model', good social relationships may contribute to well-being by promoting positive affect and reducing negative emotions (Cohen, 2004). Maintaining social relationships during the pandemic may have protected children from the negative effects of social isolation.

Kluck and colleagues (2021) explored how digital communication influenced people's adherence to physical distancing measures during the COVID-19 pandemic. They aimed to understand if using online communication could make up for the lack of face-to-face interactions during lockdowns. Participants were 301 adults (M = 31.72 years) from Germany during the first lockdown in March 2020. Participants completed questionnaires about digital communication (i.e., texting, phone calls), socioemotional factors, and social connectedness for five days. Researchers found that text-based communication (e.g., texting) indirectly increased willingness to adhere to distancing measures by enhancing feelings of social support and life satisfaction. However, longitudinal analyses found that when reported social support increased, digital communication and adherence to distancing measures decreased. This finding related to fluctuations in lockdown policies — when restrictions lessened, reports of social connectedness increased. The study challenges the notion that audio-visual communication (e.g., phone calls) can compensate for the lack of in-person interactions more than text-based communication, suggesting that general online communication can boost perceived social support. These findings also suggest digital forms of communication cannot replicate feelings of social support from offline interactions.

Studies have investigated how social-oriented technology may impact mental well-being during the pandemic. Marciano and colleagues (2023) longitudinally investigated the relations between life satisfaction and technology use during the pandemic in a sample of 764 children and adolescents ($M = 12.51$ years) from Switzerland. Participants completed questionnaires about process-oriented (e.g., "*I use electronic media to relax*," "*I use electronic media to get informed about the latest news*") and social-oriented technology use (e.g., "*I use electronic media to send messages to friends or family members*"), as well as their life satisfaction. Data were collected monthly from September 2020 to January 2021. Researchers found that children reported lower life satisfaction during the earlier months of the study before gradually increasing. Process-oriented technology use was linked to lower life satisfaction levels during earlier months of the pandemic. Social-oriented technology use was associated with less of a decline in life satisfaction during earlier months, and a steeper increase during later months. The findings suggested that during periods when in-person social interactions were limited, promoting social-oriented technology use helped individuals establish and maintain social connections, supporting the rich-get-richer hypothesis. While Kluck and colleagues (2021) suggest online interactions cannot compensate for a lack of offline interactions, Marciano and colleagues (2023) demonstrate that these online interactions can help protect against the negative effects of social isolation.

Few studies have explored social-focused technology-based coping in children during the pandemic. Barnes (2022) examined how children used technology to cope before and during the COVID-19 pandemic in a sample of 190 families with a child, aged 8 to 13, in Southwestern Ontario. Children and caregivers completed questionnaires about child technology use (i.e., television, internet, social media, texting, video games, computer use), mental health symptomatology, COVID-19 saliency (e.g., presence of COVID-19 in the household), and other socioemotional variables. Data were collected in June/July 2020, and participants provided retrospective reports of these variables 3 months before the beginning of the lockdowns. Findings showed that participants reported greater technology use after the pandemic began. Additionally, Barnes (2022) found that those who reported using technology in a problem-focused way (e.g., using technology to search for information) and a social-focused way (e.g., using technology to talk to friends) were both associated with reports of children feeling better than those who reported emotion-focused technology use (e.g., using technology as a distraction). Additionally, higher levels of child anxiety and depression symptoms were associated with higher proportions of emotion-focused technology use and lower proportions of problem- and social-focused use. These findings suggest that social-oriented technology use may have helped children feel better during the pandemic. These data reported in the Barnes (2022) study were used alongside longitudinal data for the present study.

In summary, the COVID-19 pandemic led to a significant increase in child technology use in Canada. Research highlights the link between increased technology use and adverse mental health outcomes, with different types of technology affecting mental health symptoms differently. Social-oriented technology use, in particular, appears to have played a crucial role in compensating for the lack of face-to-face interactions and mitigating the negative effects of social isolation.

Present Study

The present study investigated how children in Southwestern Ontario used technology during the COVID-19 pandemic. The study also investigated the specific impact of social-oriented technology use on mental health and perceived social support throughout the pandemic. I examined child and caregiver reports of child technology use using monthly assessments from June/July 2020 to November/December 2020, and a follow-up assessment from March 2021.

The present study builds on previous research by investigating monthly fluctuations in how youth in Southwestern Ontario used technology during the COVID-19 pandemic between June 2020 and March 2021. It is critical to apply a longitudinal, developmental lens when studying the pandemic, allowing one to capture the dynamic, non-linear factors that have impacted children (Wade et al., 2020). Additionally, categorizing technology by its use will help researchers parse the specific effects of social-oriented use on socioemotional factors during periods of social isolation.

Research Questions and Hypotheses

1. Does child technology use fluctuate across the pandemic?

I hypothesize that reports of every type of child technology use will fluctuate across the early pandemic (June 2020 to March 2021); technology use will increase when children report attending school virtually. This aligns with the rich-get-richer hypothesis, as children attending school virtually are hypothesized to use the online environment during the pandemic as an extension of their offline social world, alongside using technology for entertainment and distraction-based purposes (Valkenburg & Peter, 2007). It is important to study how technology use fluctuates across time to assess its relationship to other variables, such as mental health.

2. Is there consistency between parent and child reports of child technology use across the pandemic?

I hypothesize that parents will underestimate the amount of time children spend using technology; this may be greater when parents report higher levels of family stress. This is because parents who are preoccupied with their own stressors may pay less attention to how much technology use children are engaging in (Brauchli et al., 2024; Katzman, 2022). Consistent with this, previous research found discrepancies in reports of child and parent reports of child technology use during the COVID-19 pandemic (Barnes, 2022).

3. Is social-oriented technology use (i.e., texting, social media) associated with perceived social support over the pandemic?

I hypothesize that children who report higher levels of perceived social support over the early pandemic will engage in higher levels of social-oriented technology use; this may be greater when children report attending school virtually. This would be consistent with the rich-get-richer hypothesis, as children will use technology to maintain their social relationships virtually when they cannot interact face-to-face (Valkenburg & Peter, 2007).

4. Is technology use associated with children's mental health symptomatology across the pandemic?

I hypothesize that children's reports of higher social-oriented technology use will be associated with reports of lower mental health symptomatology (better mental health) across the early pandemic. This is based on Barnes (2022), who found that majority of children reported using technology for social purposes (e.g., talking to friends) and that social-oriented technology use was associated with reports of children feeling better. These findings are hypothesized to extend to the longitudinal data collected for this study.

CHAPTER 3

Methods

Participants

The present study used longitudinal data obtained from the "Acute and Long-Term Impact of the COVID-19 Pandemic on Children's Mental Health" study (WE-SPARK Health Institute Igniting Discovery Grant [ORS Fund # 820473], Ontario Ministry of Colleges and Universities COVID-19 Rapid Research Fund [ORS Fund # 820800]; REB # 20-123; PI: Lance Rappaport). Recruitment occurred between June and July 2020 from Southwestern Ontario via local school boards, news advertisements, and social media. Participants were required to have internet access and to be proficient in English to participate.

One caregiver and one child per family were permitted to participate in the study. Caregivers self-selected to participate in the study, and child participants were determined by the age range requested by examiners, as indicated in study advertisements. If a caregiver had 2 children within the age range, they selected one to participate in the study.

There were 375 caregivers and 321 children who completed the baseline questionnaires. The largest attrition occurred between baseline (June 2020) and Time 1 (July/August 2020), with 19.4% of caregivers and 11.5% of children not completing the follow-ups. Attrition rates were between 2.4% and 6.6% for caregivers and 0.8% and 8.5% for children between each monthly follow-up, which is expected when working with longitudinal data. Table 1 contains the number of participants who completed each follow-up.

Table 1

Number of Participants that Completed Each Follow-Up Questionnaire

	Jun/Jul 2020	Jul/Aug 2020	Aug/Sept 2020	Sept/Oct 2020	Oct/Nov 2020	Nov/Dec 2020	Dec/Jan 2021	Mar 2021
Caregiver (n)	375	302	286	267	258	251	245	237
Child (n)	321	284	272	249	240	238	236	222

Ultimately, 178 participants were included in the present study, with 178 caregivers and 147 children completing all 8 questionnaires. To preserve the most data, caregivers were included in the final sample even if the child did not complete all questionnaires. Separate analyses were conducted for caregiver and child reports of the data to limit the amount of missing data in the sample. When running analyses comparing parent and child reports, only data from both caregivers and their child were used. For the demographic characteristics of the caregivers and children, please see Tables 2 and 3.

Procedure

After providing informed consent, caregivers completed an online questionnaire about their child's demographic information, mental health, and pandemic-related activities such as technology use. Then, after providing informed assent, children completed similar self-report measures. Following baseline assessment, families completed six monthly assessments spanning from June/July 2020 to November/December 2020 (see Figure 1). During the baseline assessment, caregivers and children reported on the child's mental health and pandemic-related activities, such as technology use (i) three months before COVID-19 measures took effect (e.g., lockdown measures) and (ii) two weeks before the time they completed the survey, during the beginning of the pandemic. During follow-up assessments, caregivers and children completed reports about the time frame of two weeks before they completed the survey. In the follow-up questionnaires, participants reported less demographic information (i.e., age, sex, education level, and ancestry were not collected during follow-ups) than required from the baseline assessment. Caregivers and children completed a final follow-up assessment, with the same questions as the follow-up assessments, in March 2021, nine months after the baseline assessment. Families were compensated $12 for completing the baseline assessment and $9 for completing each follow-up assessment.

Table 2

Demographic Characteristics of Caregivers (N = 178)

	n	%	*M*	*SD*
Age			42.01 [26 - 58]	5.01
Sex				
Male	31	17.4%		
Female	147	82.6%		
Relationship				
Mother	143	80.3%		
Father	32	18.0%		
Grandparent	1	0.6%		
Stepmother	1	0.6%		
Education				
Some high school	2	1.1%		
High school diploma or GED	9	5.1%		
Some college or 2-year degree	53	29.8%		
4-year college/university graduate	74	41.6%		
Some school beyond college/university	6	3.4%		
Graduate or professional degree	33	18.5%		
Other	1	0.6%		

Table 3

Caregiver-Reported Demographic Characteristics of Children (N = 147)

	n	%	*M*	*SD*
Age	147		10.95 [8, 13]	1.25
Sex				
Male	92	62.6%		
Female	55	37.4%		
Grade				
2	1	0.7%		
3	5	3.4%		
4	18	12.2%		
5	24	16.3%		
6	25	17.0%		
7	42	28.6%		
8	30	20.4%		
9	1	0.7%		
N/A	1	0.7%		
Ancestry				
England, Ireland, Scotland or Wales	52	36.4%		
North America - not of First Nations, Native American, Inuit or Métis descent	44	30.8%		
Western Europe	24	16.8%		
Eastern Europe	32	22.4%		
Northern Europe	16	11.2%		
Middle East	11	8.3%		
Southern Europe	18	12.6%		
Eastern Asia	7	4.9%		
North America - of First Nations, Native American, Inuit or Métis descent	3	2.1%		

Hispanic or Latino descent	2	1.4%
South Asia	2	1.4%
Africa	1	0.7%
South-East Asia	1	0.7%
Unknown	3	2.1%
Youth Pre-Existing Mental Health		
Generalized Anxiety Disorder	7	4.9%
Attention-Deficit/Hyperactivity Disorder (ADHD)	6	4.2%
Learning Disorder	5	3.5%
Social Anxiety Disorder	4	2.8%
Obsessive Compulsive Disorder (OCD)	3	2.1%
Autism Spectrum Disorder	1	0.7%
Depression	1	0.7%
Intellectual Disability	1	0.7%

Figure 1

Timeline of Data Collection

Measures

CoRonavIruS Health Impact Survey (CRISIS; Merikangas et al., 2020; Nikolaidis et al., 2021)

The caregiver (110 items) and child (99 items) versions of the modified CRISIS questionnaire evaluate the impact of the COVID-19 pandemic on an individual's daily life. Alongside demographic information, the CRISIS assesses physical and mental health (e.g., "How would you rate your overall physical health?"), COVID-19 exposure (e.g., "Have you been suspected of having Coronavirus/COVID-19 infection?"), pandemic-related life changes (e.g., "Is your child attending classes in person or virtually?"), and well-being and behavioural factors, including technology use, social support, and substance use (e.g., "On average, how many hours per night did you sleep on weekdays?") (i) three months before the start of the COVID-19 pandemic and (ii) over the past two weeks. The questionnaire offers several response methods such as multiple-choice, yes/no, and fill-in-the-blank. The CRISIS was modified to include questions about technology use frequency, reasons for engaging in technology use, and how using technology made children feel (described below). The follow-up questionnaires removed questions about demographics, reasons for engaging in technology use, and how using technology made children feel.

Mactavish et al. (2021) reported high internal consistency for the modified CRISIS, pre-pandemic (α = .82 to .85) and during the pandemic (α = .90 to .88). For the original version of the CRISIS, Nikolaidis et al. (2021) reported high test-retest reliability (r = .79 to .87, p < .001), as well as good construct validity across the questionnaire domains. Previous research supports the use of the CRISIS to assess the impact of the

COVID-19 pandemic on children, ranging from 8 to 13 years old (Mactavish et al., 2021; Rappaport et al., 2022). The present study focused on the technology use, social support, and family stress domains of the CRISIS.

Technology Use

The original version of the CRISIS assesses technology use via television, social media, and video game use. This measure does not account for the emotional salience of technology use or additional forms of technology such as texting, internet use, and general computer use. Therefore, the modified CRISIS used in the present study expanded on the types of technology by assessing six technology types (i.e., television, internet, social media, texting, video games, and computer use). Respondents rate the frequency (i.e., *no use, under 1 hour, 1 to 3 hours, 4 to 6 hours, more than 6 hours*) of each type of technology use (i) three months prior to the start of the COVID-19 pandemic during baseline assessment and (ii) over the past two weeks during baseline and follow-up assessments.

Technology-Based Coping Strategies

The present study categorized process-oriented and social-oriented technology use based on the findings of Barnes (2022). Using Folkman and Lazarus' (1980) definitions of coping strategies, Barnes (2022) coded reasons for technology use as problem-focused (i.e., *to seek information about COVID-19, to keep up with schoolwork, to keep in touch with friends, to keep in touch with family, and to meet new people*) and emotion-focused coping (i.e., *to reduce worry, to distract themselves, to reduce feelings of loneliness, to pass the time*). The problem-focused category was further split into social problem-focused (i.e., *to keep in touch with friends, to keep in touch with family, and to meet new* *people*) and non-social problem-focused coping (i.e., *to seek information about COVID-19, to keep up with schoolwork*) to elucidate the impact of social-focused technology use during the pandemic.

Barnes (2022) found that both children and caregivers reported that social media and texting were mainly used for social problem-focused coping, computers were mainly used for non-social problem-focused coping, and the internet, video games, and television were mainly used for emotion-focused coping. Given that this study is an extension of Barnes (2022), I defined social-oriented technology use as texting and social media use, and process-oriented use was defined as internet, video games, television, and computer use.

Ultimately, I chose to analyse each technology type separately, as research demonstrates that technology use is multifaceted and can be used in many different ways (Vuorre et al., 2021). Using a two-factor categorization for social-oriented technology use (i.e., analyzing texting and social media use separately) allows for comparisons between two technologies that are primarily used in social-oriented ways, but may differ in other ways. For example, social media can also be used in a distraction-based way, rather than to communicate with friends (Barnes, 2022). To preserve the subtleties of different technology uses, I chose to analyse them separately.

Social Support

The child version of the CRISIS contains four items assessing social support systems (i.e., family, friends) in the child's life (i.e., "When I needed help doing something, I could count on my family/friends to help me," "When I was sad, worried, or in a bad mood, I could count on my family/friends to help me feel better"). Children rate their agreement with each item on a five-point Likert-type scale ranging from 0 (*strongly disagree*) to 4 (*strongly agree*), based on their experience in the last two weeks across each time point. There are no comparable items on the parent version of the CRISIS.

Social support was divided into family and friend support to capture the nuances of support during the pandemic — while caregivers could interact with their children in the home, it may have been more difficult for children to receive support from their friends due to school closures and lockdowns. To calculate scores, the sum of two questions pertaining to each type of support was used to develop a perceived social support score for family and perceived social support score for friends. Higher scores indicated greater perceived social support.

Family Stress

The caregiver version of the CRISIS contains two items assessing family stress based on their experience in the last two weeks across each time point. On the first item, "*Has the quality of the relationships between your child and members of his/her family changed,"* caregivers rate their answer on a five-point Likert-type scale ranging from 0 (*a lot worse*) to 4 (*a lot better*). On the second item, "*How stressful have these changes in family contacts been for your child,"* caregivers rate their answer on a five-point Likert-type scale ranging from 0 (*not at all*) to 4 (*extremely*). There were comparable items on the child version of the CRISIS, but the aim of the hypothesis was to understand how caregiver perceptions of family stress impact their ability to report their child's technology use. Therefore, I chose to analyse caregiver reports of family stress. To calculate scores, I reverse-coded the first item then summed the items to develop a family stress score. Higher scores indicated greater perceived family stress.

Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997)

The parent and child versions of the SCARED are 41-item questionnaires that evaluate symptoms related to anxiety disorders in children and adolescents. This includes somatic/panic anxiety (e.g., parent version: "My child gets frightened for no reason at all" or child version: "I get really frightened for no reason"), general anxiety (e.g., "My child is nervous" or "I am nervous"), separation anxiety (e.g., "My child doesn't like to be away from his/her family" or "I don't like being away from family"), and social anxiety (e.g., "My child feels shy with people he/she doesn't know well" or "I'm shy with people I don't know well"). Items that assess school avoidance were omitted due to the provincial closure of schools (Rappaport et al., 2022). Respondents rate their agreement with each item on a three-point Likert-type scale ranging from 0 (*not true or hardly ever true*) to 2 (*true or often true*), based on their experience in the last two weeks. A total score is obtained by adding the scores of each item. Scores greater than 25 suggest the possibility of an anxiety disorder. Total scores were computed for both caregiver and child reports at each time point. Birmaher et al. (1997) reported high internal consistency (α = .74 to .93) and test-retest reliability for the SCARED (r = .70 to .90, $p < .001$), as well as good convergent validity with similar measures (i.e., Child Behaviour Checklist, State-Trait Anxiety Inventory for Children; Monga et al., 2000). Previous research supports the use of the SCARED to assess anxiety symptom severity in children, ranging from 8 to 18 years old (Birmaher et al., 1999).

Short Mood and Feelings Questionnaire (SMFQ; Angold et al., 1995)

The parent and child versions of the SMFQ are 13-item questionnaires that evaluate depressive symptoms in children and adolescents. Specifically, both versions assess how the child has been feeling and acting in the past two weeks (e.g., child version: “I felt lonely” or parent version: “He/she felt lonely”). Respondents rate their agreement with each item on a three-point Likert-type scale ranging from 0 (*not true*) to 2 (*true*), based on their experience in the last two weeks. A total score is obtained by adding the scores of each item. Scores greater than 8 suggest a significant presence of depressive symptoms. Total scores were computed for both caregiver and child reports. Angold et al. (1995) reported high internal consistency for the SMFQ (α = .85 to .87), as well as good convergent validity with similar measures (i.e., Children's Depression Inventory, Diagnostic Interview Schedule for Children; Messer et al., 1995). Previous research supports use of the SMFQ to assess depressive symptom severity in children, ranging from 8 to 16 years old (Klein et al., 2005; Lewis et al., 2014).

Child PTSD Symptom Scale for DSM-5 (CPPS-5; Foa et al., 2018)

The parent and child versions of the CPSS-5 are 20-item questionnaires that evaluate PTSD symptoms in children and adolescents. The questionnaire was modified to focus on COVID-19 related PTSD symptoms (i.e., “Please mark the box that indicates how often the following things have bothered your child *about the virus* in the last 2 weeks”). This includes intrusion (e.g., “Having bad dreams or nightmares”), avoidance (e.g., “Not being able to remember an important part of what happened”), changes in cognition and mood (e.g., “Trouble having good feelings [like happiness or love] or trouble having any feelings at all”), and arousal and hyperactivity (e.g., “Having trouble falling or staying asleep”). Respondents rate the frequency and severity of each symptom on a four-point Likert-type scale ranging from 0 (*not at all*) to 3 (*five or more times per week; almost always*). For consistency of time frames between measures used in the study, the CPSS-5 was modified by researchers to reference the past two weeks (Mactavish et al., 2021). A total score is obtained by adding the scores of each item, with high scores suggesting greater severity of PTSD symptoms. Total scores were computed for both caregiver and child reports. Foa et al. (2018) reported moderate-to-high internal consistency (α = .63 to .92) and test-retest reliability for the CPSS-5 (r = .51 to .80, $p <$ .001), as well as good convergent validity with similar measures (i.e., Child PTSD Symptom Scale—Interview Version for DSM-5, Children's Depression Inventory, Multidimensional Anxiety Scale for Children). Previous research supports the use of the CPSS-5 to assess PTSD symptom severity in children, ranging from 8 to 18 years old (Foa et al., 2018).

CHAPTER 4

Results

Missing Data Analysis

Missing Value Analysis was used to check for missing data. Little's MCAR test was not significant, $\chi 2(5226, N = 178) = 5012.796, p = .982$, suggesting that data were missing completely at random (Tabachnick & Fidell, 2013). Listwise deletion was used for missing data during ANOVA analyses, and pairwise deletion was used for missing data in regression analyses.

Covariates

To assess for covariates in the sample, I ran a zero-order correlation matrix to determine associations between child age, child gender, and the target study variables. Child age and gender were selected as covariates because they have been found to have a relationship with technology use across the literature (Hawke et al., 2021; Nagata et al., 2022). For the target study variables, I calculated the average of each variable across eight time points to include in the correlation matrix.

Significant correlations suggested that girls had higher technology use for the following variables: caregiver reports of average computer use ($r = .280, p < .001$), caregiver reports of average internet use ($r = .252, p < .001$), caregiver reports of average social media use ($r = .256, p < .001$), caregiver reports of average texting use ($r = .240, p = .001$), caregiver reports of average television use ($r = .396, p < .001$), child reports of average internet use ($r = .250, p = .002$), child reports of average social media use ($r = .323, p < .001$), child reports of average texting use ($r = .319, p < .001$), and child reports of average television use ($r = .373, p < .001$).

Significant correlations suggested that boys had higher technology use for the following variables: caregiver reports of average video game use (r = -.277, p < .001) and child reports of average video game use (r = -.383, p < .001).

Significant correlations indicated that older children engaged in social media use (caregiver report; r = .216, p = .004), texting use (caregiver report; r = .173, p = .021), and computer use (child report; r = .189, p < .034) more than younger children. Given these findings, and because they have been used as covariates for other studies of technology use, I controlled for child gender and age in analyses involving all technology use variables.

Assumptions

I first assessed the data for potential outliers. Using Tabachnick and Fidell's (2013) guidelines, standardized scores that were +/-3.29 were considered potential outliers. There were three cases of caregiver-reported texting use at Times 6, 7, and 8, two cases of child-reported texting use at Times 2 and 4, one case of caregiver-reported SCARED scores at Time 7, three cases of caregiver-reported SMFQ scores were reported at Times 3, 6, and 7, and four cases of child-reported SMFQ scores were reported at Times 2, 5, 7, and 8. In total, I identified 10 participants with outliers in their data, with 3 participants having outliers on the same variable across time points.

Analyses were run with and without outliers. Outlier removal did not change the main overall findings from the results. Additionally, we expect to see variability and extreme scores in reports of technology use and mental health symptomatology (Seguin et al., 2021; Mactavish et al., 2022). Participants identified as outliers on texting use frequency reported engaging in texting for more than 6 hours per day. Outliers on the

SCARED and SMFQ variables reported high total scores at specific time points. I anticipated that some children may exhibit higher levels of depression and anxiety, particularly during a stressful life event such as a pandemic. As seen by Mactavish and colleagues (2022), there are fluctuations in child mental health symptomatology within the present study's sample. Although high frequencies of technology use and mental health symptomatology were not common in the sample, variability in scores is expected in the population. Ultimately, outliers were left in the dataset for the main analyses.

I assessed normality by examining histograms, skewness z-scores, and kurtosis z-scores for each variable across each time point. Skewness and kurtosis values greater than 2 were flagged for concern (Pituch & Stevens, 2016).

Skewness for caregiver reports of the SMFQ at Times 5 (2.192), 5 (2.020), and 7 (2.140) were slightly above the recommended range. Skewness for child reports of the SMFQ at Time 3 (4.299), 5 (3.948), and 6 (4.142) were above the recommended range.

Kurtosis for caregiver reports of internet use at Time 4 (2.325), texting use at Time 2 (2.617), Time 4 (2.713), Time 7 (2.334), Time 8 (2.838), SCARED at Time 4 (2.672), Time 5 (2.329), Time 6 (3.293), Time 7 (4.658), Time 8 (3.971), and SMFQ at all time points except Time 1 (ranging from 3.040 to 6.286) were above the recommended range.

Kurtosis for child reports of internet use at Time 2 (2.094), Time 4 (2.840), Time 5 (2.464), texting use at Time 1 (2.719), Time 2 (2.973), Time 4 (2.890), Time 5 (3.333), Time 6 (4.004), Time 7 (3.111), SCARED at Time 5 (2.883), Time 6 (3.030), Time 8 (2.357), and SMFQ for all time points (ranging from 4.006 to 8.330) were above the recommended range. Histograms for caregiver and child reports of the SMFQ appear to be positively skewed.

Many of the z-scores were only slightly above the cutoff, and since they were not consistently skewed, which would be expected for these variables, these findings were not a cause for concern. Because ANOVAs are typically said to be robust to this assumption, and performing transformations on selective variables is not recommended, I decided to leave the data untransformed (Pituch & Stevens, 2016).

I assessed homogeneity of variance using Levene's test of equality error variances and comparing variances between groups. Levene's test was violated for both caregiver and child reports across the majority of technology use reports at all time points for Hypothesis 1 (virtual schooling), Hypothesis 2 (high/low family stress), and Hypothesis 3 (high/low family/friend social support). ANOVAs are typically said to be robust to heterogeneity of variance when the sample sizes are equal (Pituch & Stevens, 2016). Sample sizes for Hypothesis 2 regarding family stress levels (e.g., computer use: high family stress: $n = 55$; low family stress: $n = 55$) and Hypothesis 3 about social support levels (e.g., caregiver-reported computer use: low family support: $n = 59$; high family support: $n = 47$; low friend support: $n = 52$; high friend support: $n = 54$) analyses fall within the recommended range of the largest sample size being within 1.5 times the amount of the smallest sample size, satisfying this assumption.

Sample sizes for the virtual schooling groups were highly unequal (e.g., Majority virtual schooling: $n_{parent} = 55$, $n_{child} = 42$; variable virtual schooling: $n_{parent} = 74$, $n_{child} = 62$; in-person schooling: $n_{parent} = 11$, $n_{child} = 7$). Analyses were run using these 3 groups for both caregiver and child reports, resulting in no significant differences between the variable virtual school group and the in-person schooling group. To satisfy the assumption of homogeneity of variance, I grouped the variable virtual schooling group and in-person schooling group together for the final analyses, resulting in two groups for analyses (Majority virtual schooling: $n_{parent} = 55$, $n_{child} = 42$; variable virtual schooling: $n_{parent} = 85$, $n_{child} = 69$).

I assessed sphericity using Mauchly's test of sphericity. Mauchly's test was significant for all analyses ($p < .001$), indicating that the assumption of sphericity was violated. Therefore, all repeated measures analyses used the Greenhouse-Geisser correction to correct for the violation of the assumption of sphericity (Pituch & Stevens, 2016).

I assessed homogeneity of covariance matrices using Box's test of equality of covariance matrices. Box's test was significant across all analyses, indicating the assumption of homogeneity of covariance matrices was violated ($p < .001$). Therefore, analyses with between-group comparisons should be interpreted with caution.

I assessed normality of errors by examining a plot of the residuals. The errors appeared to be distributed normally, following a linear pattern on the plot across all regressions run. Therefore, this assumption was met.

I assessed multicollinearity and singularity by looking at tolerance and variance inflation factor (VIF) for each predictor across analyses. Tolerance was greater than .10 and VIF was less than 10 for all predictors. Furthermore, there were no correlations between the predictors that were greater than 0.9. Therefore, this assumption was met.

I assessed linearity and homoscedasticity of errors by examining a plot of the residuals. Based on the plots for all regressions run, residuals fell symmetrically about the x-axis, suggesting the data were homoscedastic and linear. Therefore, this assumption was met.

I assessed independence of errors using Durbin-Watson values. Because all values were between the recommended range of 1.5 and 2.5, there is a low probability that the variables are closely related. Therefore, the assumption was met.

Main Analyses

I examined the effects of the COVID-19 pandemic on child technology use and mental health symptomatology (i.e., anxiety, depression, and PTSD) by analyzing responses from the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997), Short Mood and Feelings Questionnaire (SMFQ; Angold et al., 1995), Child PTSD Symptom Scale (CPSS; Foa et al., 2018), and modified CoRonavIruS Health Impact Survey (CRISIS; Merikangas et al., 2020; Nikolaidis et al., 2020) measured across eight time points (June/July 2020, July/August 2020, August/September 2020, September/October 2020, October/November 2020, November/December 2020, December 2020/January 2021, March 2021; refer to Figure 1 for a timeline of data collection). All analyses were conducted using Statistical Package for the Social Sciences (SPSS 28; IBM Corp). Descriptive statistics for all relevant variables are reported in Tables 4 to 7.

Table 4.

Descriptive Statistics of Technology Use Frequencies

		Child Report (N =147)		*Caregiver Report (N =178)*	
		M	*SD*	*M*	*SD*
Computer					
	Time 1	1.50	1.10	1.38	.93
	Time 2	1.16	.94	1.16	.97
	Time 3	1.42	1.10	1.44	1.07
	Time 4	1.40	.95	1.56	1.03
	Time 5	1.47	1.04	1.63	1.06
	Time 6	1.64	1.03	1.72	1.09
	Time 7	1.82	1.17	1.81	1.16
	Time 8	1.48	1.07	1.46	.99
Internet					
	Time 1	1.50	.81	1.66	.88
	Time 2	1.41	.79	1.60	.89
	Time 3	1.45	.83	1.48	.83
	Time 4	1.29	.63	1.47	.77
	Time 5	1.41	.78	1.47	.81
	Time 6	1.45	.81	1.45	.84
	Time 7	1.43	.69	1.49	.81
	Time 8	1.46	.76	1.49	.83
Social Media					
	Time 1	1.20	1.01	1.22	1.02
	Time 2	1.24	.98	1.71	.94
	Time 3	1.23	.95	1.13	.89
	Time 4	1.16	.86	1.04	.89
	Time 5	1.21	.93	1.13	.93
	Time 6	1.23	.96	1.13	.94
	Time 7	1.23	.92	1.12	.94
	Time 8	1.25	.97	1.18	.94
Texting					
	Time 1	1.12	.72	1.17	.87
	Time 2	1.18	.73	1.08	.74
	Time 3	1.14	.73	1.07	.59
	Time 4	1.20	.68	1.07	.62
	Time 5	1.16	.72	1.13	.74
	Time 6	1.22	.74	1.11	.73
	Time 7	1.20	.71	1.15	.79
	Time 8	1.21	.68	1.15	.75
Television					
	Time 1	1.71	.82	1.83	.91
	Time 2	1.67	.79	1.92	.96
	Time 3	1.66	.84	1.77	.88
	Time 4	1.60	.72	1.69	.75

	Time 5	1.61	.77	1.71	.87
	Time 6	1.65	.78	1.78	.84
	Time 7	1.61	.71	1.74	.80
	Time 8	1.69	.83	1.74	.84
Video Games					
	Time 1	1.38	1.06	1.47	1.00
	Time 2	1.34	1.05	1.48	1.02
	Time 3	1.31	1.02	1.42	1.02
	Time 4	1.33	.97	1.33	.94
	Time 5	1.27	1.00	1.35	.92
	Time 6	1.38	1.00	1.43	1.00
	Time 7	1.38	1.01	1.44	.98
	Time 8	1.35	1.02	1.45	1.04

Table 5.
Descriptive Statistics of Child Mental Health Symptomatology

		Child Report (N = 147)		*Caregiver Report (N =178)*	
		M	*SD*	*M*	*SD*
SCARED Total					
	Time 1	14.24	11.05	15.66	12.23
	Time 2	12.40	9.48	14.73	11.85
	Time 3	11.48	9.33	12.99	10.63
	Time 4	10.40	9.55	11.92	10.75
	Time 5	10.33	9.97	12.04	12.04
	Time 6	10.63	8.73	12.97	11.60
	Time 7	11.66	10.17	11.46	10.53
	Time 8	14.24	11.05	11.90	10.88
SMFQ Total					
	Time 1	4.19	4.54	4.87	4.62
	Time 2	3.73	3.89	4.32	4.55
	Time 3	3.43	3.94	3.98	4.30
	Time 4	3.29	3.80	3.53	3.95
	Time 5	3.40	3.85	3.87	4.14
	Time 6	3.85	3.70	3.90	4.14
	Time 7	3.91	3.60	3.97	4.05
	Time 8	3.97	4.00	3.77	3.86
CPSS-V Total					
	Time 1	10.14	11.12	9.89	9.64
	Time 2	9.22	9.31	9.43	9.99
	Time 3	8.65	7.75	9.19	9.43
	Time 4	7.59	7.95	8.46	10.17
	Time 5	7.16	9.46	7.90	9.91
	Time 6	7.36	8.57	9.75	11.65
	Time 7	8.78	10.32	9.12	9.36
	Time 8	8.00	8.47	8.69	9.56

Table 6.

Descriptive Statistics of Caregiver-Reported Total Family Stress on the CRISIS (N =178)

		Minimum	*Maximum*	*M*	*SD*
Family Stress					
	Time 1	0	6	2.95	1.11
	Time 2	0	7	3.21	1.33
	Time 3	0	8	2.88	1.50
	Time 4	0	8	2.98	1.27
	Time 5	1	6	3.20	1.40
	Time 6	0	7	3.44	1.42
	Time 7	0	7	3.37	1.31
	Time 8	0	8	3.34	1.42

Table 7.
Descriptive Statistics of Child-Reported Social Support on the CRISIS (N =147)

		Minimum	*Maximum*	*M*	*SD*
Family Support					
	Time 1	2	8	6.90	1.37
	Time 2	1	8	6.77	1.47
	Time 3	2	8	6.80	1.26
	Time 4	3	8	6.99	1.16
	Time 5	0	8	6.66	1.51
	Time 6	2	8	6.81	1.30
	Time 7	2	8	6.74	1.31
	Time 8	0	8	6.86	1.35
Friend Support					
	Time 1	0	8	5.56	1.90
	Time 2	0	8	5.78	1.92
	Time 3	0	8	5.94	1.93
	Time 4	0	8	6.20	1.64
	Time 5	0	8	5.92	1.83
	Time 6	0	8	5.78	1.75
	Time 7	0	8	5.83	1.73
	Time 8	0	8	6.05	1.56

Hypothesis 1

Fluctuations in Child Technology Use. I conducted a 6 (technology use type) x 8 (time) repeated measures ANCOVA for each report type (parent and child reports) to determine fluctuations in the frequencies of child technology use over time. Child Gender and age were included as covariates in the analyses. I hypothesized that reports of every type of child technology use would fluctuate across the pandemic.

There was a statistically significant main effect of technology on caregiver reports of child technology use frequency, $F(3.211, 545.879) = 10.070$, $p < .001$, $\eta^2p = .056$, as well as child reports of child technology use frequency, $F(3.143, 323.725) = 20.807$, $p = .001$, $\eta^2p = .050$.

Post-hoc tests with Bonferroni corrections were used to examine mean differences (see Figures 2 and 3). Across all time points, caregivers reported that children engaged in social media and texting significantly less than computers, internet, television (all $p < .001$), and video games ($p = .029$). Caregivers reported that children engaged in television use significantly more than all other technologies (all $p < .001$). Social media use and texting did not significantly differ ($p = .755$). Children reported engaging in texting significantly less than computers, internet, and television use (all $p < .001$). Children reported engaging in television use significantly more than internet, social media, and texting (all $p < .001$). Overall, the findings suggest that children engaged with social-oriented technologies (i.e., social media, texting) significantly less than other technologies across time points.

There is no statistically significant main effect of time on caregiver reports of child technology use frequency, $F(5.848, 994.191) = 1.321$, $p = .246$, $\eta^2p = .008$, or child reports of child technology use frequency, $F(5.537, 570.307) = 1.090$, $p = .366$, η^2p = .010, suggesting there were no specific time points where overall child technology use significantly fluctuated.

There was a statistically significant interaction between technology and time on caregiver reports of child technology use frequency, $F(17.745, 3016.567) = 1.656$, p = .041, $\eta^2p = .010$. In contrast, there is no statistically significant interaction between technology and time on child reports of child technology use frequency, $F(14.884, 1533.012) = 1.155$, $p = .302$, $\eta^2p = .011$.

Post-hoc tests with Bonferroni corrections were used to examine mean differences in caregiver-reported technology use in children (see Figure 2). At Time 1 (June 2020), caregiver-reported television use was significantly higher than all other technologies (p ranging from .015 to < .001), internet use was significantly higher than computer use (p < .001), and texting was significantly lower than all technologies (p ranging from .033 to < .001), except social media use ($p = .755$). At Time 2 (July/August 2020), computer use was significantly lower than all technologies (p ranging from .033 to < .001) except texting use ($p = 1.00$), reflecting the change in technology use during the summer months. There was a spike in social media use, wherein social media use was significantly higher than texting use ($p < .001$). At Time 3 (August/September 2020) and Time 4 (September/October 2020), caregiver-reported television use was significantly higher than all other technologies (p ranging from .015 to < .001) and texting was significantly lower than all technologies (p ranging from .013 to < .001) except social media use ($p = 1.00$). Computer use rises again at Time 5 (October/November 2020) and Time 6 (November/December 2020), reflecting the beginning of the school year. At Time

6 (November/December 2020) and Time 7 (December 2020/January 2021), computer use is significantly higher than all technologies (p ranging from .003 to < .001) except television use (p = 1.00). At Time 8 (March 2021), computer use significantly drops. Computer use did not significantly differ from internet and video game use (p = 1.00). This may represent changes in approaches to schooling. For example, more children may have been attending classes in person in March 2021 compared to December 2020.

Child gender was significantly related to caregiver reports of child technology use frequency, $F(1, 170) = 10.711$, $p = .001$, $\eta^2p = .059$. Child gender was significantly related to child reports of child technology use frequency, $F(1, 103) = 4.292$, $p = .041$, $\eta^2p = .040$, with girls engaging in more technology use than boys. Child age was not significantly related to caregiver reports of child technology use, $F(1, 170) = 2.420$, $p = .122$, $\eta^2p = .014$, or child reports of child technology use frequency, $F(1, 103) = 2.500$, $p = .117$, $\eta^2p = .024$.

Overall, the findings partially supported the hypothesis, showcasing fluctuations within certain types of technology use, such as computer use. Other technologies, such as television and texting use, remained relatively stable across time points. I did not find evidence that overall technology use fluctuated significantly across time during the early pandemic.

Figure 2.

Caregiver-Reported Technology Use Frequencies across Time

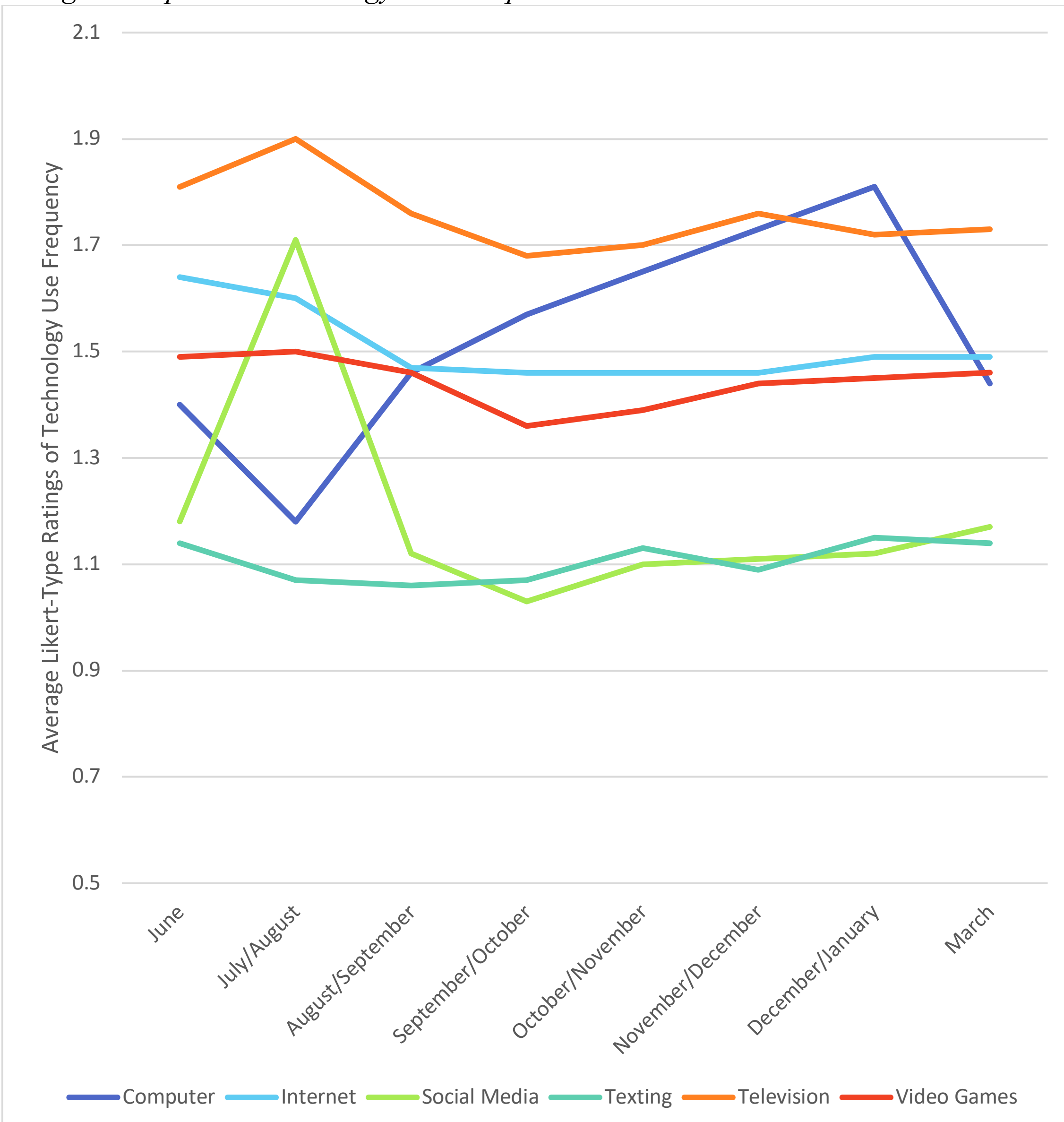
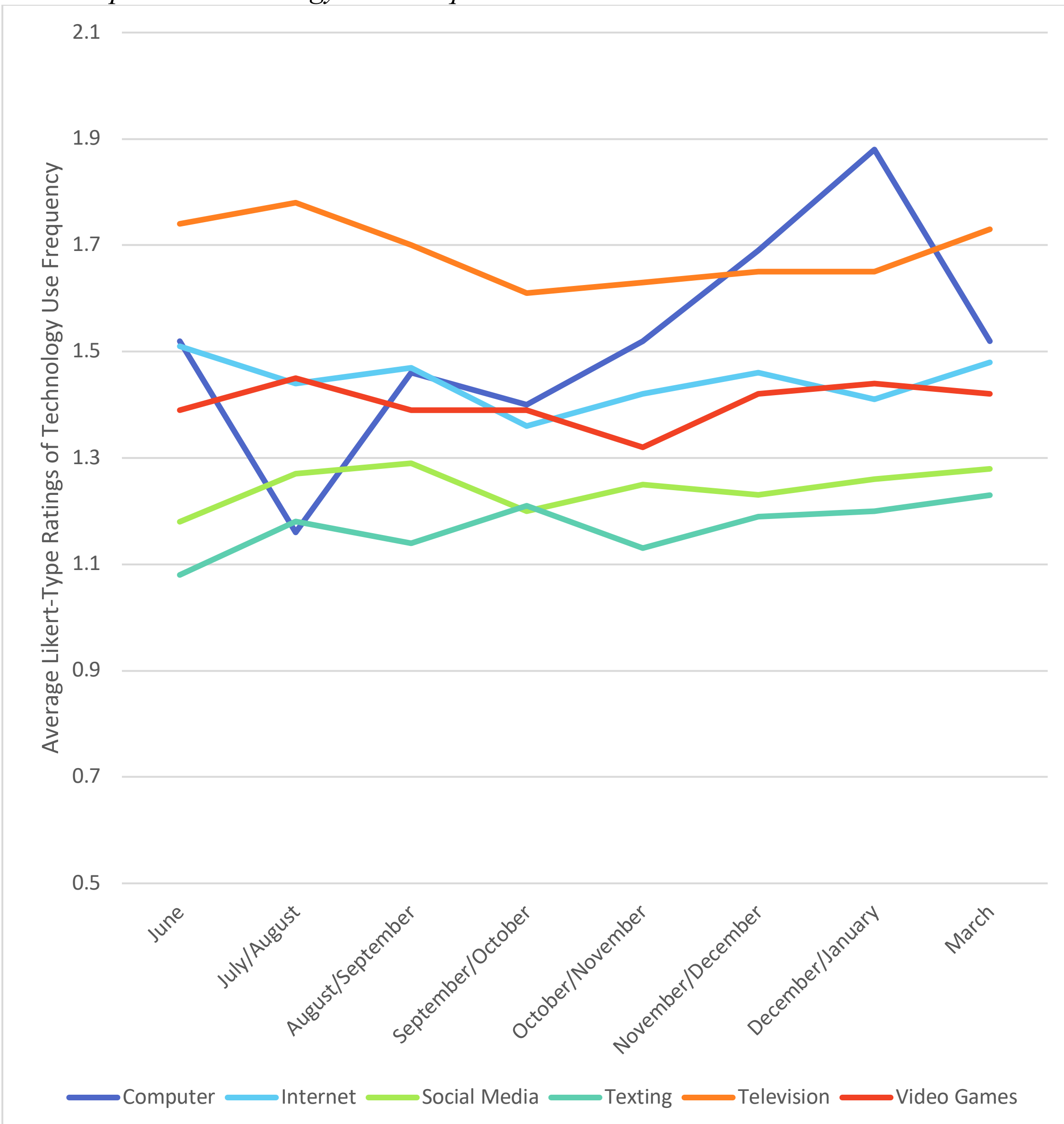


Figure 3.

Child-Reported Technology Use Frequencies across Time



Virtual Schooling. I conducted a 2 (virtual schooling) x 6 (technology) x 5 (time) mixed-factor ANCOVA to determine fluctuations in child technology use across different levels of virtual schooling. Separated analyses were run for caregiver and child reports. Child Gender and age were included as covariates in the analyses.

Five time points (Time 4, Time 5, Time 6, Time 7, Time 8) were included in the analysis as most children reported attending school (September 2020-December 2020/January 2021; March 2021). Participants were categorized into two groups based on time spent in virtual schooling: Majority virtual schooling (reported attending school virtually 3 to 5 times out of a possible 5 times during the study period; $n_{\text{parent}} = 55$; $n_{\text{child}} = 42$), and variable virtual schooling (reported attending school virtually 0 to 2 times during the study period; $n_{\text{parent}} = 85$; $n_{\text{child}} = 69$). I hypothesized that children who reported attending school virtually for the majority of time points would report greater amounts of technology use, particularly social-oriented technology use (i.e., social media and texting) and computer use.

There was a statistically significant main effect of virtual schooling on caregiver reports of child technology use frequency, $F(1, 136) = 41.102$, $p < .001$, $\eta^2p = .232$, as well as child reports of child technology use frequency, $F(1, 107) = 28.605$, $p < .001$, $\eta^2p = .211$. Across all time points and all technologies, caregivers reported that children engaged in technology use significantly more in the majority virtual schooling group than the variable virtual schooling group ($p < .001$). Similarly, children reported engaging in technology use significantly more in the majority virtual schooling group than in the variable virtual schooling group ($p < .001$). These findings support the hypothesis that children who attended school virtually engaged in greater amounts of technology use.

There was a statistically significant interaction between technology and virtual schooling on caregiver reports of child technology use frequency, *F*(3.326, 452.282) = 15.405, $p < .001$, $\eta^2p = .102$, as well as an interaction between technology and virtual schooling for child reports of child technology use frequency, *F*(3.225, 348.275) = 9.312, $p < .001$, $\eta^2p = .080$.

Post-hoc tests with Bonferroni corrections were used to examine mean differences in technology use across groups. Not surprisingly, across all time points, caregivers reported that computer use was significantly greater in the majority virtual schooling group than the variable virtual schooling group ($p < .001$; see Figure 4). Caregivers also reported significantly more internet, television, and video game use in the majority virtual schooling group than the variable virtual schooling group (all $p < .001$; see Figure 4). However, texting and social media use did not significantly differ across groups (*p* ranging from .235 to .956; see Figure 4).

Similarly, children reported that computer use was significantly greater in the majority virtual schooling group than the variable virtual schooling group ($p < .001$; see Figure 5). Children also reported significantly more internet, television, and video game use in the majority virtual schooling group than the variable virtual schooling group (all $p < .001$; see Figure 5). However, texting and social media use did not significantly differ across groups (*p* ranging from .050 to .803; see Figure 5).

There was no statistically significant interaction between time and virtual schooling on caregiver reports of child technology use frequency, *F*(3.401, 462.484) = 1.070, $p = .175$, $\eta^2p = .008$, or child reports of child technology use frequency, *F*(3.425, 366.469) = .504, $p = .507$, $\eta^2p = .005$.

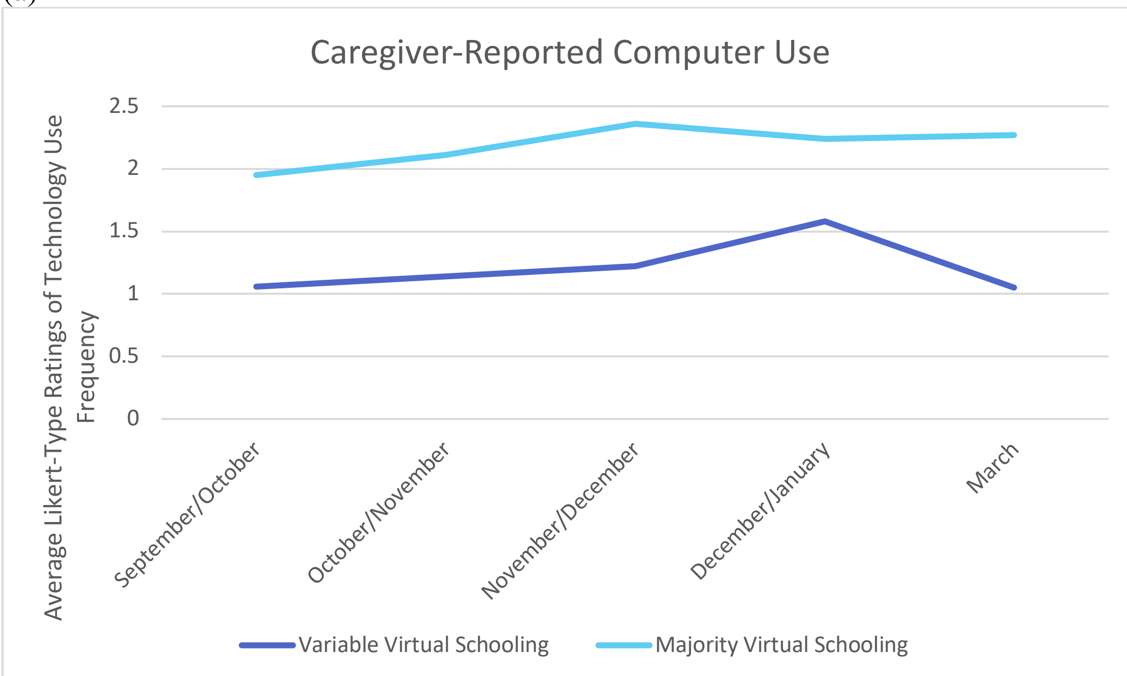
Child gender was not significantly related to caregiver reports or child reports of child technology use frequency (*F's* = 1.782 and .059, *p's* = .184 and .808, respectively). Child age was not significantly related to caregiver or child reports of child technology use frequency (*F's* = 3.398 and 1.134, *p's* = .067 and .289, respectively).

Overall, the findings partially supported the hypothesis. Overall, child technology use was greater in the majority virtual schooling group than the variable virtual schooling group. While computer use was greater in the majority virtual schooling group, no differences were observed in social-oriented technology use between groups. The findings suggest that, outside of engaging in greater computer use for virtual schooling, those who reported attending virtual schooling more frequently also engaged in more entertainment-based technology use, such as television, internet, and video game use, than those who attended in-person schooling more frequently.

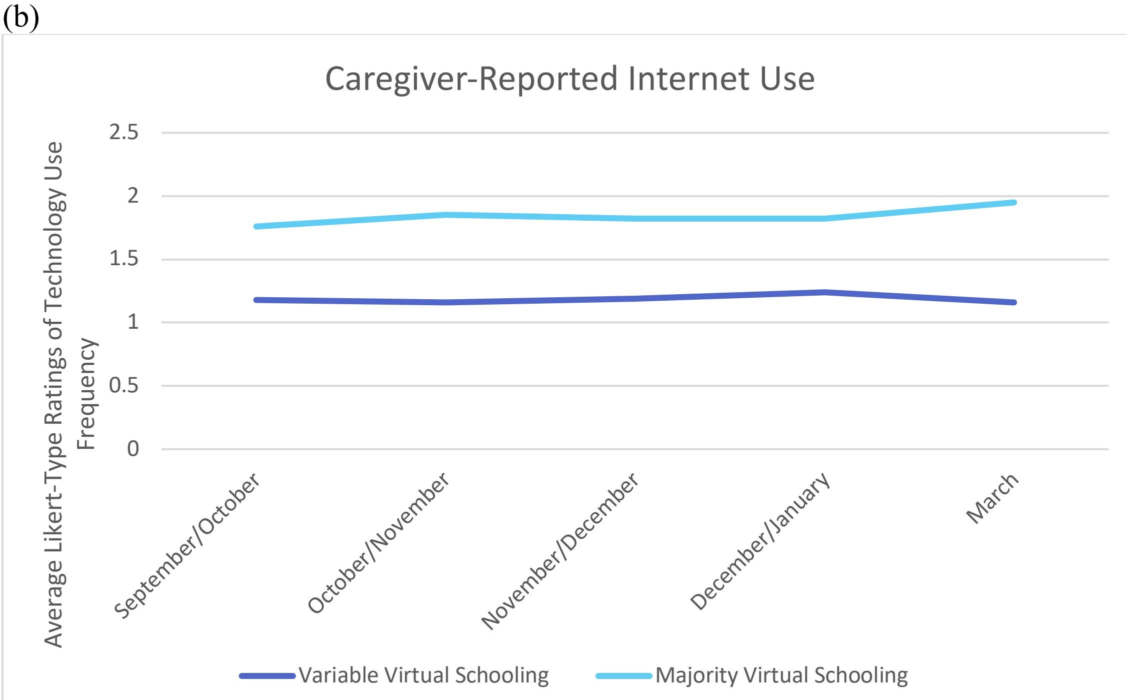
Figure 4.

Caregiver-Reported Technology Use Frequencies across Time as a Function of Virtual School Group

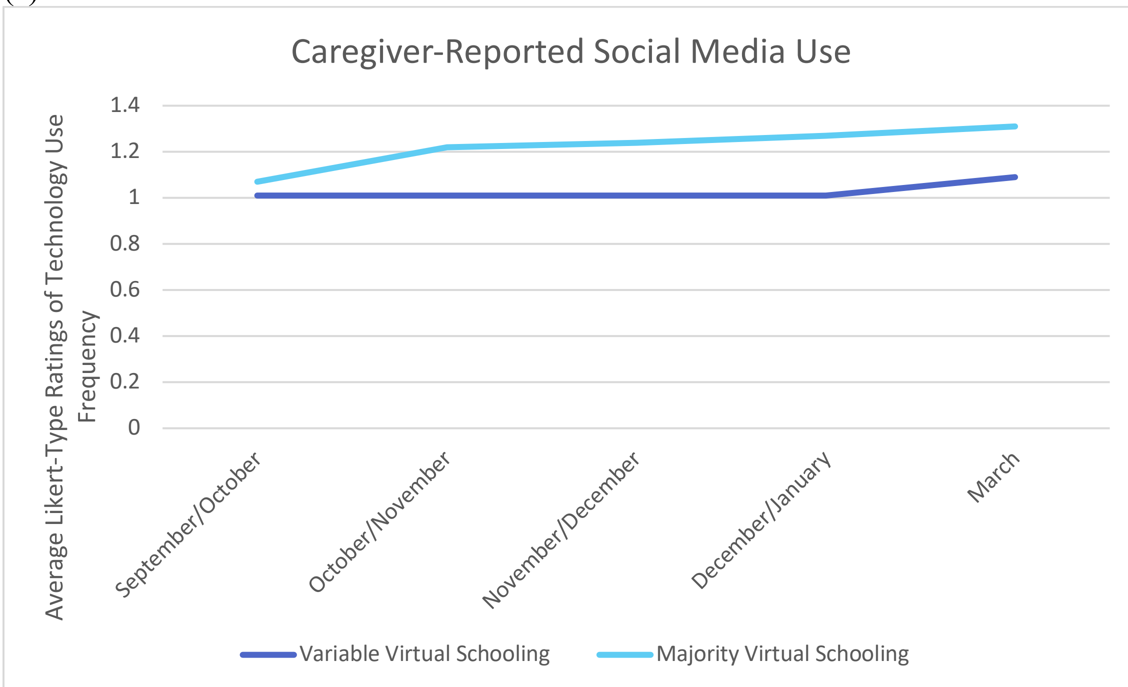
(a)



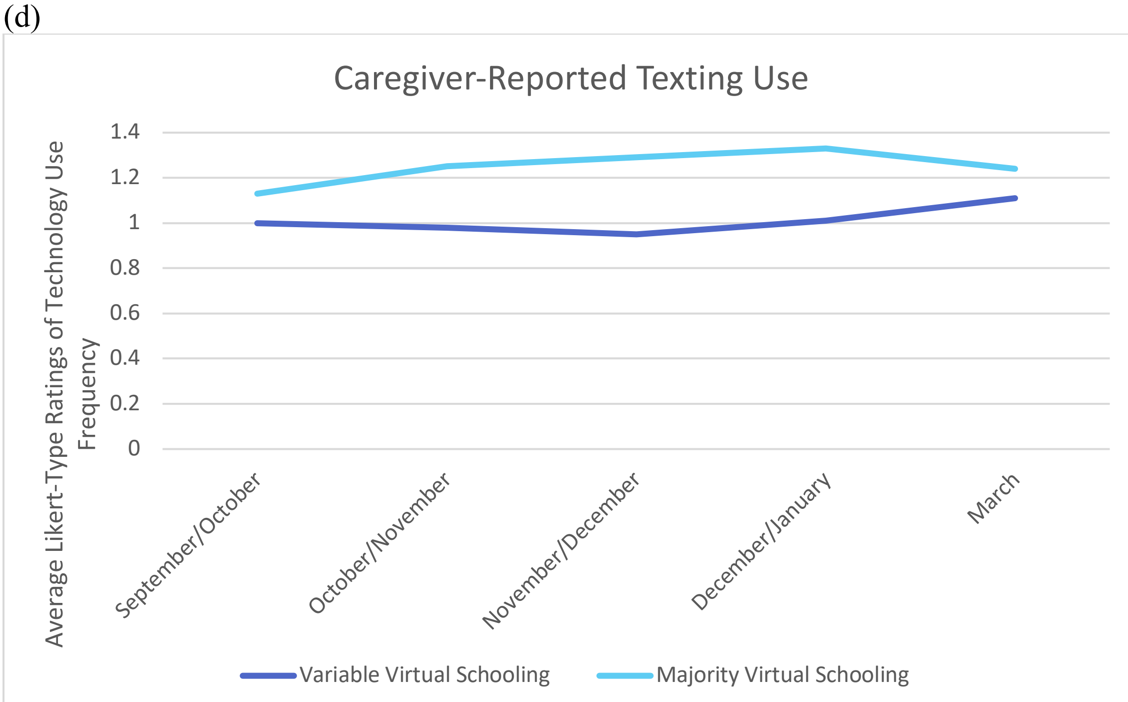
(b)



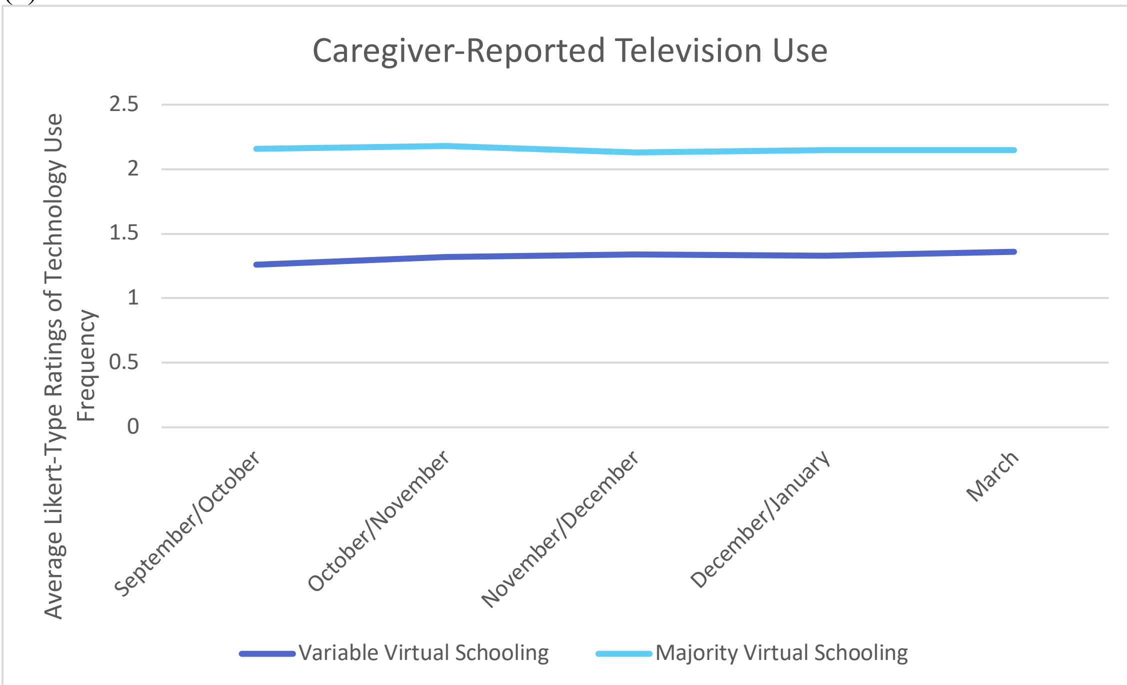
(c)


Caregiver-Reported Social Media Use
Average Likert-Type Ratings of Technology Use Frequency
1.4
1.2
1
0.8
0.6
0.4
0.2
0
September/October
October/November
November/December
December/January
March
Variable Virtual Schooling
Majority Virtual Schooling

(d)


Caregiver-Reported Texting Use
Average Likert-Type Ratings of Technology Use Frequency
1.4
1.2
1
0.8
0.6
0.4
0.2
0
September/October
October/November
November/December
December/January
March
Variable Virtual Schooling
Majority Virtual Schooling

(e)


Caregiver-Reported Television Use
Average Likert-Type Ratings of Technology Use Frequency
2.5
2
1.5
1
0.5
0
September/October
October/November
November/December
December/January
March
Variable Virtual Schooling
Majority Virtual Schooling

(f)

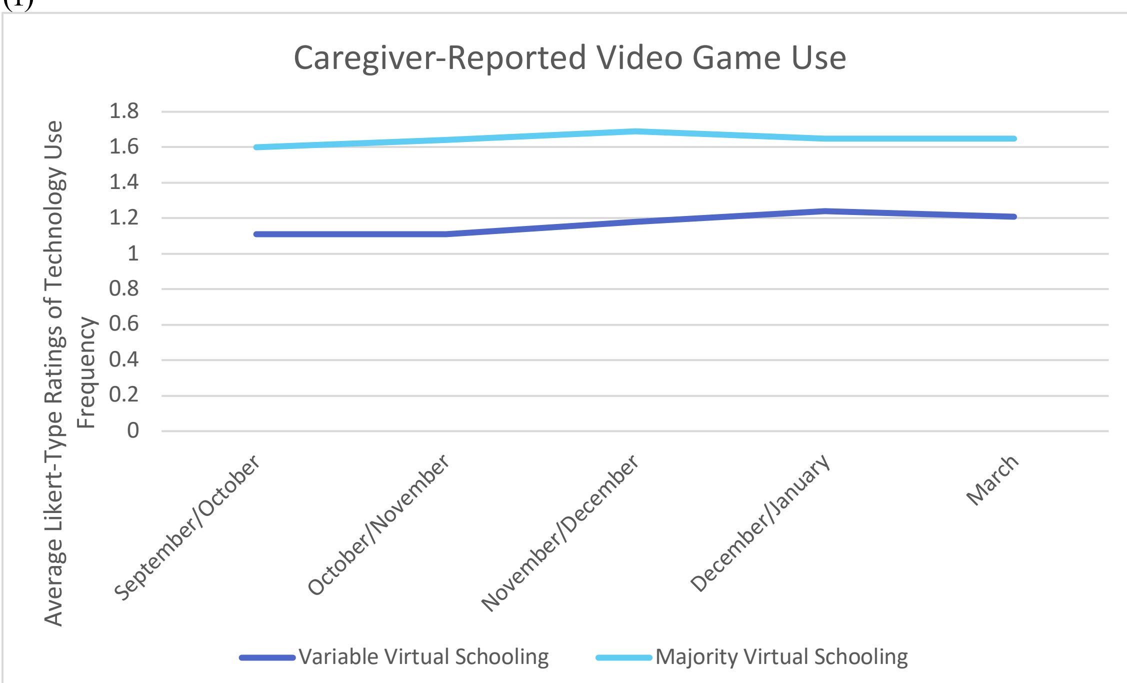
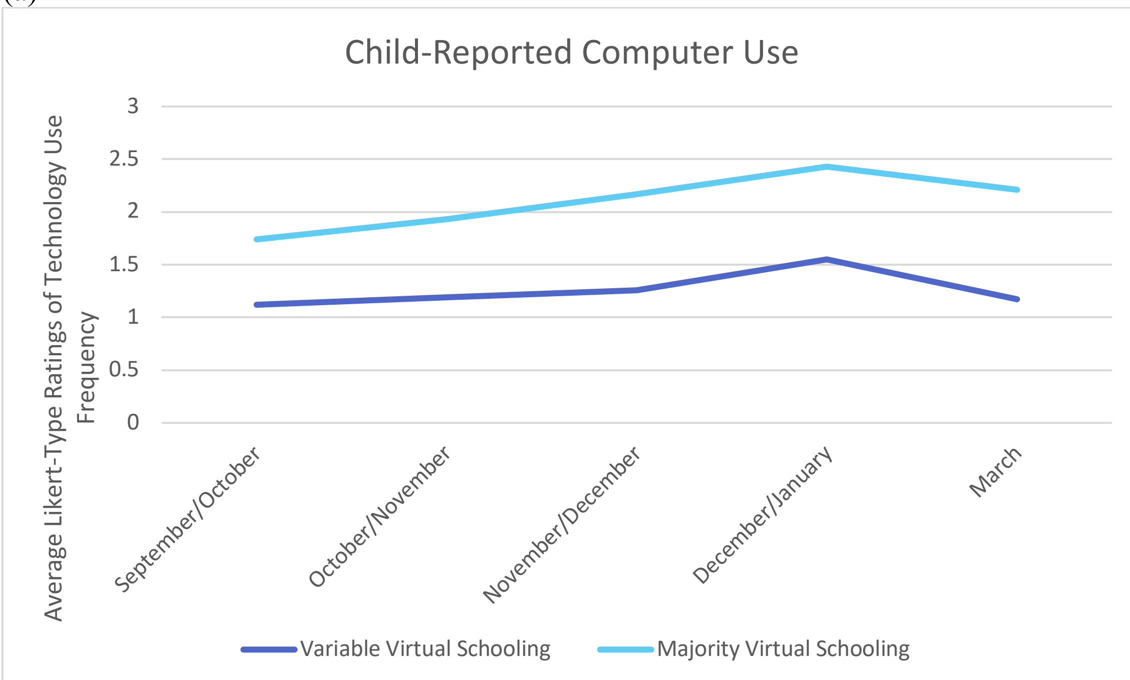
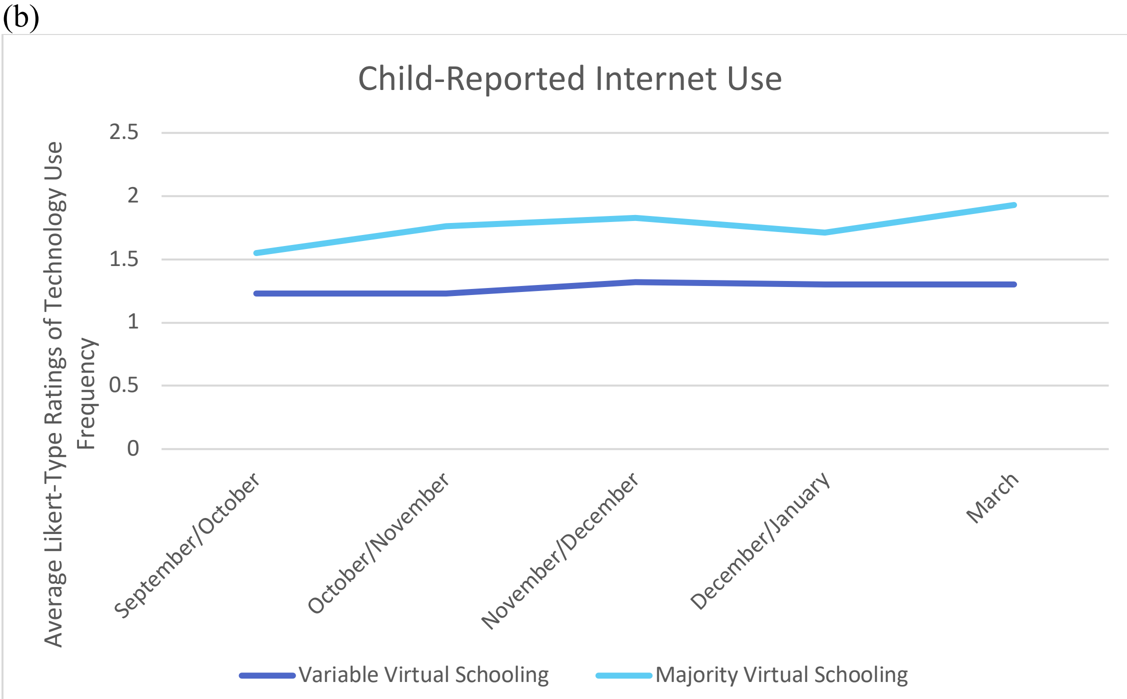

Caregiver-Reported Video Game Use
Average Likert-Type Ratings of Technology Use Frequency
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
September/October
October/November
November/December
December/January
March
Variable Virtual Schooling
Majority Virtual Schooling

Figure 5.
Child-Reported Technology Use Frequencies across Time as a Function of Virtual School Group

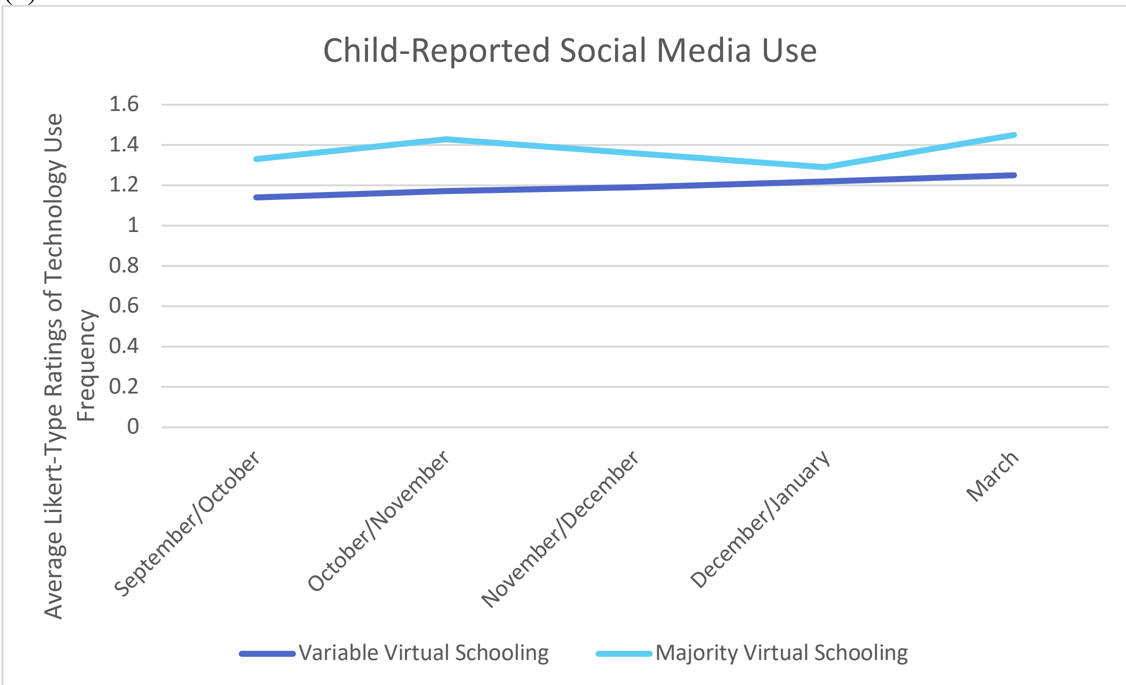
(a)



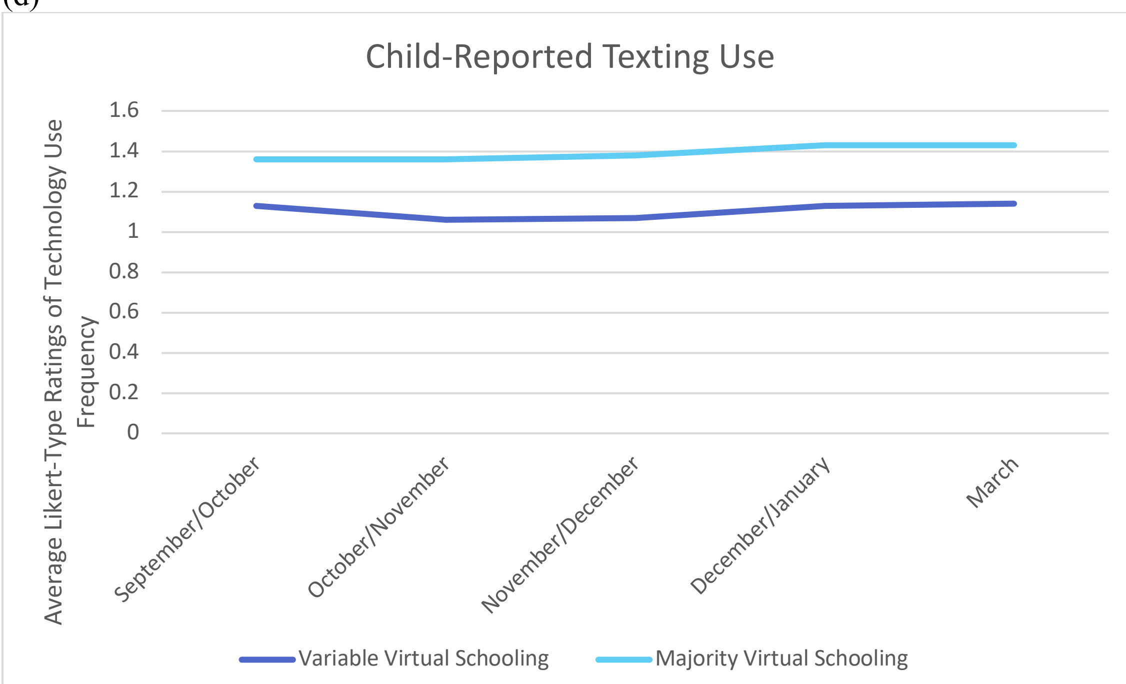
(b)



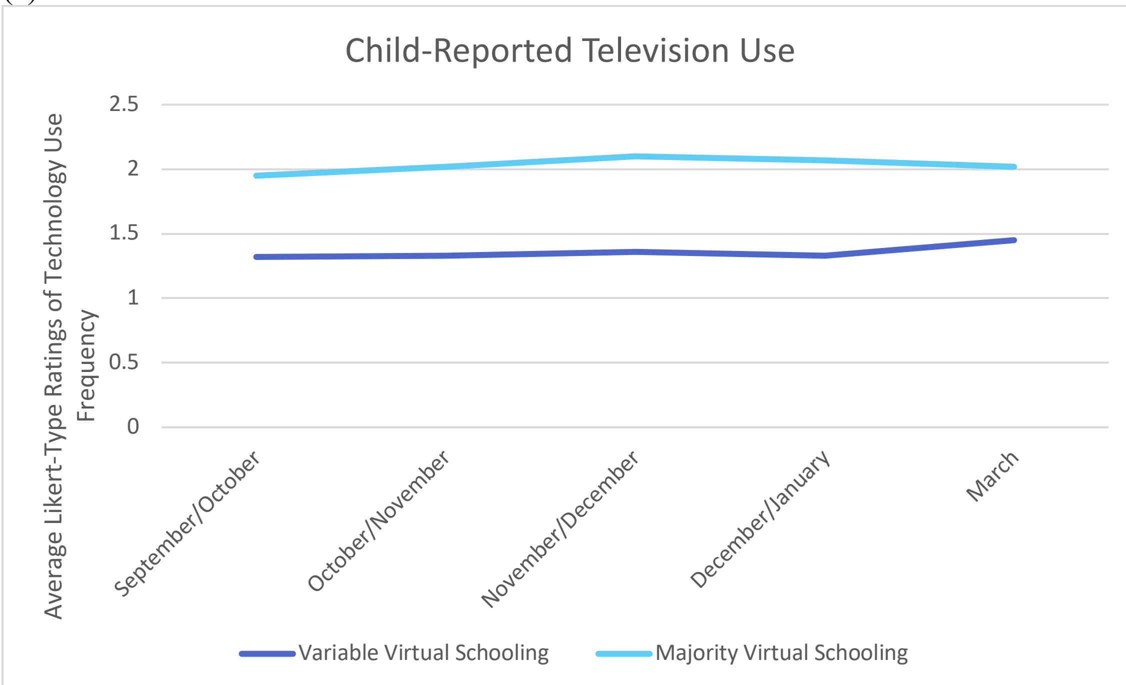
(c)


Child-Reported Social Media Use
Average Likert-Type Ratings of Technology Use Frequency
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
September/October
October/November
November/December
December/January
March
Variable Virtual Schooling
Majority Virtual Schooling

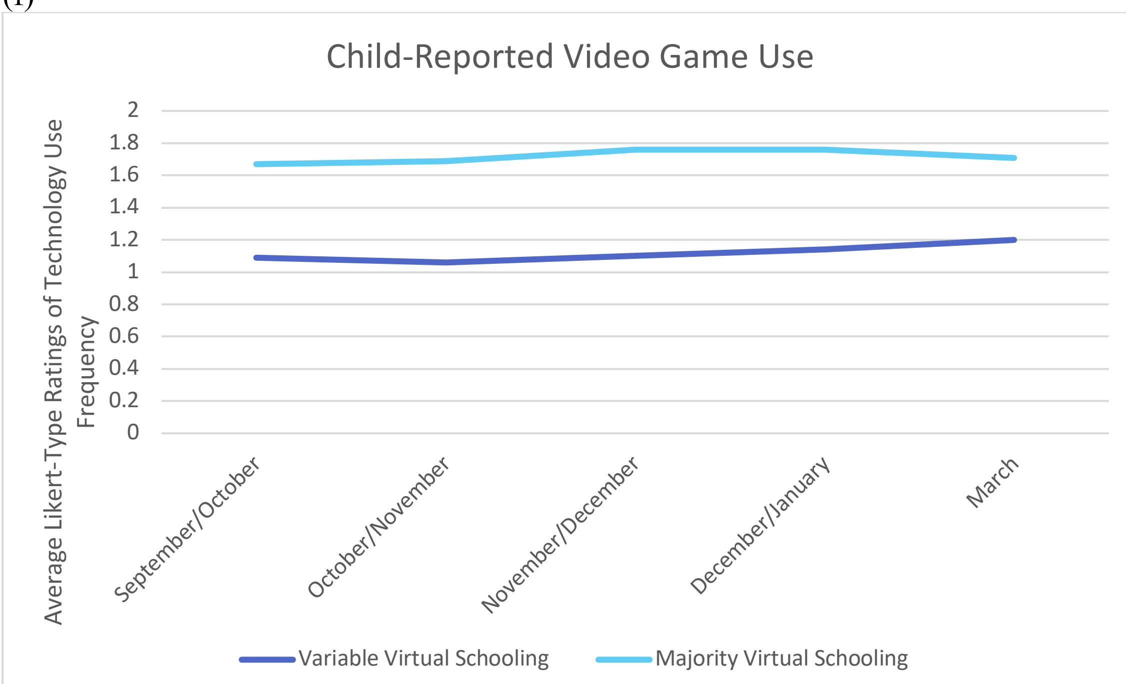
(d)


Child-Reported Texting Use
Average Likert-Type Ratings of Technology Use Frequency
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
September/October
October/November
November/December
December/January
March
Variable Virtual Schooling
Majority Virtual Schooling

(e)


Child-Reported Television Use
Average Likert-Type Ratings of Technology Use Frequency
2.5
2
1.5
1
0.5
0
September/October
October/November
November/December
December/January
March
Variable Virtual Schooling
Majority Virtual Schooling

(f)


Child-Reported Video Game Use
Average Likert-Type Ratings of Technology Use Frequency
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
September/October
October/November
November/December
December/January
March
Variable Virtual Schooling
Majority Virtual Schooling

Hypothesis 2

Fluctuations in Caregiver versus Child Reports of Child Technology Use. I conducted a 2 (report type) x 6 (technology) x 8 (time) mixed-factor ANCOVA for each technology use type to determine differences in caregiver versus child reports of child technology use over time. Child gender and age were included as covariates in the analyses. I hypothesized that caregivers would underestimate the amount of time children spent using technology.

There was no statistically significant main effect of reporter (i.e., caregiver versus child) on reports of child technology use frequency, $F(1, 100) = .208$, $p = .624$, $\eta^2p = .002$, contradicting the hypothesis. Additionally, there is no statistically significant interaction between technology and reporter on reports of child technology use frequency, $F(3.826, 382.568) = 1.062$, $p = .374$, $\eta^2p = .011$, as well as time and reporter on reports of child technology use frequency, $F(13.766, 1376.579) = 1.275$, $p = .267$, $\eta^2p = .013$. While there appeared to be a difference in caregiver versus child reports of social media use at Time 2, this was not statistically significant ($p = .758$).

As previously reported, child gender was significantly related to reports of child technology use frequency, $F(1, 100) = 4.070$, $p = .047$, $\eta^2p = .039$, with girls engaging in more technology use than boys. Child age was not significantly related to reports of child technology use frequency ($p = .171$). Overall, the findings do not provide evidence of differences in reports of child technology use frequency between caregivers and children.

Family Stress and Fluctuations in Reports of Child Technology Use. Given there were no initial differences between reporters, I chose to investigate the effects of family stress to gain a more nuanced understanding of other factors that may affect reports of child technology use. I conducted a median split to determine high versus low family stress based on average reports of family stress on the CRISIS. I used a 2 (high/low family stress) x 2 (report type) x 8 (time) repeated measures ANCOVA for each technology use type. Child gender and age were included as covariates in the analyses. I hypothesized that family stress would influence caregivers' reports of child technology use, specifically, caregivers who reported experiencing higher levels of family stress would underestimate the amount of time children spent using technology, compared to those who reported lower levels of family stress.

There was a statistically significant main effect of family stress on reports of computer use frequency, $F(1, 122) = 6.968$, $p = .009$, $\eta^2p = .054$. Across all time points and reporters, computer use was significantly greater in the high family stress group than the low family stress group (see Figure 6).

There was no statistically significant main effect of family stress on reports of internet use frequency, social media use frequency, texting frequency, television use frequency, and video game use (*F's* ranging from .709 to 3.030; *p's* ranging from .084 to .401), contradicting the hypothesis.

No statistically significant interactions between family stress and reporter were found across technologies (*F's* ranging from .029 to .789; *p's* ranging from .401 to .865), further contradicting the hypothesis. No statistically significant interactions between family stress and time were found across technologies (*F's* ranging from .544 to 1.599; *p's* ranging from .202 to .626).

Similar to previous analyses, child gender was significantly related to reports of computer use frequency, $F(1, 122) = 4.870$, $p = .029$, $\eta^2p = .038$, internet use frequency,

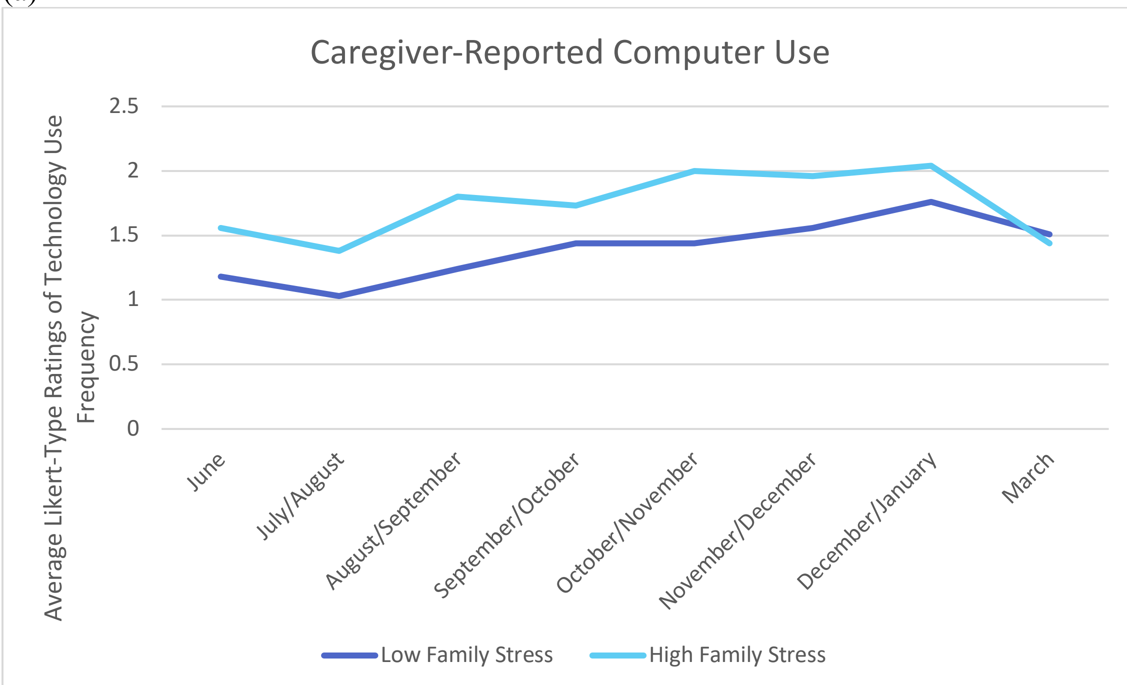
$F(1, 141) = 8.398$, $p = .004$, $\eta^2p = .056$, social media use frequency $F(1, 142) = 16.249$, $p < .001$, $\eta^2p = .103$, texting frequency $F(1, 135) = 12.200$, $p < .001$, $\eta^2p = .083$, television use frequency, $F(1, 143) = 25.091$, $p < .001$, $\eta^2p = .149$, and video game use frequency, $F(1, 134) = 23.387$, $p < .001$, $\eta^2p = .149$. Girls reported engaging in all technologies more than boys except video game use — boys reported engaging in video game use more than girls.

Child age was significantly related to reports of computer use frequency, $F(1, 122) = 6.189$, $p = .014$, $\eta^2p = .048$, social media use frequency, $F(1, 142) = 7.044$, $p = .009$, $\eta^2p = .047$, and texting frequency, $F(1, 135) = 4.689$, $p = .032$, $\eta^2p = .034$. Older children reported engaging in these technologies more than younger children. Child age was not significantly related to reports of internet use frequency ($p = .485$), television use frequency ($p = .328$), or video game use frequency (*Fs* ranging from .417 to .964, *ps* ranging from .328 to .519).

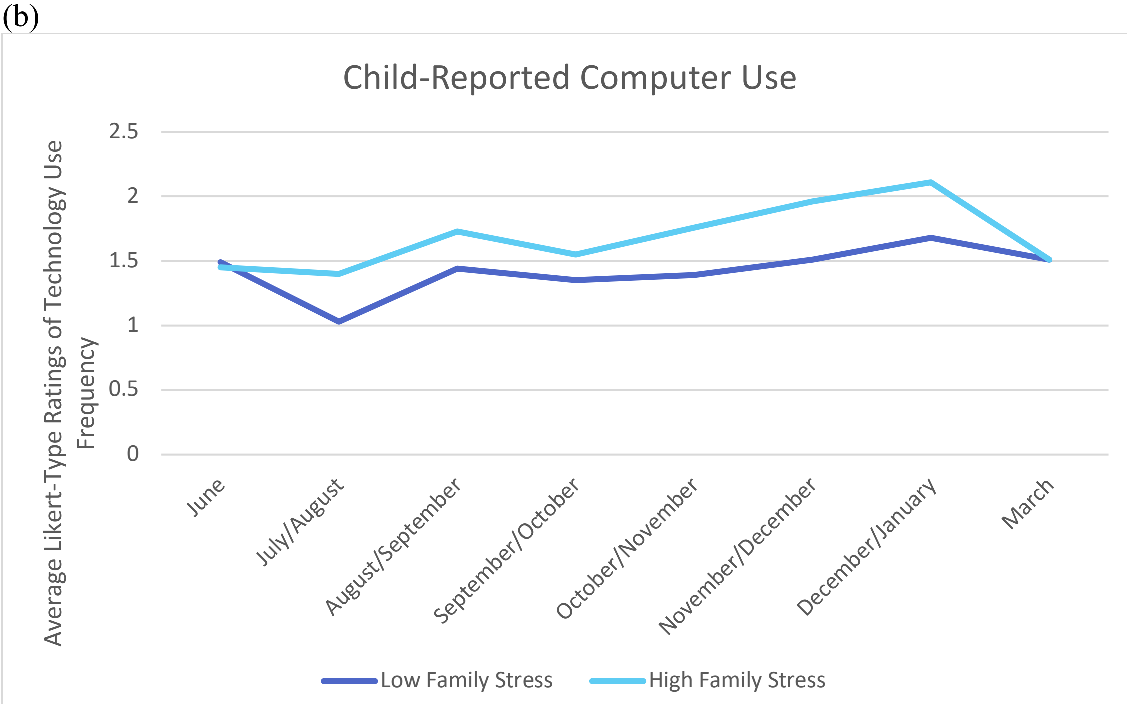
Overall, the hypothesis that caregivers would underestimate the amount of time children spend using technology, particularly when they report high levels of family stress, was not supported. However, the findings showed a link between family stress and computer use, wherein both caregivers and children reported greater child computer use when caregivers reported experiencing high levels of family stress.

Figure 6.
Caregiver and Child-Reported Computer Use Frequencies across Time as a Function of Family Stress

(a)



(b)



Hypothesis 3

To investigate the relationship between perceived social support and social-oriented technology use, I conducted a median split to determine high versus low perceived social support based on average child reports of family and friend social support on the CRISIS. I used a 2 (social support type; family/friend) x 2 (social support level; high/low) x 8 (time) mixed ANCOVA for each technology use type. Child gender and age were included as covariates in the analyses. I hypothesized that children who reported higher levels of perceived social support over the pandemic would engage in higher levels of social-oriented technology use.

There was no statistically significant main effect of family social support on caregiver reports of child computer use frequency, internet use frequency, social media use frequency, texting use frequency, television use frequency, and video game use frequency (*F's* ranging from 2.389 to .0058, *p's* ranging from .125 to .809).

Similarly, there was no statistically significant main effect of family social support on child reports of child computer use frequency, internet use frequency, child social media use frequency, texting use frequency, television use frequency, and video game use frequency (*F's* ranging from .044 to 2.783, *p's* ranging from .098 to .752). These findings contradict the hypothesis.

Additionally, there was no statistically significant interaction between time and family social support on caregiver reports of child computer use frequency, internet use frequency, social media use frequency, texting use frequency, television use frequency, and video game use frequency (*F's* ranging from .413 to 1.453, *p's* ranging from .190 to .846).

There was no statistically significant interaction between time and family social support on child reports of child computer use frequency, internet use frequency, social media use frequency, texting use frequency, television use frequency, and video game use frequency (*F's* ranging from .161 to 1.682, *p's* ranging from .122 to .846). These findings further contradict the hypothesis.

There was a statistically significant main effect of friend social support across caregiver and child reports of technology use. Across all time points, caregivers reported that children engaged in computer, internet, television, and video game use significantly more in the low friend social support group than the high friend social support group (*F* ranging from 18.457 to 40.331, all $p < .001$; see Figure 7). Children also reported engaging in computer, internet, television, and video game use significantly more in the low friend social support group than the high friend social support group (*F* ranging from 16.101 to 34.895, all $p < .001$; see Figure 8).

Contrary to hypothesis 3, there were no statistically significant main effects of friend social support on caregiver reports of child social media use frequency, $F(1, 120) = .199$, $p = .657$, $\eta^2p = .002$, child reports of child social media use frequency, $F(1, 111) = .313$, $p = .577$, $\eta^2p = .003$, caregiver reports of child texting use frequency $F(1, 120) = .151$, $p = .698$, $\eta^2p = .001$, and child reports of child texting use frequency, $F(1, 104) = .788$, $p = .377$, $\eta^2p = .008$.

There was a statistically significant interaction between time and friend social support on caregiver reports of child computer use frequency, $F(4.735, 568.167) = 3.452$, $p = .005$, $\eta^2p = .028$, as well as child reports of child computer use frequency, $F(5.179, 517.926) = 3.766$, $p = .002$, $\eta^2p = .036$.

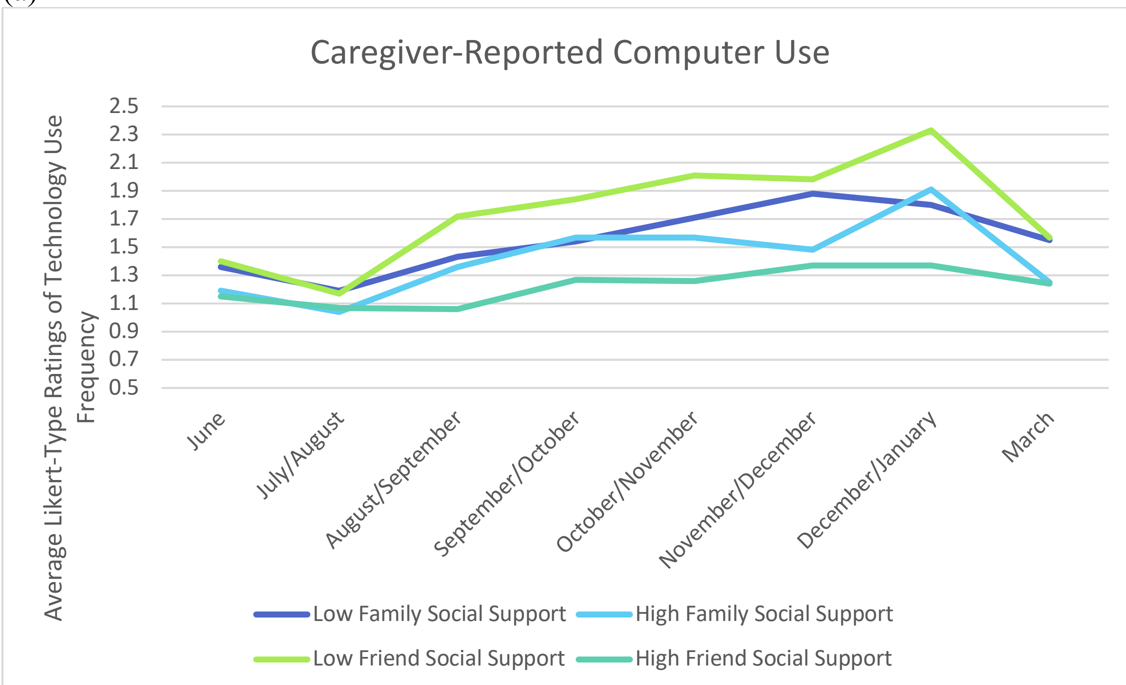
Post-hoc tests with Bonferroni corrections were used to examine mean differences (see Figures 7 and 8). Caregivers reported that children engaged in computer use significantly more in the low friend social support group than the high friend social support group at Time 3 ($p < .001$), Time 4 ($p = .001$), Time 5 ($p < .001$), Time 6 ($p = .001$), and Time 7 ($p < .001$). Similarly, children reported that they engaged in computer use significantly more in the low friend social support group than the high friend social support group at Time 3 ($p < .010$), Time 4 ($p = .041$), Time 5 ($p = .008$), Time 6 ($p < .001$), Time 7 ($p < .001$), and Time 8 ($p = .002$). These times overlap with the times children reported attending school.

There was no statistically significant interaction between time and friend social support on caregiver reports of child internet use frequency, child reports of child internet use frequency, caregiver reports of child social media use frequency, child reports of child social media use frequency, caregiver reports of child texting use frequency, child reports of child texting use frequency, caregiver reports of child television use frequency, child reports of child television use frequency, caregiver reports of child video game use frequency, and child reports of child video game use frequency (*F's* ranging from .185 to 2.006, *p's* ranging from .163 to .628).

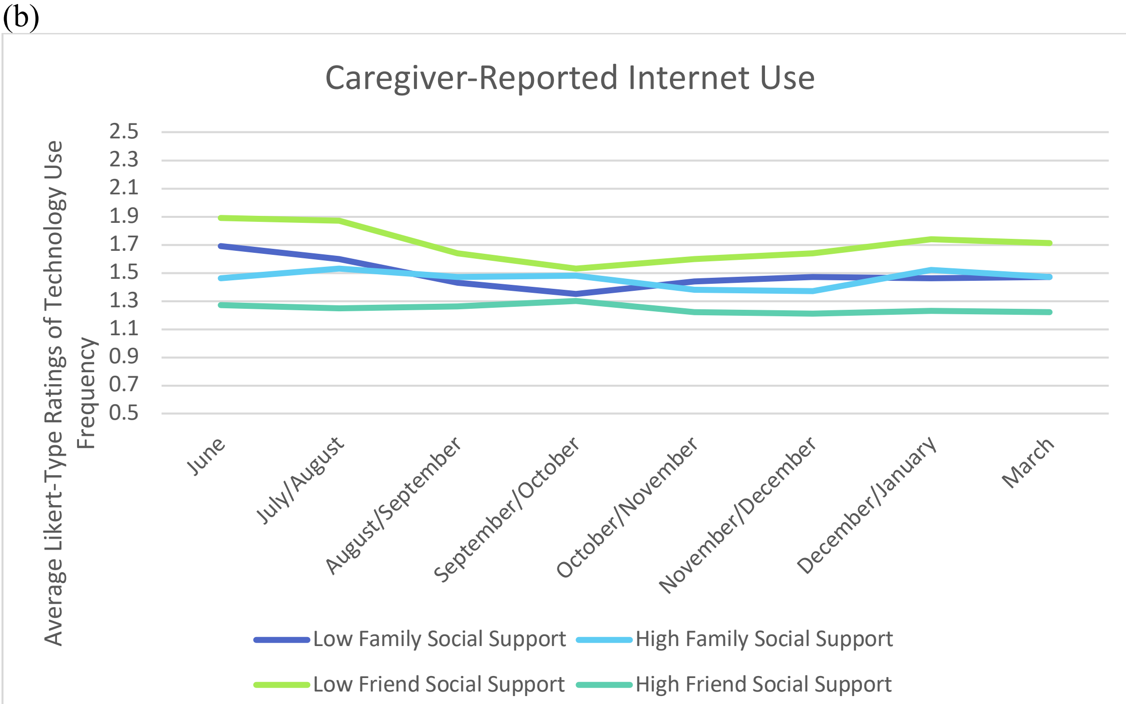
Overall, the findings contradict hypothesis 3. Whereas social-oriented technology use (i.e., social media, texting) was not related to feelings of perceived family and friend social support, all other forms of technology showed differences between levels of perceived social support from friends, wherein those who reported low perceived social support from friends reported higher amounts of non-social technology use across time. Additionally, computer use was significantly higher for those who reported lower levels of friend social support during the school months, compared to those who reported higher levels of friend social support, suggesting a link between perceived social support from friends and how children used computers for activities like virtual schooling.

Figure 7.
Caregiver-Reported Technology Use Frequencies across Time as a Function of High and Low Perceived Social Support

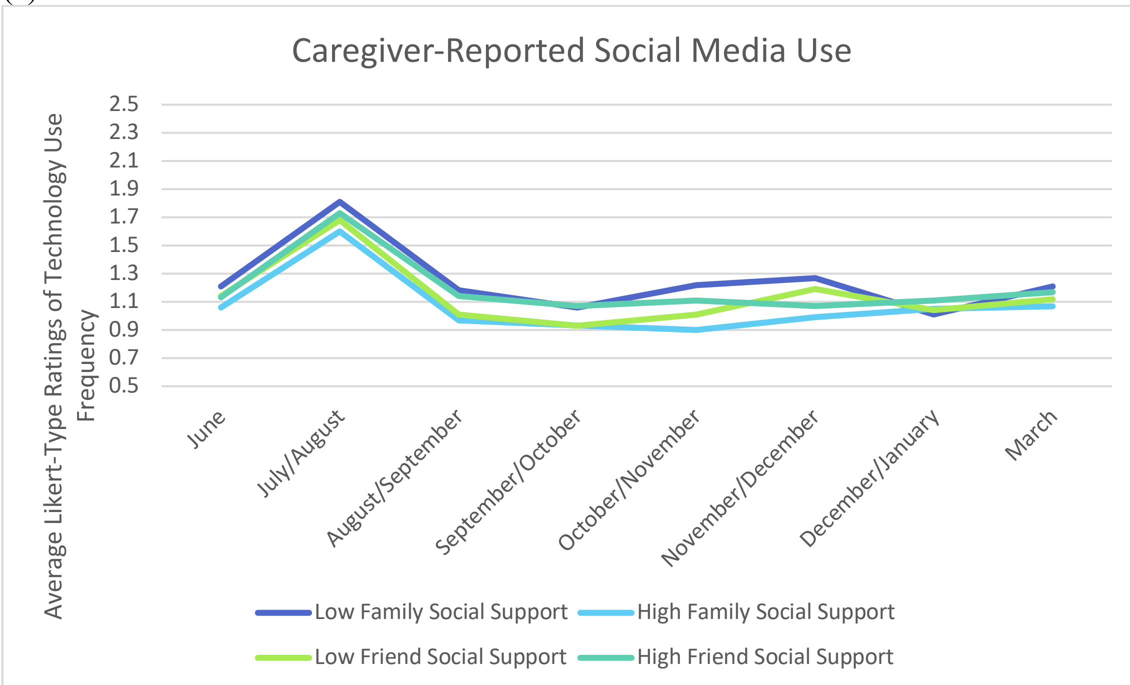
(a)



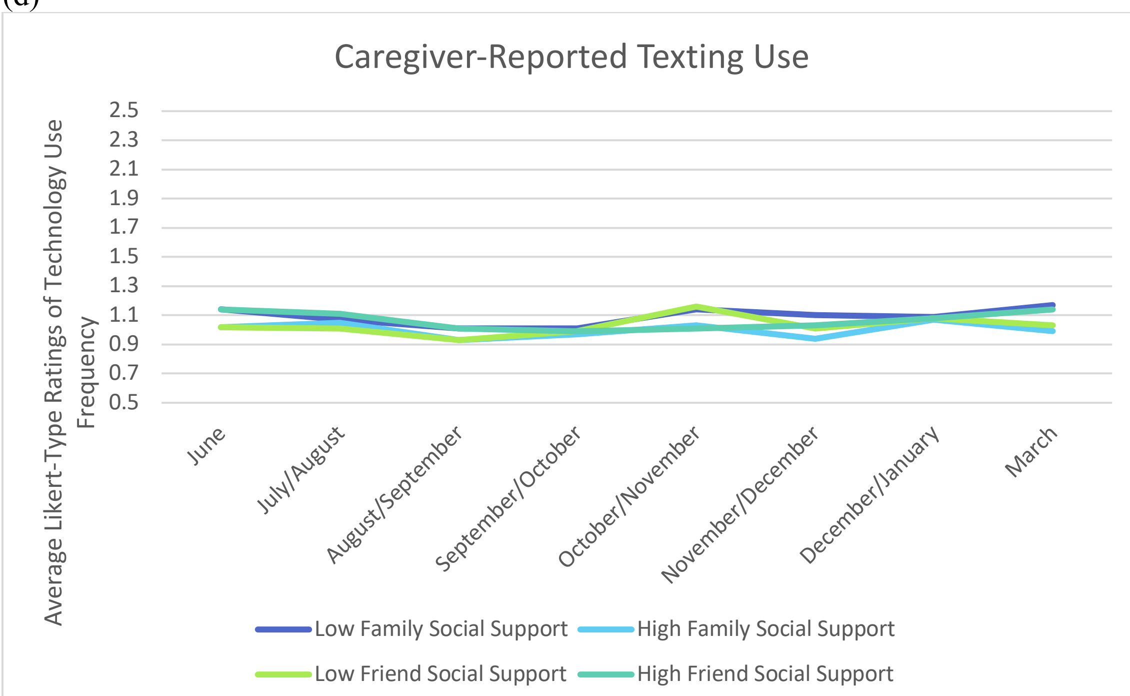
(b)



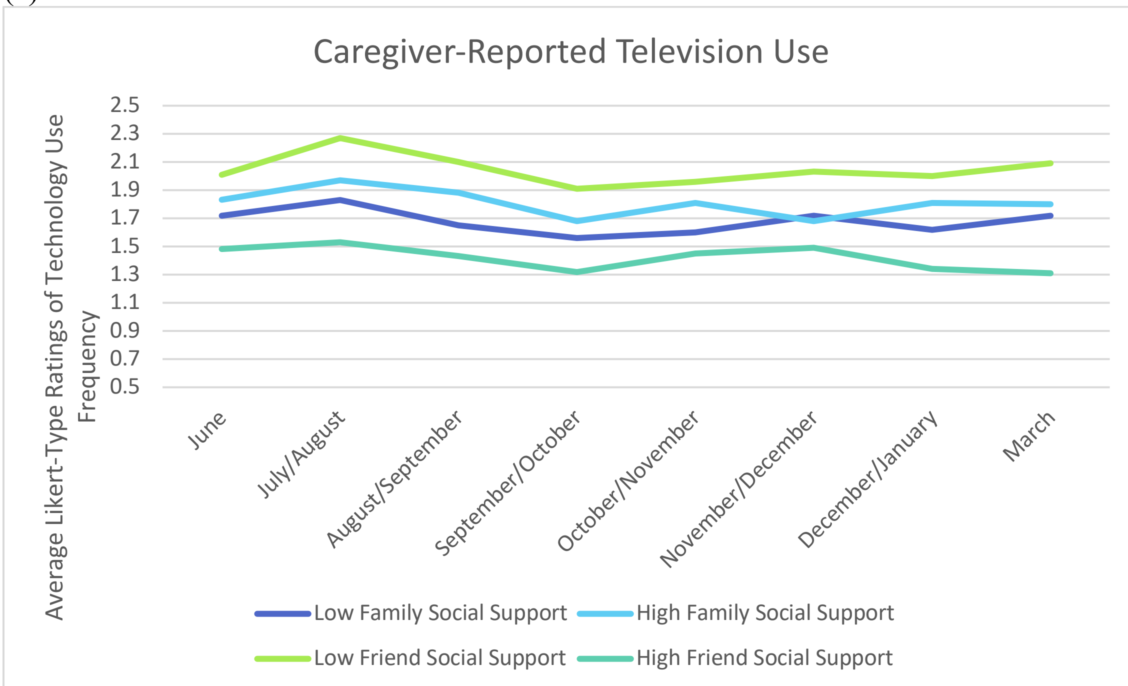
(c)


Caregiver-Reported Social Media Use
Average Likert-Type Ratings of Technology Use Frequency
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
June
July/August
August/September
September/October
October/November
November/December
December/January
March
Low Family Social Support
High Family Social Support
Low Friend Social Support
High Friend Social Support

(d)


Caregiver-Reported Texting Use
Average Likert-Type Ratings of Technology Use Frequency
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
June
July/August
August/September
September/October
October/November
November/December
December/January
March
Low Family Social Support
High Family Social Support
Low Friend Social Support
High Friend Social Support

(e)


Caregiver-Reported Television Use
Average Likert-Type Ratings of Technology Use Frequency
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
June
July/August
August/September
September/October
October/November
November/December
December/January
March
Low Family Social Support
High Family Social Support
Low Friend Social Support
High Friend Social Support

(f)

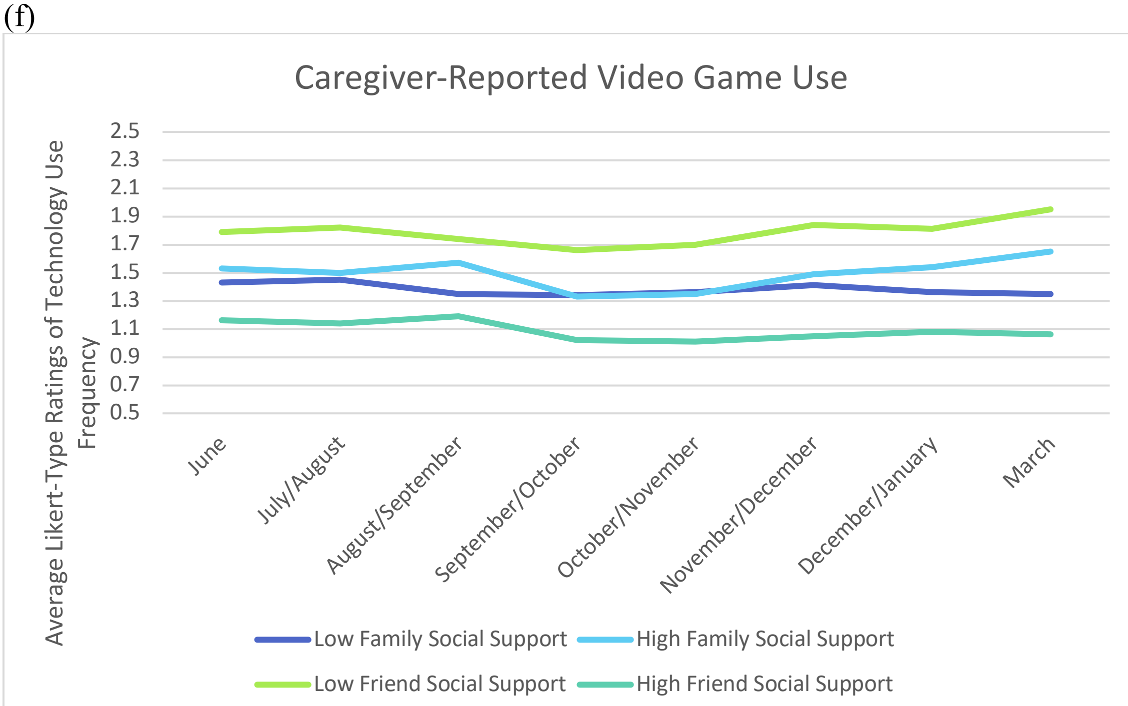
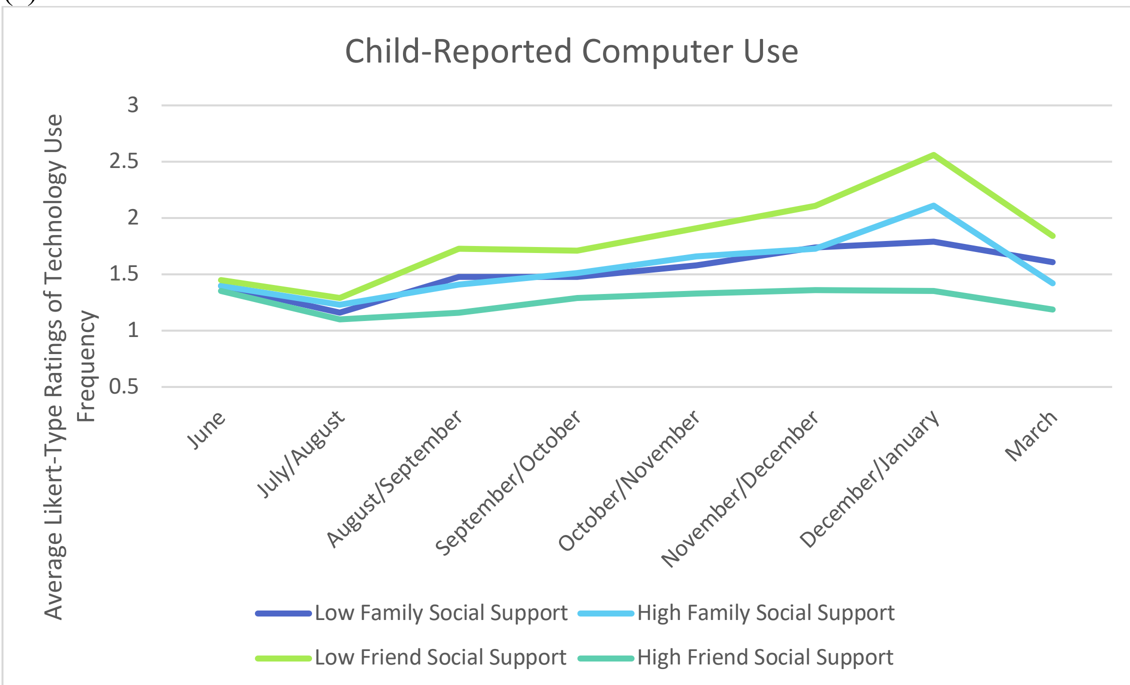
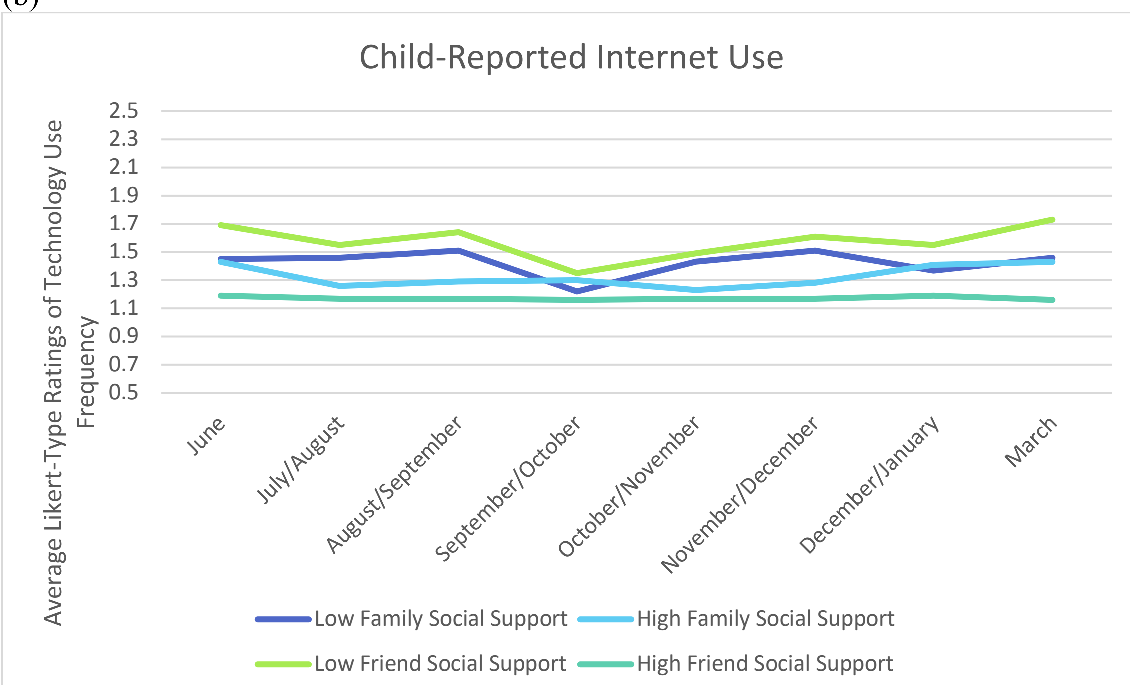

Caregiver-Reported Video Game Use
Average Likert-Type Ratings of Technology Use Frequency
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
June
July/August
August/September
September/October
October/November
November/December
December/January
March
Low Family Social Support
High Family Social Support
Low Friend Social Support
High Friend Social Support

Figure 8.
Child-Reported Technology Use Frequencies across Time as a Function of High and Low Perceived Social Support

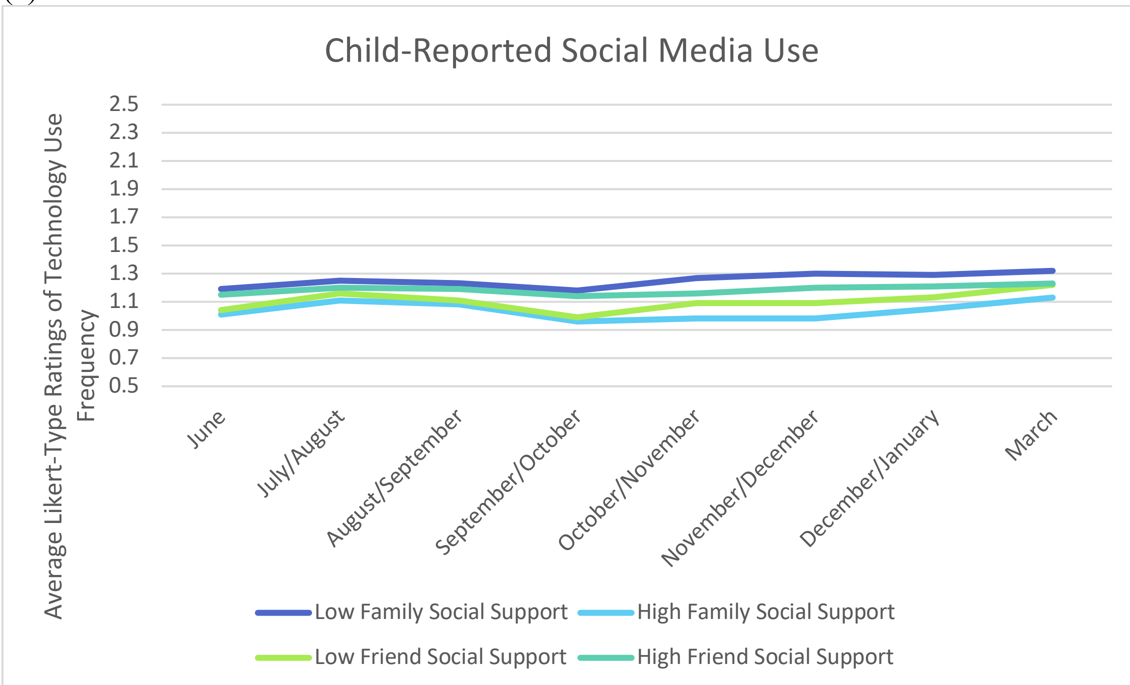
(a)



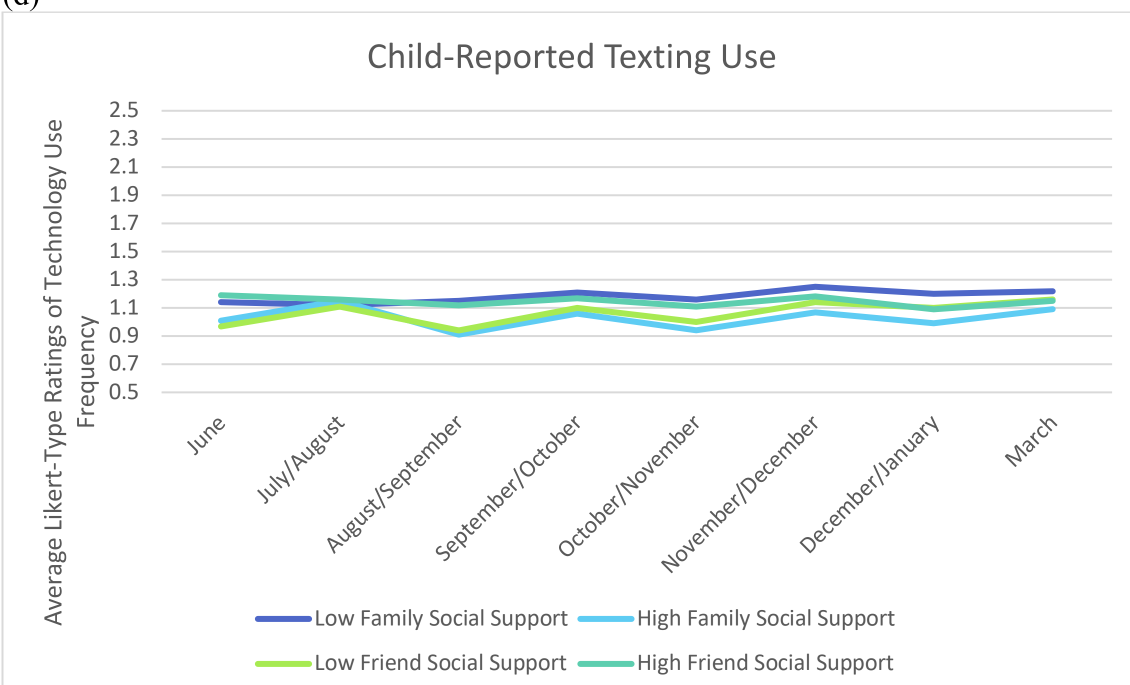
(b)



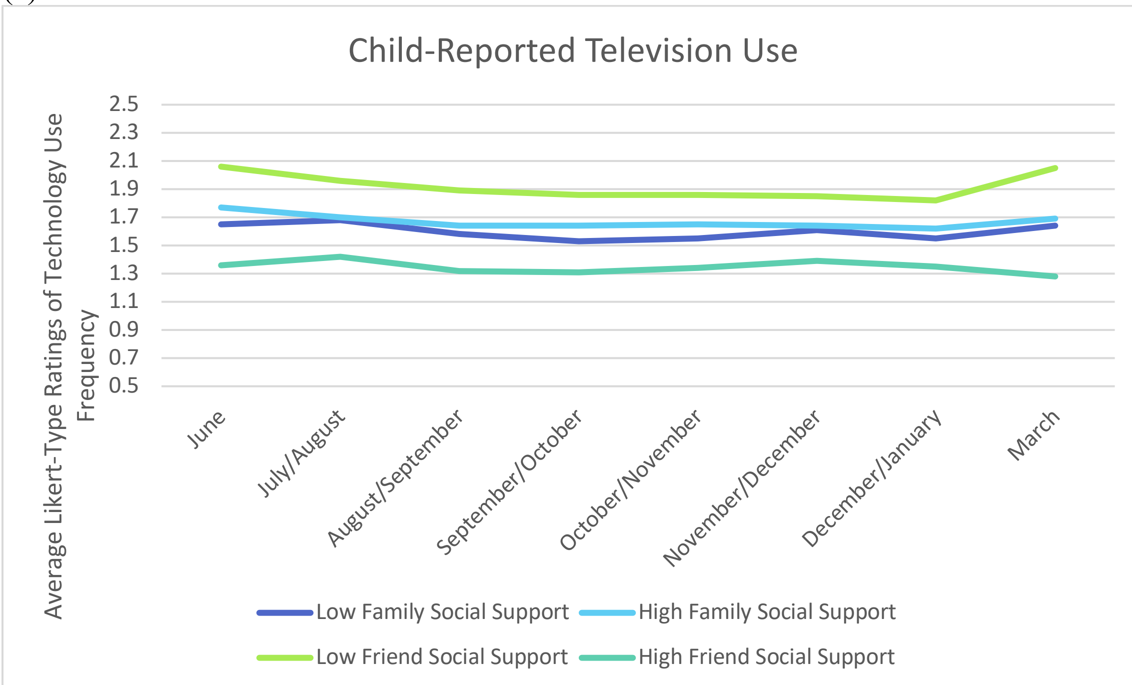
(c)


Child-Reported Social Media Use
Average Likert-Type Ratings of Technology Use Frequency
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
June
July/August
August/September
September/October
October/November
November/December
December/January
March
Low Family Social Support
High Family Social Support
Low Friend Social Support
High Friend Social Support

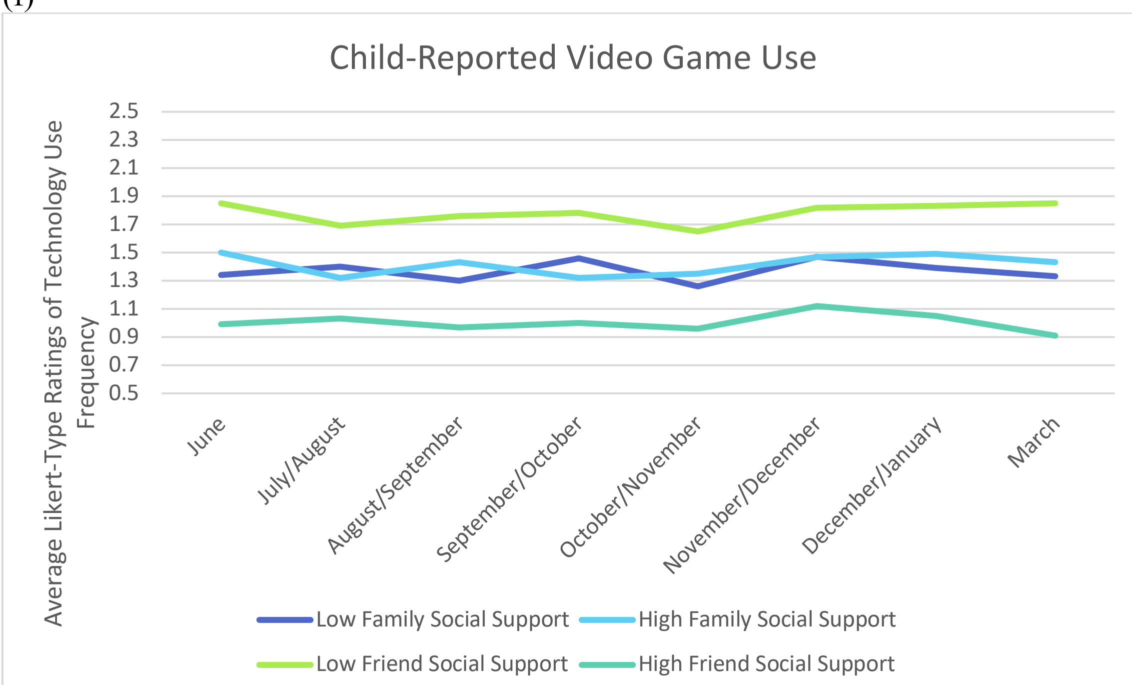
(d)


Child-Reported Texting Use
Average Likert-Type Ratings of Technology Use Frequency
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
June
July/August
August/September
September/October
October/November
November/December
December/January
March
Low Family Social Support
High Family Social Support
Low Friend Social Support
High Friend Social Support

(e)


Child-Reported Television Use
Average Likert-Type Ratings of Technology Use Frequency
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
June
July/August
August/September
September/October
October/November
November/December
December/January
March
Low Family Social Support
High Family Social Support
Low Friend Social Support
High Friend Social Support

(f)


Child-Reported Video Game Use
Average Likert-Type Ratings of Technology Use Frequency
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
June
July/August
August/September
September/October
October/November
November/December
December/January
March
Low Family Social Support
High Family Social Support
Low Friend Social Support
High Friend Social Support

Hypothesis 4

I conducted separate regression analyses to determine whether anxiety, depression, and PTSD symptoms obtained from the SCARED, SMFQ, and CPSS-V, respectively, were associated with technology use and social support in children across time. Caregiver- and child-reported technology use frequency and child-reported social support were used as predictor variables, and SCARED, SMFQ and CPSS-V scores were used as the outcome variables in the regression analyses.

Separate regressions were run at each time point, controlling for child gender and age. Because child age was not related to caregiver-reported SCARED and SMFQ scores ($p > .05$), I only controlled for child gender in those analyses. Analyses were with child age to see if it had any effect on the findings, and it did not. I hypothesized that reports of greater social-oriented technology use and social support would be associated with reports of lower mental health symptomatology across all time points.

Anxiety. For caregiver-reported SCARED scores, the overall models for the regressions were found to be significant at Time 1 ($p = .002$), Time 2 ($p = .005$), Time 3 ($p = .008$), Time 4 ($p < .001$), and Time 6 ($p = .020$; see Table 8). The models accounted for 7.4% to 17.3% of the variance in caregiver-reported SCARED scores across time (see Table 8).

Significant predictors of caregiver-reported SCARED scores included: internet use (Time 1), social media use (Time 6), friend social support (Time 2), and family social support (Times 3, 4, 6). At Time 6 (November/December 2020), greater social media use predicted higher caregiver-reported anxiety symptoms, contrary to the hypothesis. At Time 1 (June 2020), greater internet use predicted higher caregiver-reported anxiety symptoms. Additionally, higher perceived family and friend social support predicted lower caregiver-reported anxiety symptoms from Times 2 to 6 (July/August to November/December 2020), supporting the hypothesis.

Table 8.

Linear Regressions Predicting Total Caregiver SCARED Scores from Social Support and Caregiver-Reported Technology Use Frequencies, Controlling for Gender (N = 178)

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 1							
(Intercept)	13.18	1.32		9.99***			
Child Gender	6.68	2.17	.265	3.08**			
					9.49 (1, 126)**	.063**	
(Intercept)	.95	6.60		.14			
Child Gender	6.35	2.65	.25	2.40*			
Family Support	.129	.88	.014	.15			
Friend Support	.53	.58	.085	.92			
Computer	.29	1.18	.022	.24			
Internet	3.94*	1.82	.282	2.16*			
Social Media	.440	1.41	.037	.31			
Texting	-.787	1.68	-.056	-.47			
Television	-.430	1.78	-.032	-.24			
Video Games	1.890	1.26	.15	1.50			
					3.10 (9, 118)**	.129*	.032
Time 2							
(Intercept)	12.86	1.16		11.09***			
Child Gender	5.05	1.90	.21	2.65			
					7.03 (1, 158)**	.037**	
(Intercept)	22.99	6.05		3.80***			
Child Gender	2.62	2.26	.11	1.16			
Family Support	-1.13	.63	-.14	-1.78			
Friend Support	-1.11	.53	-.18	-2.08*			
Computer	.41	1.01	.034	.41			
Internet	-.63	1.43	-.047	-.44			
Social Media	.62	.98	.049	.63			
Texting	-.46	1.31	-.029	-.35			
Television	2.16	1.35	.17	1.60			
Video Games	.47	1.09	.040	.43			
					2.81 (9, 150)**	.093*	.101

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 3							
(Intercept)	10.79	1.02		10.55***			
Child Gender	5.92	1.68	.27	3.52***			
					12.39 (1, 158)***	.067***	
(Intercept)	18.45	5.37		3.43***			
Child Gender	3.74	1.96	.17	1.91			
Family Support	-1.29	.63	-.16	-2.05*			
Friend Support	-.17	.49	-.03	-.34			
Computer	.31	.84	.031	.36			
Internet	1.20	1.74	.093	.69			
Social Media	1.15	1.07	.096	1.07			
Texting	.29	1.60	.016	.18			
Television	.20	1.54	.016	.13			
Video Games	-.90	.97	-.087	-.93			
					2.61 (9, 150)**	.084	.063
Time 4							
(Intercept)	10.47	1.11		9.48***			
Child Gender	3.90	1.82	.18	2.15*			
					4.62 (1, 145)*	.024*	
(Intercept)	22.01	6.27		3.51***			
Child Gender	1.30	2.04	.059	.64			
Family Support	-2.46	.65	-.31	-3.82***			
Friend Support	.15	.59	.023	.26			
Computer	.42	1.05	.040	.40			
Internet	-2.95	1.68	-.21	-1.76			
Social Media	1.99	1.07	.17	1.87			
Texting	.51	1.51	.029	.34			
Television	3.72	1.65	.26	2.26*			
Video Games	.073	1.11	.006	.066			
					4.39 (9, 137)***	.173***	.193

Note. **p* < .05. ***p* < .01. ****p* < .001.

Predictor	b	b SE	β	t	$F(df)$	Adjusted R^2	ΔR^2
Time 5							
(Intercept)	10.41	1.30		8.03***			
Child Gender	4.40	2.13	.18	2.07*			
					4.27 (1, 132)*	.024*	
(Intercept)	25.18	6.38		3.95***			
Child Gender	2.50	2.55	.10	.98			
Family Support	-1.22	.75	-.16	-1.64			
Friend Support	-1.12	.67	-.17	-1.67			
Computer	-.99	1.27	-.087	-.77			
Internet	.53	1.96	.036	.27			
Social Media	1.54	1.35	.12	1.14			
Texting	-.95	1.61	-.058	-.59			
Television	.51	1.68	.037	.30			
Video Games	-.072	1.41	-.005	-.051			
					1.73 (9, 124)	.047	.080
Time 6							
(Intercept)	12.29	1.21		10.15***			
Child Gender	1.85	1.99	.077	.93			
					.86 (1, 144)	-.001	
(Intercept)	26.76	6.54		4.09***			
Child Gender	-.96	2.42	-.040	-.40			
Family Support	-1.81	.73	-.21	-2.47*			
Friend Support	-.69	.59	-.10	-1.16			
Computer	-.26	1.08	-.025	-.24			
Internet	-2.10	1.73	-.15	-1.22			
Social Media	3.21	1.25	.26	2.57*			
Texting	.006	1.51	.00	.004			
Television	1.76	1.67	.13	1.05			
Video Games	-.41	1.22	-.04	-.33			
					2.29 (9, 136)*	.074*	.126

Note. $*p < .05$. $**p < .01$. $***p < .001$.

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 7							
(Intercept)	11.03	1.08		10.26***			
Child Gender	1.16	1.77	.053	.66			
					.43 (1, 151)	-.004	
(Intercept)	27.38	5.34		5.13***			
Child Gender	-.96	2.06	-.044	-.47			
Family Support	-1.63	.66	-.21	-2.46*			
Friend Support	-.59	.54	-.010	-1.09			
Computer	.048	.85	.005	.056			
Internet	-1.08	1.48	-.083	-.73			
Social Media	.92	1.18	.082	.78			
Texting	1.10	1.38	.083	.80			
Television	-.15	1.49	-.011	-.099			
Video Games	-1.19	1.05	-.11	-1.14			
					1.76 (9, 143)	.043	.097
Time 8							
(Intercept)	10.91	1.12		9.74***			
Child Gender	2.67	1.84	.12	1.45			
					2.11 (1, 147)	.007	
(Intercept)	25.92	6.75		3.84***			
Child Gender	-.39	2.09	-.018	-.19			
Family Support	-1.32	.76	-.17	-1.74			
Friend Support	-.86	.64	-.12	-1.35			
Computer	-.30	1.05	-.028	-.29			
Internet	-.79	1.62	-.061	-.49			
Social Media	2.32	1.18	.20	1.97			
Texting	.31	1.41	.021	.22			
Television	.29	1.48	.021	.18			
Video Games	-1.06	.99	-.10	-1.07			
					1.92 (9, 139)	.053	.096

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

For child-reported SCARED scores, the overall models for the regressions were found to be significant across all 8 time points (*p's* ranging from .033 to < .001; see Table 9). The models accounted for 6.4% to 31.3% of the variance in child-reported SCARED scores across time (see Table 9).

Significant predictors of child-reported SCARED scores included: social media use (Time 1, 8) and family social support (Time 2, 3, 4, 5, 6, 7, 8). Similar to caregiver reports, greater social media use predicted higher child-reported anxiety symptoms at Times 1 and 8 (June 2020, March 2021), contradicting the hypothesis. Higher perceived family social support predicted lower child-reported anxiety symptoms from Time 2 to Time 8 (July/August 2020 to March 2021), supporting the hypothesis.

Table 9.
Linear Regressions Predicting Total Child SCARED Scores from Social Support and Child-Reported Technology Use Frequencies, Controlling for Gender and Age (N = 178)

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 1							
(Intercept)	10.32	8.64		1.19			
Child Gender	9.39	2.06	.39	4.56***			
Child Age	.11	.78	.012	.14			
					10.42 (2, 120)***	.134***	
(Intercept)	.62	11.03		.056			
Child Gender	8.73	2.46	.36	3.54***			
Child Age	.27	.77	.029	.34			
Family Support	.16	.84	.018	.20			
Friend Support	.009	.54	.002	.018			
Computer	-.015	.94	-.001	-.016			
Internet	-.53	1.82	-.037	-.29			
Social Media	2.80	1.26	.24	2.23*			
Texting	-2.03	1.67	-.17	-1.22			
Television	2.35	1.83	.16	1.28			
Video Games	1.96	1.20	.17	1.79			
					3.69 (10, 112)***	.180	.100
Time 2							
(Intercept)	7.03	7.40		.950			
Child Gender	5.72	1.76	.25	3.25**			
Child Age	.44	.67	.051	.66			
					5.40 (2, 157)**	.052**	
(Intercept)	21.55	9.01		2.39*			
Child Gender	5.39	2.14	.24	2.53*			
Child Age	.30	.67	.034	.44			
Family Support	-1.48	.59	-.20	-2.49*			
Friend Support	-.82	.50	-.14	-1.65			
Computer	.11	.89	.010	.13			
Internet	-1.80	1.39	-.13	-1.29			

Social Media	1.18	1.15	.11	1.02			
Texting	-.36	1.47	-.025	-.25			
Television	.38	1.46	.028	.26			
Video Games	1.82	.93	.18	1.96			
					3.08 (10, 149)**	.116*	.107

Note. *p < .05. **p < .01. ***p < .001.

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 3							
(Intercept)	-.71	7.61		-.093			
Child Gender	5.44	1.81	.24	3.00**			
Child Age	1.09	.69	.13	1.59			
					5.56 (2, 144)**	.059**	
(Intercept)	14.14	9.79		1.45			
Child Gender	5.04	2.04	.22	2.47*			
Child Age	.67	.69	.078	.96			
Family Support	-1.65	.70	-.20	-2.38*			
Friend Support	.019	.51	.003	.038			
Computer	-1.18	.84	-.12	-1.41			
Internet	2.19	1.42	.17	1.54			
Social Media	1.10	1.17	.096	.94			
Texting	1.07	1.59	.073	.67			
Television	-2.40	1.36	-.19	-1.76			
Video Games	.50	.97	.047	.52			
					3.12 (10, 136)**	.127*	.115
Time 4							
(Intercept)	-7.38	7.09		-1.04			
Child Gender	5.83	1.69	.28	3.45***			
Child Age	1.48	.64	.19	2.32*			
					8.30 (2, 137)***	.095***	
(Intercept)	9.77	8.67		1.13			
Child Gender	3.89	1.96	.19	1.98			
Child Age	1.32	.65	.17	2.03*			
Family Support	-1.84	.63	-.24	-2.90**			
Friend Support	-.60	.55	-.10	-1.10			
Computer	.46	.88	.045	.52			
Internet	-.88	1.38	-.064	-.64			
Social Media	2.38	1.25	.20	1.91			
Texting	-1.95	1.59	-.13	-1.23			
Television	1.10	1.39	.079	.79			

Video Games	-.028	1.00	-.003	-.028			
					3.74 (10, 129)***	.165*	.117

Note. *p < .05. **p < .01. ***p < .001.

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 5							
(Intercept)	-9.09	7.21		-1.26			
Child Gender	7.45	1.72	.35	4.34***			
Child Age	1.55	.65	.19	2.38*			
					11.81 (2, 128)***	.143***	
(Intercept)	7.14	8.82		.81			
Child Gender	7.16	2.07	.34	3.46***			
Child Age	1.05	.69	.13	1.52			
Family Support	-1.67	.60	-.26	-2.80**			
Friend Support	-.042	.53	-.008	-.080			
Computer	-.20	.93	-.021	-.21			
Internet	.013	1.46	.001	.009			
Social Media	1.89	1.28	.17	1.48			
Texting	-2.17	1.42	-.16	-1.52			
Television	-.13	1.55	-.010	-.081			
Video Games	1.09	1.06	.11	1.03			
					3.81 (10, 120)***	.178	.085
Time 6							
(Intercept)	4.30	6.55		.66			
Child Gender	2.78	1.56	.14	1.78			
Child Age	.53	.59	.072	.90			
					1.92 (2, 151)	.012	
(Intercept)	24.52	8.28		2.96**			
Child Gender	1.44	1.84	.074	.78			
Child Age	.34	.60	.046	.56			
Family Support	-2.14	.62	-.31	-3.45***			
Friend Support	-.46	.48	-.084	-.95			
Computer	-.27	.84	-.030	-.32			
Internet	.49	1.29	.044	.38			
Social Media	-.32	1.13	-.035	-.28			
Texting	-.12	1.33	-.010	-.090			
Television	.10	1.60	.009	.063			

Video Games	-.33	.87	-.037	-.38			
					2.04 (10, 143)*	.064*	.100

Note. *p < .05. **p < .01. ***p < .001.

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 7							
(Intercept)	-5.14	7.65		-.67			
Child Gender	5.27	1.82	.23	2.89**			
Child Age	1.46	.69	.17	2.12*			
					6.16 (2, 145)**	.066**	
(Intercept)	33.29	8.76		3.80***			
Child Gender	2.78	1.91	.12	1.46			
Child Age	.68	.62	.079	1.11			
Family Support	-4.08	.63	-.50	-6.46***			
Friend Support	-.091	.50	-.014	-.18			
Computer	-.79	.72	-.086	-1.09			
Internet	1.04	1.58	.073	.66			
Social Media	1.25	1.11	.11	1.13			
Texting	-1.04	1.28	-.072	-.82			
Television	-.55	1.64	-.037	-.33			
Video Games	-.52	.91	-.048	-.57			
					7.70 (10, 137)***	.313***	.281
Time 8							
(Intercept)	-9.21	7.23		-1.27			
Child Gender	5.32	1.72	.24	3.09**			
Child Age	1.78	.65	.22	2.74**			
					8.15 (2, 145)***	.089***	
(Intercept)	18.43	8.96		2.06*			
Child Gender	.64	1.87	.029	.34			
Child Age	1.29	.61	.16	2.11*			
Family Support	-2.39	.66	-.31	-3.60***			
Friend Support	-.43	.57	-.063	-.74			
Computer	1.15	.86	.12	1.34			
Internet	.41	1.44	.030	.28			
Social Media	2.43	1.10	.22	2.20*			
Texting	-1.72	1.49	-.12	-1.16			
Television	-.89	1.43	-.072	-.63			

Video Games	-2.43	.90	-.24	-2.70**			
					6.25 (10, 137)***	.263***	.212

Note. *p < .05. **p < .01. ***p < .001.

Depression. For caregiver-reported SMFQ scores, the overall models for the regressions were found to be significant across all 8 time points (*p's* ranging from .007 to < .001; see Table 10). The models accounted for 8.2% to 22.1% of the variance in caregiver-reported SMFQ scores across time (see Table 10).

Significant predictors of caregiver-reported SMFQ scores included: social media use (Time 1, 3, 4, 5), television use (Time 2), texting (Time 7), family social support (Time 3, 4, 5, 6, 7), internet use (Time 6), and friend social support (Time 7, 8). Higher social media use and texting use predicted higher caregiver-reported depression symptoms from Times 1 to 5 (June 2020 to October/November 2020), contradicting the hypothesis. Higher perceived family and friend social support predicted lower caregiver-reported depression symptoms from Times 3 to 8 (August/September 2020 to March 2021), supporting the hypothesis. Additionally, higher television use predicted higher caregiver-reported depression symptoms at Time 2 (July/August 2020), while higher internet use predicted lower predicted caregiver-reported depression symptoms at Time 6 (November/December 2020).

Table 10.
Linear Regressions Predicting Total Caregiver SMFQ Scores from Social Support and Caregiver-Reported Technology Use Frequencies, Controlling for Gender (N = 178)

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 1							
(Intercept)	4.19	.48		8.66***			
Child Gender	1.82	.80	.19	2.29*			
					5.24 (1, 139)*	.029*	
(Intercept)	1.40	2.41		.58			
Child Gender	1.34	.97	.14	1.38			
Family Support	.20	.32	.055	.62			
Friend Support	-.26	.21	-.11	-1.25			
Computer	.39	.43	.078	.89			
Internet	.35	.67	.066	.53			
Social Media	1.14	.52	.25	2.20*			
Texting	-.91	.61	-.17	-1.49			
Television	.42	.65	.083	.65			
Video Games	.58	.46	.13	1.27			
					2.79 (9, 131)**	.103*	.125
Time 2							
(Intercept)	4.00	.44		9.05***			
Child Gender	.86	.73	.092	1.19			
					1.41 (1, 166)**	.002	
(Intercept)	5.11	2.28		2.24*			
Child Gender	-.32	.85	-.035	-.38			
Family Support	-.53	.24	-.17	-2.22			
Friend Support	-.11	.20	-.043	-.53			
Computer	.075	.38	.016	.20			
Internet	-.19	.54	-.036	-.34			
Social Media	.35	.37	.071	.94			
Texting	.21	.49	.034	.42			
Television	1.26	.51	.26	2.47*			
Video Games	.34	.41	.076	.83			
					2.71 (9, 158)**	.084**	.125

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 3							
(Intercept)	3.74	.42		8.86***			
Child Gender	.65	.69	.074	.94			
					.89 (1, 163)	-.001	
(Intercept)	6.01	2.04		2.95**			
Child Gender	-.40	.74	-.046	-.54			
Family Support	-.79	.24	-.25	-3.28**			
Friend Support	-.024	.19	-.011	-.13			
Computer	.25	.32	.063	.79			
Internet	.67	.66	.13	1.02			
Social Media	.87	.41	.18	2.14*			
Texting	.94	.61	.13	1.54			
Television	.002	.58	.00	.003			
Video Games	.16	.37	.039	.44			
					4.64 (9, 155)***	.166***	.207
Time 4							
(Intercept)	3.51	.38		9.15***			
Child Gender	.033	.63	.004	.053			
					.003 (1, 167)	-.006	
(Intercept)	8.65	2.08		4.15***			
Child Gender	-.84	.68	-.10	-1.25			
Family Support	-.97	.21	-.33	-4.54***			
Friend Support	-.14	.20	-.056	-.70			
Computer	-.27	.35	-.069	-.77			
Internet	-.32	.56	-.062	-.57			
Social Media	1.05	.35	.24	2.95**			
Texting	.93	.50	.15	1.85			
Television	.66	.55	.13	1.20			
Video Games	.28	.37	.066	.75			
					6.28 (9, 159)**	.221***	.262

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Predictor	b	b SE	β	t	$F(df)$	Adjusted R^2	ΔR^2
Time 5							
(Intercept)	3.36	.41		8.19***			
Child Gender	1.38	.67	.16	2.05*			
					4.21 (1, 157)*	.020*	
(Intercept)	6.79	1.90		3.58***			
Child Gender	.007	.76	.001	.009			
Family Support	-.61	.22	-.23	-2.75**			
Friend Support	-.19	.20	-.085	-.97			
Computer	.15	.38	.037	.38			
Internet	-.44	.58	-.086	-.76			
Social Media	1.15	.40	.26	2.89**			
Texting	.072	.48	.013	.15			
Television	.71	.50	.15	1.41			
Video Games	.034	.42	.008	.082			
					4.26 (9, 149)***	.157***	.179
Time 6							
(Intercept)	3.94	.41		9.72***			
Child Gender	-.11	.67	-.012	-.16			
					.025 (1, 165)	-.006	
(Intercept)	10.11	2.17		4.66***			
Child Gender	-1.14	.80	-.13	-1.43			
Family Support	-.77	.24	-.25	-3.17**			
Friend Support	-.20	.20	-.085	-1.03			
Computer	-.14	.36	-.037	-.39			
Internet	-1.35	.57	-.27	-2.35*			
Social Media	.80	.42	.18	1.91			
Texting	.52	.50	.091	1.04			
Television	.82	.56	.17	1.47			
Video Games	-.13	.41	-.031	-.32			
					2.66 (9, 157)**	.082**	.132

Note. $*p < .05$. $**p < .01$. $***p < .001$.

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 7							
(Intercept)	4.00	.40		10.02***			
Child Gender	-.077	.66	-.009	-.12			
					.014 (1, 163)	-.006	
(Intercept)	15.03	1.80		8.37***			
Child Gender	-.78	.70	-.093	-1.12			
Family Support	-1.09	.22	-.37	-4.90***			
Friend Support	-.51	.18	-.22	-2.82**			
Computer	-.19	.29	-.053	-.65			
Internet	.25	.50	.050	.51			
Social Media	-.35	.40	-.081	-.88			
Texting	1.30	.47	.25	2.80**			
Television	-.88	.50	-.17	-1.76			
Video Games	-.06	.35	-.014	-.17			
					5.85 (9, 155)***	.210***	.254
Time 8							
(Intercept)	3.76	.38		9.80***			
Child Gender	.021	.63	.003	.033			
					.001 (1, 159)	-.006	
(Intercept)	8.35	2.25		3.72***			
Child Gender	-1.09	.70	-.14	-1.56			
Family Support	-.27	.25	-.096	-1.07			
Friend Support	-.53	.21	-.21	-2.47*			
Computer	.052	.35	.013	.15			
Internet	-.80	.54	-.17	-1.48			
Social Media	.36	.39	.087	.91			
Texting	.79	.47	.15	1.68			
Television	.75	.49	.16	1.52			
Video Games	-.46	.33	-.12	-1.38			
					2.91 (9, 151)**	.097**	.148

Note. **p* < .05. ***p* < .01. ****p* < .001.

For child-reported SMFQ scores, the overall models for the regressions were found to be significant across all 8 time points (*p's* ranging from .003 to < .001; see Table 11). The models accounted for 12.8% to 38.4% of the variance in child-reported SMFQ scores across time (see Table 11).

Significant predictors of child-reported SMFQ scores included: social media use (Time 1, 4, 7), family social support (Time 2, 3, 4, 5, 6, 7, 8), friend social support (Time 6), texting use (Time 8), and video game use (Time 1, 8). Higher social media use predicted higher child-reported depression symptoms at Times 1, 4, and 7 (June 2020, September/October 2020, December 2020/January 2021), contrary to the hypothesis. Higher perceived family and friend social support predicted lower child-reported depression symptoms from Times 2 to 8 (July/August 2020 to March 2021), supporting the hypothesis. Contradictory to caregiver reports, but consistent with the hypothesis, child-reported texting use predicted lower child-reported depression symptoms at Time 8 (March 2021). At Time 1 (June 2020), higher video game use predicted higher depression symptoms, but at Time 8 (March 2021) the association was different — higher video game use predicted fewer depressions symptoms.

Table 11.
Linear Regressions Predicting Total Child SMFQ Scores from Social Support and Child-Reported Technology Use Frequencies, Controlling for Child Gender and Age (N = 178)

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 1							
(Intercept)	2.73	3.62		.75			
Child Gender	2.94	.86	.29	3.41***			
Child Age	.077	.33	.020	.24			
					5.81 (2, 125)**	.070**	
(Intercept)	-2.75	4.61		-.60			
Child Gender	3.19	1.03	.32	3.10**			
Child Age	.11	.32	.028	.34			
Family Support	.52	.35	.14	1.50			
Friend Support	-.27	.23	-.11	-1.21			
Computer	.35	.39	.077	.89			
Internet	.16	.76	.027	.21			
Social Media	1.22	.53	.25	2.32*			
Texting	-.44	.70	-.066	-.63			
Television	-.16	.76	-.027	-.22			
Video Games	1.04	.46	.22	2.26*			
					2.87 (10, 117)**	.128*	.112
Time 2							
(Intercept)	.93	2.76		.34			
Child Gender	1.79	.66	.21	2.72**			
Child Age	.24	.25	.072	.95			
					4.04 (2, 164)*	.035*	
(Intercept)	12.67	3.12		4.07***			
Child Gender	1.32	.74	.15	1.79			
Child Age	.095	.23	.029	.412			
Family Support	-1.16	.21	-.41	-5.66***			
Friend Support	-.29	.17	-.13	-1.71			
Computer	-.15	.31	-.035	-.48			
Internet	-.94	.48	-.17	-1.95			

Social Media	.75	.40	.18	1.88			
Texting	.10	.51	.019	.20			
Television	-.37	.50	-.072	-.74			
Video Games	.418	.321	.106	1.300			
					5.90 (10, 156)***	.228***	.227

Note. *p < .05. **p < .01. ***p < .001.

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 3							
(Intercept)	-.86	3.16		-.27			
Child Gender	2.61	.75	.27	3.47***			
Child Age	.37	.28	.099	1.30			
					6.67 (2, 157)**	.067**	
(Intercept)	10.77	3.82		2.82**			
Child Gender	1.81	.79	.19	2.28*			
Child Age	.044	.27	.012	.16			
Family Support	-1.44	.27	-.41	-5.29***			
Friend Support	.051	.20	.021	.26			
Computer	-.059	.33	-.014	-.18			
Internet	.35	.56	.064	.64			
Social Media	.77	.46	.16	1.69			
Texting	-.23	.62	-.035	-.36			
Television	.083	.53	.015	.16			
Video Games	.23	.38	.051	.62			
					5.84 (10, 149)***	.282***	.203
Time 4							
(Intercept)	.19	3.07		.063			
Child Gender	1.02	.73	.11	1.40			
Child Age	.30	.28	.085	1.08			
					1.50 (2, 159)	.006	
(Intercept)	13.25	3.25		4.09***			
Child Gender	-.30	.74	-.032	-.41			
Child Age	.13	.24	.037	.53			
Family Support	-1.60	.24	-.47	-6.75***			
Friend Support	-.20	.21	-.071	-.97			
Computer	.23	.33	.051	.71			
Internet	-.013	.52	-.002	-.025			
Social Media	1.66	.47	.32	3.55***			
Texting	-1.18	.56	-.18	-1.98*			
Television	.36	.52	.058	.69			

Video Games	.012	.37	.003	.032			
					8.42 (10, 151)***	.315***	.339

Note. *p < .05. **p < .01. ***p < .001.

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 5							
(Intercept)	-4.13	2.82		-1.46			
Child Gender	1.59	.67	.19	2.36*			
Child Age	.65	.25	.20	2.57*			
					5.84 (2, 152)**	.059**	
(Intercept)	4.66	3.29		1.42			
Child Gender	.44	.77	.052	.58			
Child Age	.35	.26	.11	1.37			
Family Support	-.91	.22	-.34	-4.08***			
Friend Support	-.002	.20	-.001	-.011			
Computer	.36	.35	.095	1.04			
Internet	-.72	.55	-.14	-1.32			
Social Media	.70	.48	.16	1.47			
Texting	.24	.53	.042	.45			
Television	.37	.58	.073	.64			
Video Games	-.20	.40	-.049	-.51			
					4.42 (10, 144)***	.181***	.163
Time 6							
(Intercept)	-.48	2.86		-.17			
Child Gender	.44	.68	.050	.64			
Child Age	.41	.26	.12	1.58			
					1.41 (2, 160)	.005	
(Intercept)	12.05	3.38		3.57***			
Child Gender	-.44	.75	-.051	-.59			
Child Age	.26	.25	.080	1.07			
Family Support	-1.09	.25	-.35	-4.30***			
Friend Support	-.40	.20	-.16	-2.03*			
Computer	-.095	.34	-.024	-.28			
Internet	.18	.53	.036	.34			
Social Media	.62	.46	.15	1.34			
Texting	.041	.54	.008	.075			
Television	-.97	.65	-.19	-1.48			

Video Games	-.24	.36	-.059	-.67			
					4.47 (10, 152)***	.177***	.210

Note. *p < .05. **p < .01. ***p < .001.

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 7							
(Intercept)	.10	2.83		.036			
Child Gender	1.58	.67	.18	2.35*			
Child Age	.34	.26	.10	1.33			
					3.50 (2, 163)*	.029*	
(Intercept)	16.25	3.01		5.40***			
Child Gender	.69	.66	.078	1.05			
Child Age	.006	.21	.002	.028			
Family Support	-1.75	.22	-.56	-8.05***			
Friend Support	-.12	.17	-.050	-.72			
Computer	-.16	.25	-.047	-.66			
Internet	-.023	.54	-.004	-.042			
Social Media	.80	.38	.18	2.01*			
Texting	-.26	.44	-.046	-.58			
Television	-.40	.56	-.071	-.71			
Video Games	.35	.31	.085	1.14			
					11.31 (10, 155)***	.384***	.381
Time 8							
(Intercept)	-1.66	2.83		-.59			
Child Gender	1.54	.67	.18	2.28*			
Child Age	.48	.26	.15	1.89			
					4.19 (2, 156)*	.039*	
(Intercept)	10.42	3.42		3.05**			
Child Gender	-.37	.72	-.042	-.51			
Child Age	.35	.23	.11	1.49			
Family Support	-1.08	.25	-.35	-4.25***			
Friend Support	-.27	.22	-.10	-1.22			
Computer	.52	.33	.13	1.59			
Internet	.11	.55	.021	.21			
Social Media	.94	.42	.22	2.24*			
Texting	-1.48	.57	-.25	-2.61*			

Television	.009	.55	.002	.017			
Video Games	-.89	.34	-.22	-2.60*			
					6.55 (10, 148)***	.260***	.256

Note. *p < .05. **p < .01. ***p < .001.

Post-Traumatic Stress. For caregiver-reported CPSS-V scores, the overall models for the regressions were found to be significant at Times 1, 3, 4, 5, 6, 7, and 8 (*p's* ranging from .021 to < .001; see Table 12). The models accounted for 8.3% to 24.7% of the variance in caregiver-reported CPSS-V scores across time (see Table 12).

Significant predictors of caregiver-reported CPSS-V scores included: social media use (Times 1, 3, 4, 5, 6), texting use (Time 7), family social support (Times 4, 5, 6, 7, 8) and television use (Time 7). Higher social media use and texting use predicted higher caregiver-reported PTSD symptoms at Time 1 and Times 3 to 7 (June 2020, August/September 2020 to December 2020/January 2021), contradicting the hypothesis. Higher perceived family social support predicted lower caregiver-reported PTSD symptoms from Times 4 to 8 (September/October 2020 to March 2021), supporting the hypothesis. Additionally, higher television use predicted lower caregiver-reported PTSD symptoms at Time 7 (December 2020/January 2021).

Table 12.
Linear Regressions Predicting Total Scores on Caregiver CPSS from Social Support and Technology Use Frequencies, Controlling for Child Gender and Age (N =178)

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 1							
(Intercept)	15.11	7.18		2.10*			
Child Gender	2.20	1.71	.11	1.28			
Child Age	-.55	.65	-.073	-.85			
					1.24 (2, 133)	.004	
(Intercept)	7.63	9.07		.84			
Child Gender	.23	2.08	.011	.11			
Child Age	-.59	.64	-.078	-.91			
Family Support	.48	.69	.065	.70			
Friend Support	-.32	.45	-.064	-.70			
Computer	1.23	.93	.12	1.32			
Internet	1.87	1.42	.17	1.31			
Social Media	2.47	1.11	.26	2.22*			
Texting	-1.35	1.32	-.12	-1.02			
Television	.34	1.41	.032	.24			
Video Games	.089	.99	.009	.090			
					2.21 (10, 125)*	.083*	.132
Time 2							
(Intercept)	.93	2.76		.34			
Child Gender	1.79	.66	.21	2.72**			
Child Age	.24	.25	.072	.95			
					.066 (2, 166)	-.011	
(Intercept)	22.25	8.37		2.66**			
Child Gender	-1.42	1.94	-.069	-.73			
Child Age	-.50	.62	-.065	-.81			
Family Support	-1.39	.54	-.21	-2.56*			
Friend Support	-.27	.46	-.050	-.59			
Computer	.095	.86	.009	.11			
Internet	.77	1.23	.069	.63			

Social Media	.66	.85	.062	.78			
Texting	.99	1.13	.073	.88			
Television	.10	1.16	.010	.088			
Video Games	.30	.93	.031	.32			
					1.28 (10, 158)	.016	.074

Note. *p < .05. **p < .01. ***p < .001.

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 3							
(Intercept)	13.13	6.51		2.02*			
Child Gender	-1.10	1.55	-.056	-.71			
Child Age	-.32	.59	-.044	-.55			
					.682 (2, 157)	-.008	
(Intercept)	36.95	8.47		4.37***			
Child Gender	-1.96	1.71	-.10	-1.15			
Child Age	-1.39	.60	-.19	-2.33			
Family Support	-2.12	.55	-.30	-3.82			
Friend Support	.32	.43	.063	.73			
Computer	.93	.74	.11	1.26			
Internet	.85	1.53	.074	.56			
Social Media	2.06	.93	.19	2.22*			
Texting	.74	1.40	.046	.53			
Television	-2.70	1.36	-.25	-1.99*			
Video Games	-.22	.85	-.024	-.26			
					3.22 (10, 149)*	.123***	.173
Time 4							
(Intercept)	17.68	6.94		2.55*			
Child Gender	1.20	1.65	.057	.73			
Child Age	-.88	.63	-.11	-1.41			
					1.31 (2, 159)	.004	
(Intercept)	38.54	8.43		4.57***			
Child Gender	-.066	1.76	-.003	-.037			
Child Age	-1.90	.60	-.24	-3.18**			
Family Support	-2.69	.56	-.35	-4.81***			
Friend Support	.53	.51	.084	1.04			
Computer	1.60	.93	.16	1.73			
Internet	-2.11	1.45	-.16	-1.45			
Social Media	3.16	.94	.28	3.35**			
Texting	2.26	1.31	.14	1.73			
Television	-.42	1.46	-.031	-.29			

Video Games	1.02	.96	.094	1.06			
					6.04 (10, 151)***	.239***	.270

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Predictor	b	b SE	β	t	$F(df)$	Adjusted R^2	ΔR^2
Time 5							
(Intercept)	9.31	6.96		1.34			
Child Gender	.98	1.66	.048	.59			
Child Age	-.16	.63	-.021	-.26			
					.214 (2, 152)	-.010	
(Intercept)	26.27	8.17		3.22**			
Child Gender	-1.00	1.91	-.049	-.52			
Child Age	-.61	.64	-.078	-.95			
Family Support	-1.83	.56	-.29	-3.27**			
Friend Support	-.24	.51	-.045	-.48			
Computer	.75	.97	.081	.77			
Internet	-1.26	1.46	-.10	-.87			
Social Media	2.36	1.00	.22	2.35*			
Texting	-.86	1.21	-.064	-.71			
Television	.28	1.26	.025	.22			
Video Games	.47	1.05	.044	.45			
					2.68 (10, 144)*	.099**	.154
Time 6							
(Intercept)	18.95	7.94		2.39*			
Child Gender	-.39	1.89	-.016	-.21			
Child Age	-.83	.72	-.091	-1.16			
					.68 (2, 161)	-.004	
(Intercept)	49.54	10.11		4.90***			
Child Gender	-2.29	2.21	-.095	-1.04			
Child Age	-1.60	.72	-.18	-2.24*			
Family Support	-3.27	.67	-.38	-4.86***			
Friend Support	-.20	.55	-.029	-.36			
Computer	-.78	.98	-.073	-.80			
Internet	-.46	1.61	-.033	-.29			
Social Media	2.47	1.16	.20	2.13*			
Texting	1.07	1.39	.067	.78			
Television	-.36	1.57	-.026	-.23			

Video Games	.26	1.12	.023	.24			
					3.67 (10, 153)***	.141***	.185

Note. *p < .05. **p < .01. ***p < .001.

Predictor	b	b SE	β	t	$F(df)$	Adjusted R^2	ΔR^2
Time 7							
(Intercept)	18.77	6.34		2.96			
Child Gender	-1.45	1.51	-.075	-.96			
Child Age	-.83	.57	-.11	-1.46			
					1.46 (2, 161)	.006	
(Intercept)	55.09	7.58		7.27***			
Child Gender	-3.05	1.59	-.16	-1.91			
Child Age	-1.95	.54	-.27	-3.60***			
Family Support	-2.73	.51	-.40	-5.33***			
Friend Support	-.43	.41	-.078	-1.05			
Computer	-.73	.65	-.091	-1.12			
Internet	1.74	1.14	.15	1.52			
Social Media	.44	.90	.044	.48			
Texting	2.52	1.06	.21	2.39*			
Television	-3.84	1.15	-.33	-3.34**			
Video Games	-.52	.81	-.054	-.64			
					6.36 (10, 153)***	.247***	.276
Time 8							
(Intercept)	17.41	6.64		2.62*			
Child Gender	-.93	1.58	-.047	-.59			
Child Age	-.77	.60	-.10	-1.28			
					.96 (2, 154)	-.001	
(Intercept)	40.36	8.76		4.61***			
Child Gender	-4.52	1.73	-.23	-2.61*			
Child Age	-1.33	.60	-.18	-2.23			
Family Support	-1.79	.63	-.26	-2.84**			
Friend Support	-.67	.53	-.11	-1.26			
Computer	-.87	.86	-.090	-1.01			
Internet	-.59	1.35	-.051	-.44			
Social Media	1.84	.97	.18	1.90			
Texting	1.84	1.16	.14	1.59			
Television	.32	1.23	.028	.26			

Video Games	-1.25	.82	-.14	-1.53			
					3.53 (10, 146)***	.131***	.174

Note. *p < .05. **p < .01. ***p < .001.

For child-reported CPSS-V scores, the overall models for the regressions were found to be significant across all eight time points (*p's* ranging from .003 to < .001; see Table 13). The models accounted for 7.6% to 40.7% of the variance in child-reported CPSS-V scores across time (see Table 13).

Significant predictors of child-reported CPSS-V scores included: social media use (Time 1), family social support (Times 2, 3, 4, 5, 6, 7, 8) and video game use (Time 8). Similar to caregiver reports, higher social media use predicted higher caregiver-reported PTSD symptoms at Time 1 (June 2020), contradicting the hypothesis. Higher perceived family social support predicted lower child-reported PTSD symptoms from Times 2 to 8 (July/August 2020 to March 2021), supporting the hypothesis. Additionally, higher video game use predicted lower child-reported PTSD symptoms at Time 8 (March 2021).

Overall, the findings partially support hypothesis 4. Perceived social support, particularly perceived family social support, predicted lower mental health symptomatology for many time points. The pattern emerged particularly during school months. Contrary to the hypothesis, social-oriented technology use, particularly social media use, predicted higher mental health symptomatology across many time points. This pattern emerged around the beginning of the pandemic (Times 1, 3, 4), particularly for depression and PTSD symptoms.

Additionally, there some evidence that certain types of technology use were associated with mental health symptoms during the early pandemic. Television, video game, and internet use were associated with both high and low mental health symptoms at specific times, providing weaker evidence of an association across time. See Table 14 for a summary of the findings.

Table 13.

Linear Regressions Predicting Total Child CPSS Scores from Social Support and Child-Reported Technology Use Frequencies, Controlling for Child Gender and Age (N =178)

Predictor	*b*	*b SE*	*β*	*t*	*F(df)*	Adjusted R^2	ΔR^2
Time 1							
(Intercept)	3.02	9.15		.33			
Child Gender	5.71	2.18	.23	2.62*			
Child Age	.53	.83	.057	.65			
					3.57 (2, 123)*	.040*	
(Intercept)	-2.94	11.79		-.25			
Child Gender	4.26	2.63	.17	1.62			
Child Age	.63	.82	.067	.77			
Family Support	.24	.89	.025	.27			
Friend Support	-.56	.59	-.092	-.97			
Computer	.34	1.00	.031	.34			
Internet	1.19	1.95	.080	.61			
Social Media	3.39	1.34	.28	2.52*			
Texting	-1.07	1.78	-.065	-.60			
Television	.062	1.96	.004	.031			
Video Games	1.11	1.17	.096	.94			
					2.03 (10, 115)*	.076	.095
Time 2							
(Intercept)	10.17	7.27		1.40			
Child Gender	4.05	1.73	.18	2.34*			
Child Age	-.092	.66	-.011	-.14			
					2.77 (2, 163)	-.021	
(Intercept)	34.08	8.54		3.99***			
Child Gender	3.73	2.02	.17	1.84			
Child Age	-.67	.63	-.079	-1.05			
Family Support	-2.83	.56	-.38	-5.02***			
Friend Support	.21	.47	.036	.45			
Computer	.85	.84	.078	1.00			
Internet	-2.14	1.32	-.15	-1.62			

Social Media	.94	1.09	.088	.86			
Texting	1.22	1.40	.085	.87			
Television	-1.36	1.38	-.10	-.99			
Video Games	1.414	.881	.138	1.605			
					3.87 (10, 155)***	.148***	.167

Note. $*p < .05$. $**p < .01$. $***p < .001$.

Predictor	b	b SE	β	t	$F(df)$	Adjusted R^2	ΔR^2
Time 3							
(Intercept)	5.18	7.46		.69			
Child Gender	2.38	1.78	.11	1.34			
Child Age	.42	.67	.049	.63			
					1.05 (2, 160)	.001	
(Intercept)	28.62	9.07		3.16**			
Child Gender	.52	1.89	.023	.28			
Child Age	-.40	.64	-.047	-.63			
Family Support	-3.32	.64	-.41	-5.16***			
Friend Support	.89	.47	.15	1.90			
Computer	.21	.79	.021	.27			
Internet	1.62	1.32	.13	1.23			
Social Media	1.18	1.09	.10	1.09			
Texting	-.32	1.48	-.021	-.21			
Television	-.28	1.26	-.022	-.22			
Video Games	-.015	.89	-.001	-.017			
					4.34 (10, 162)***	.171***	.209
Time 4							
(Intercept)	4.47	6.71		.67			
Child Gender	1.53	1.60	.077	.96			
Child Age	.35	.61	.047	.58			
					.60 (2, 152)	-.005	
(Intercept)	29.01	7.55		3.84***			
Child Gender	-.18	1.71	-.009	-.11			
Child Age	-.065	.57	-.009	-.12			
Family Support	-3.18	.55	-.44	-5.77***			
Friend Support	-.20	.48	-.033	-.41			
Computer	.54	.77	.056	.71			
Internet	-.36	1.20	-.027	-.30			
Social Media	2.14	1.09	.20	1.97			
Texting	-.52	1.39	-.037	-.38			
Television	.11	1.21	.009	.093			

Video Games	.84	.87	.089	.97			
					5.19 (10, 144)***	.214***	.257

Note. *p < .05. **p < .01. ***p < .001.

Predictor	b	b SE	β	t	F(df)	Adjusted R^2	ΔR^2
Time 5							
(Intercept)	-12.14	6.92		-1.75			
Child Gender	4.95	1.65	.24	3.00**			
Child Age	1.63	.62	.21	2.61*			
					7.58 (2, 148)	.081***	
(Intercept)	13.10	7.70		1.70			
Child Gender	1.97	1.81	.094	1.09			
Child Age	.74	.60	.093	1.23			
Family Support	-2.76	.52	-.42	-5.29***			
Friend Support	.31	.46	.056	.68			
Computer	1.75	.81	.19	2.15*			
Internet	-2.74	1.28	-.21	-2.15*			
Social Media	1.54	1.12	.14	1.38			
Texting	-.15	1.24	-.011	-.12			
Television	1.57	1.36	.13	1.16			
Video Games	-.75	.93	-.074	-.81			
					6.59 (10, 140)***	.272***	.227
Time 6							
(Intercept)	1.34	7.13		.19			
Child Gender	2.71	1.70	.13	1.60			
Child Age	.55	.64	.066	.85			
					1.58 (2, 160)	.007	
(Intercept)	30.91	8.58		3.60***			
Child Gender	1.41	1.91	.065	.74			
Child Age	-.001	.62	.000	-.001			
Family Support	-3.07	.64	-.39	-4.77***			
Friend Support	-.12	.50	-.020	-.25			
Computer	.50	.87	.050	.58			
Internet	.60	1.34	.048	.48			
Social Media	.75	1.17	.073	.64			
Texting	-.67	1.38	-.050	-.48			
Television	-2.17	1.66	-.17	-1.31			

Video Games	-.010	.91	-.001	-.011			
					3.77 (10, 152)***	.146***	.179

Note. *p < .05. **p < .01. ***p < .001.

Predictor	b	b SE	β	t	$F(df)$	Adjusted R^2	ΔR^2
Time 7							
(Intercept)	-5.04	7.58		-.66			
Child Gender	4.45	1.81	.19	2.47*			
Child Age	1.21	.68	.14	1.77			
					4.41 (2, 162)*	.040*	
(Intercept)	42.77	7.96		5.37***			
Child Gender	2.04	1.73	.087	1.18			
Child Age	.11	.56	.012	.19			
Family Support	-5.20	.57	-.62	-9.06***			
Friend Support	.27	.46	.040	.59			
Computer	.085	.66	.009	.13			
Internet	2.06	1.43	.14	1.43			
Social Media	1.12	1.01	.094	1.11			
Texting	-1.00	1.16	-.067	-.87			
Television	-2.67	1.49	-.18	-1.80			
Video Games	-.50	.82	-.045	-.61			
					12.24 (10, 140)***	.407***	.391
Time 8							
(Intercept)	-3.01	6.48		-.46			
Child Gender	1.76	1.54	.093	1.14			
Child Age	.99	.58	.14	1.69			
					2.00 (2, 149)	.013	
(Intercept)	21.10	8.05		2.62*			
Child Gender	-2.44	1.68	-.13	-1.45			
Child Age	.49	.55	.068	.89			
Family Support	-2.20	.60	-.33	-3.70***			
Friend Support	-.11	.52	-.018	-.21			
Computer	.63	.77	.072	.81			
Internet	1.16	1.30	.098	.89			
Social Media	1.80	.99	.19	1.82			
Texting	-.63	1.33	-.048	-.47			
Television	-1.28	1.28	-.19	-1.00			

Video Games	-2.41	.81	-.27	-2.99**			
					4.73 (10, 141)***	.198***	.225

Note. *p < .05. **p < .01. ***p < .001.

Table 14.
Summary of the Findings

Hypothesis	Main Findings	Conclusion
1a: Reports of every type of child technology use will fluctuate across the pandemic.	-Fluctuations observed in computer and social media use across time -Television, internet, texting, social media, and video game use remained stable across time -Television use significantly higher than other technologies across time -Social-oriented technologies (i.e., social media and texting) significantly lower than other technologies across time	Partially Supported
1b: Children who reported attending school virtually for the majority of time points will report greater amounts of technology use, particularly social-oriented technology use (i.e., social media and texting) and computer use.	-Overall technology use greater in the majority virtual schooling group -Computer, television, internet, and video game use significantly higher in the majority virtual schooling group -No significant differences in social media and texting use between groups	Partially Supported
2a: Caregivers will underestimate the amount of time children spent using technology.	-No significant differences in reports of technology use frequencies between caregivers and children	Not Supported
2b: Caregivers who reported experiencing higher levels of family stress would underestimate the amount of time children spent using technology, compared to those who reported lower levels of family stress.	-No significant differences in reports of technology use frequencies between caregivers and children who reported high versus low family stress -Computer use significantly higher in the high family stress group	Not Supported
3: Children who reported higher levels of perceived social support over the pandemic will engage in	-Social-oriented technology did not differ between high versus low reports of both family and friend social support	Not Supported

higher levels of social-oriented technology use (social media and texting).	-No differences in technology use for those who reported high versus low family support -Computer, internet, television, and video game use significantly higher in those who reported low versus high friend support	
4: Reports of greater social-oriented technology use and social support will be associated with reports of lower mental health symptomatology (anxiety, depression, PTSD) across all time points.	-Perceived social support, particularly perceived family social support, predicted lower mental health symptomatology at many time points -Social-oriented technology use, particularly social media use, predicted higher mental health symptomatology at many time points -Television, video game, and internet use were associated with both high and low mental health symptoms at specific times	Partially Supported

CHAPTER 5

Discussion

As part of a larger investigation on children's mental health during the pandemic, the present study examined how children in Southwestern Ontario, ages 8 to 13, used technology during the early pandemic and its association with indicators of mental health and perceived social support. Parent and child reports from 178 families, assessing child technology use, social support, and mental health, were collected monthly from June to December 2020/January 2021 and again in March 2021.

The findings suggested that children engaged in different technologies at different frequencies, with some fluctuations within their use. Computer use fluctuated the most, as children reported using computers more during the school months. Children who attending school virtually for majority of the study period reported engaging in significantly more technology use than those who attended virtual school more variably. There were no significant differences in caregiver and child reports of child technology use.

Additionally, the findings suggested that social-oriented technology use (i.e., social media and texting) did not foster feelings of perceived social support during the early pandemic. Social-oriented technology use did not appear to be related to feelings of perceived social support across the pandemic. Furthermore, social media use was associated with reports of higher mental health symptomatology across many time points of the study, while perceived social support was associated with reports of lower mental health symptoms. The opposing directionality of the predictors suggests that social-oriented technology use and feelings of perceived social support may not be related to each other.

Fluctuations in Technology Use across the Early Pandemic

Hypothesis 1, which predicted that all types of child technology use would fluctuate across the early pandemic, was partially supported. Both caregivers and children reported statistically different frequencies of types of technology use across the pandemic. Television use was found to be the technology that children used the most, whereas social media and texting use were engaged in the least. However, there was no evidence that overall technology use was higher or lower at specific time points. Specifically, there were not any time points during the study where all six types of technology use significantly increased or decreased.

Fluctuations were demonstrated for computer and social media use. Computer use, a measure of how children used computers for school and general computing, increased during the school months (i.e., September to December 2020/January 2021), then decreased in March 2021. This may reflect the changes in lockdown policies across the year. Large outbreaks occurring in fall 2020 led to school closures in December 2020 (Ontario Ministry of Health, 2022). Schools began to partially re-open at the end of January 2021, with schools fully reopening from February 16th, 2021, to April 12th, 2021, when the cases began spiking (Gallagher-Mackay et al., 2021).

In the present study, there was a significant spike in caregiver-reported social media use during Time 2 (i.e., July/August 2020), but not child-reported social media use; however, the difference between caregiver and child reports was not significant. The difference in caregiver reports from Time 1 to Time 2 may demonstrate a difference in child monitoring during the summer months, as all children would be in the home more often, regardless of type of schooling (i.e., in-person versus virtual schooling). This was also the time when lockdowns were extremely strict, so children likely spent more time at home (Gallagher-Mackay et al., 2021). Therefore, caregivers had more opportunity to see their children using technology, relative to what they typically see, which may have appeared to be greater than usual.

Contrary to hypothesis 1, technologies used for entertainment purposes, such as video games, internet, and television, remained stable across time points. According to Barnes (2024), whose findings were based on the same data set as the present study, both caregivers and children identified using the television, internet, and video games in primarily distraction-based ways (i.e., using technology to distract themselves). Previous research suggests that avoidance coping, such as using technology as a distraction from real-world events, was prominent in children and adolescents during the pandemic (Liang et al., 2020; Vallejo-Slocker et al., 2022). Additionally, studies suggest that emotion-focused coping strategies may be beneficial for children during uncontrollable situations, such as the pandemic (Hsieh et al., 2021). The uncontrollable spread of COVID-19 meant individuals were unexpectedly stuck in their homes, could not see their peers face-to-face, and had to adjust to virtual spaces for school and work. Many individuals struggled with unexpected adversities, such as contracting the virus, losing loved ones, and financial struggles due to mass job layoffs (Fluharty & Fancourt, 2021). Together, this may suggest that distraction-based technologies, such as television and video games, may have been used as a stable way for children to cope with the stress of the pandemic, given the change in lockdown policies affecting their ability to see other people.

Given that entertainment-based technology use remained stable across all time points of the study, it is also possible that children simply use these technologies at a high rate outside of stressful life events. Prior to the pandemic, child screen time was already significantly high, with studies suggesting that Ontario youth spend about 7.5 hours per day using screens, and between 83% to 87% of Canadian youth use a smartphone, daily (Canadian Pediatrics Society, 2019; Statistics Canada, 2018). Entertainment-based technology use did not significantly differ from the beginning of the study, when restrictions were extremely strict, to the end of the study, when restrictions began to loosen. Additionally, it may be possible that children became used to engaging in high amounts of certain technologies. Future studies should investigate how child technology use in the present day has changed from technology use during the pandemic, to see if entertainment-based technology use has changed over time.

Technology Use and Virtual Schooling

Hypothesis 1 also posited that there would be differences in technology use across types of schooling. I hypothesized that children in the majority virtual schooling group (i.e., those who reported attending school virtually for 3-5 time points of the study) would report more technology use than those in the variable virtual schooling group (i.e., those who reported attending school virtually for 0-2 time points of the study).

Across the school months (i.e., Times 4 to 8; September 2020 to March 2021) and all technologies, I found that caregivers and children reported that children engaged in technology use significantly more in the majority virtual schooling group than the variable virtual schooling group. Particularly, caregivers and children reported that computer, internet, television, and video game use were significantly greater in the majority virtual schooling group than the variable virtual schooling group, supporting the hypothesis.

The results align with previous findings that child technology use increased during pandemic-related school closures (Bergmann et al., 2022; Seguin et al., 2021). For example, Seguin and colleagues (2021) found that non-school-related technology use (e.g., watching television) increased by three hours when children reported attending school virtually. Computer use broadly measured the amount of time children used computers for virtual schooling, alongside general computing purposes, so it seems plausible that computer use was significantly higher in the majority virtual schooling group. It is possible that children who attended school virtually had more access to other technologies at home, such as video games and television, so they were more likely to engage in them than those who attended classes in person. Additionally, it could be that families and children who were more familiar with technology use may have been more willing to do virtual schooling, so they were already engaging in greater amounts of technology use than those who chose in-person schooling.

Interestingly, it was found that those who reported high levels of family stress also reported significantly greater amounts of child computer use than those who reported low family stress. Studies have found that during the pandemic, parents reported experiencing high levels of stress due to increased child monitoring responsibilities when children remained in the home. For example, Brauchli and colleagues (2024) found positive associations between parenting stress, positive parental attitudes towards screen time, and child screen time across the pandemic. Those with more positive parental attitudes toward screen time showed a stronger association between parental stress and child screen time.

In the present study, family stress was specifically associated with reports of greater computer use.

In line with these findings, studies show that caregivers were more likely to use distraction-based technology as a ‘babysitter’ during the pandemic (e.g., Katzman, 2024). Researchers suggested that parents may have used screens as a way to take a break from child monitoring during lockdowns (Cost et al., 2020; Katzman, 2024). Given that computer use measured, in part, the amount of time children spent using a computer for school purposes, it is possible that virtual school attendance was linked to higher levels of caregiver-reported family stress, potentially due to increased child-monitoring responsibilities. Future studies should investigate the link between child technology use and caregiver child-monitoring responsibilities.

Differences in Caregiver and Child Reports of Child Technology Use

Hypothesis 2, which predicted that caregivers would underestimate the amount of time children spent using technology, particularly during periods of high family stress, was not supported. There were no significant differences between parent and child reports of technology use frequencies across time.

These findings contradict previous research. For example, Wood and colleagues (2019) found that although parent and child reports were similar, parents reported significantly less television use than children, particularly when children had a television in their bedroom. Researchers suggested that parents may unintentionally underestimate or overestimate the time their child spends using technology for various reasons, such as having limited awareness of what their child engages in online, or potential challenges in monitoring screen time across multiple devices (Wood et al., 2019).

Within the present study's sample, Barnes (2024) found differences in parent and child reports of technology use frequencies between reports of technology use three months prior to lockdowns in March 2020 and reports of technology use during lockdowns in June 2020. For example, children reported significantly higher texting and social media use than did caregivers 3 months before the pandemic. One possible explanation for the contradicting findings in the present study is that caregivers were able to better monitor their children's technology use due to constantly being around them during lockdowns. By eliminating environmental differences between caregivers and their children, it may have made it easier for caregivers to monitor how their children were engaging with technology during the pandemic.

Perceived Social Support and Social-Oriented Technology Use

Hypothesis 3, which predicted that children who reported higher levels of perceived social support over the pandemic would engage in higher levels of social-oriented technology use (i.e., social media and texting), was not supported.

Children who reported low levels of perceived social support from friends engaged in significantly higher amounts of computer use, which may suggest that they spent more time attending school virtually than those who reported high levels of perceived social support from friends. It is possible that children may have reported less perceived social support from friends because they were unable to interact with them face-to-face. This aligns with previous findings that children reported feeling lonelier and more isolated during pandemic-related school closures than pre-pandemic periods (Houghton et al., 2022).

Children who reported low levels of perceived social support from friends also reported significantly higher amounts of internet, television, and video game use, which were previously suggested to be used a distraction-based coping strategy (Barnes, 2024). The findings may suggest that children used distraction-based technologies to cope with the absence of their friends. I also found that children who reported attending school virtually for majority of the study reported higher amounts of internet, television, and video game use. This pattern suggests that children may be using technology as a way to manage feelings of social isolation and stress, particularly during uncontrollable situations like the pandemic. Virtual schooling reduced opportunities for in-person interactions with peers, likely leading to lower perceived social support and heightened stress from the lack of social connection. As a result, children may have turned to distraction-based technology use to cope with the absence of their friends.

Interestingly, it does not appear that those who reported high levels of perceived social support from friends used social-oriented technology as a means to foster social support, given that both high and low social support groups reported engaging in social-oriented technology use at similar frequencies. Additionally, no differences in technology use frequencies were identified between those who reported high versus low perceived social support from family.

The findings were similar for those who reported attending school virtually. Both children who reported low social support from friends and those who reported attending school virtually for majority of the study period engaged in greater amounts of computer use, but no differences were observed in social-oriented technology use. This may suggest a connection between virtual school attendance and perceived social support from friends, as the computer use measure accounted for time spent using a computer for attending school. The subtleties of face-to-face interactions help foster feelings of social support, but these are nonexistent in online interactions (Hoofman & Secord, 2021). As seen by Vaillancourt and colleagues (2022), children who attended school virtually reported that they felt like they mattered less than their peers who attended school in person. For children, engaging in social-oriented technology use may not have as been socially rewarding as in-person interactions, which may underscore why there were no differences in social-oriented technology use between groups. Therefore, those who attended school virtually may not have had the same opportunities for fostering social support between friends compared to those who attended classes in-person.

Taken together these findings contradict the rich-get-richer hypothesis, which states that time online can be seen as an extended space for socialization, during which offline connections are maintained and further developed (Valkenburg & Peter, 2007). Specifically, this hypothesis suggests that those with rich offline social supports will benefit significantly more from online socialization than those with poor supports (Valkenburg & Peter, 2007). If this hypothesis supported the findings, I would expect to see a difference between how those with high versus low social support engaged with social-oriented technology, however, no differences were observed.

One possible explanation is that children may have received social support from in-person interactions with caregivers, not needing to rely on technology to foster those feelings. Within the present study's sample, Mactavish and colleagues (2021) found that social support was associated with lower depression and irritability severity and an attenuated increase in psychological distress. Additionally, Zhu and colleagues (2021) found that participants who reported higher perceived vulnerability during the pandemic also reported experiencing increased offline support from friends and family. Researchers suggested that youth may be more likely to seek social support to cope when experiencing pandemic-related stress compared to coping with typical stressors during non-pandemic times. It is possible that children preferred to seek out social support from those they could access face-to-face, such as caregivers in the home, rather than communicating with their peers online.

It is also possible that technology which we defined in this study as social-oriented may not have been primarily used for social purposes. When analyzing the baseline data, Barnes (2024) found that children reported using social media and texting primarily for social reasons (e.g., to communicate with family and friends). However, problem-focused (e.g., to seek information about COVID-19) and emotion-focused reasons (e.g., to reduce worry) were also reported as reasons for engaging in social media and texting use. The findings demonstrate that technology use is multi-faceted. Popular social media platforms, such as Instagram and TikTok, can be used in primarily distraction-based ways, just as much as they can be used for social purposes. These applications can allow children to watch short-form videos and look at pictures as a form of entertainment.

Conversely, whereas Barnes (2024) found that video games were primarily used for distraction-based reasons, they can also be used in a social-focused manner to communicate with friends. Many video games such as *Overwatch, Fortnite,* and *Minecraft* have functions that allow players to voice chat with each other, facilitating social interactions. During the pandemic, video games may have served as a tool for socialization when children were unable to interact with their friends face-to-face. This may have further impacted reports of social-oriented technology use as children may have used other means to communicate with their friends, such as chatting through video games, reducing the reported amount of social-oriented technology use.

Because we only measured how children were engaging with different technologies at the baseline time point, it is possible that the function that these technologies served changed over time. Future studies should investigate how the functions of child technology use change over time, both generally and during the pandemic.

A possible limitation is that the measure of perceived social support variable did not specify a difference between online and offline supports, which is the best measure for assessing the rich-get-richer hypothesis. The questions generally asked whether children felt they could rely on friends or family, not if they typically did so online versus offline. A child that reported high perceived social support might have poor social support offline. The social support groups are based on current social support, but the sources could be from either or both online and offline. Future studies should measure online and offline supports separately, to better understand the relationship between social-oriented technology use and perceived social support.

Social Oriented-Technology Use, Perceived Social Support, and Child Mental Health Symptomatology

Hypothesis 4, which predicted that reports of higher levels of perceived social support and social-oriented technology use would be associated with reports of lower mental health symptomatology, was partially supported. Perceived social support --

particularly perceived family social support -- predicted lower mental health symptomatology across the time points in the study, which has been previously reported by MacTavish and colleagues (2021) in this sample. The findings align with the stress-buffering hypothesis, demonstrating that social support may have protected against the negative effects of social isolation across the early pandemic (Cohen & Wills, 1985; Zhu et al., 2021).

Unexpectedly, social-oriented technology use — particularly social media use — predicted *higher* mental health symptomatology over time. Similar to the previous hypotheses, social-oriented technology use did not appear to support children in the way I hypothesized. With the regressions demonstrating directions of the effects of perceived social support and social-oriented technology use on mental health that run contrary to the hypothesis, it is possible that perceived social support and social-oriented technology use have distinct effects on mental health symptomatology.

One possible explanation is that children may have been using social media in a negative way, such as engaging in social comparisons. Social comparison involves evaluating oneself through comparisons with others (Festinger, 1954). Social media intensifies these comparisons because it highlights idealized versions of people's lives, making it easier for individuals to compare themselves in a way that might not be accurate or healthy. This can contribute to feelings of anxiety and depression (Piteo & Ward, 2020). Previous studies have found a relation between children's greater use of social media and higher levels of mental health symptomatology. For example, Woods and Scott (2016) found that daily social media use in youth was related to an increase in both depression and anxiety symptoms. The present study found that greater social media use was a predictor of higher levels of child anxiety, depression, and PTSD symptoms. It is possible that children in the present study used social media to engage in excessive social comparison, leading to the relationship between mental health symptomatology and social media observed across the pandemic.

Barnes (2024) identified that both caregivers and children reported using social media and texting in primarily social-focused ways (i.e., to communicate with friends and family) when analyzing the baseline data of the present study. She also found that those who reported higher proportions of social-focused technology use reported feeling better when using technology compared to those who reported using technology in an emotion-focused way (i.e., using technology as a distraction). It is possible that across time points, children used social media in more of a distraction-based way rather than social-focused way, resulting in them feeling worse.

Additionally, I found that television, video game, and internet use, entertainment-based technologies, were associated with both high and low mental health symptoms at specific times, providing weaker evidence of an association across time. General patterns in these associations demonstrate that higher entertainment-based technology use predicted higher mental health symptomatology earlier in the pandemic (e.g., June/July/August 2020) when restrictions were stricter and still a novel experience for children, while higher use predicted lower mental health symptomatology later in the pandemic (e.g., December 2020/January/March 2021) when children were attending classes. It is possible that children became used to the lockdowns by the end of 2020, using entertainment-based technology more for entertainment's sake rather than as a distraction-based coping strategy. Further research is needed to understand the nuances in how children engaged with these technologies during the pandemic.

Overall, the findings suggest that online interactions alone may not be sufficient to foster feelings of social support for children; in-person interactions may be more salient for perceived social support than online ones. Alternatively, online support may be used differently than offline support. For example, children may use offline supports more often for instrumental support (e.g., needing help completing a task, such as homework), while online supports may be used for emotional support (e.g., emotional reassurance, validating one's feelings). Further research is required to understand the multifaceted ways children used technology for online support. Additionally, at some points, mental health symptomatology was associated with other types of technology use, such as television and video game use. Further research is needed to understand the relationship between these technologies and mental health symptoms during uncontrollable, stressful events such as the pandemic.

Age and Gender Differences in Child Technology Use

The present study also identified age and gender differences in how children engaged with technology. Younger children reported greater amounts of television use than older children, whereas older children reported greater amounts of social-oriented technology use than younger children. Television use was identified as being used in a primarily distraction-based way, whereas social-oriented use tended to be used for connecting with friends and family (Barnes, 2024). The findings align with developmental differences in child coping patterns, which suggest that younger children are more likely to engage in behavioural distraction-based coping, such as watching television (Zimmer-Gembeck & Skinner, 2011). In contrast, adolescents are more likely to use social-based coping strategies by talking to their friends (Zimmer-Gembeck & Skinner, 2011). Because face-to-face interactions were limited during the pandemic, it is possible that older children used social-oriented technology to connect with their friends as a form of social-focused coping.

Additionally, girls reported engaging in greater amounts of technology use than boys, apart from video game use. This finding aligns with previous research that boys are more likely to play video games than girls (Nagata et al., 2022). Although girls typically report higher social-oriented technology use than boys, it was unexpected that television, internet, and computer use were higher for girls than boys (Nagata et al., 2022). It is possible that girls engaged in greater amounts of entertainment-based technologies as a distraction-based coping strategy, which could be explained by potential gender differences in coping strategies. It is possible that girls are more likely to use distraction-based coping in response to uncontrollable situations, such as a global pandemic, which may have heightened feelings of uncertainty. Future research should investigate how gender differences in coping strategies influence how children engage with technology.

Limitations and Future Directions

The present study contained several outliers in the dataset. The cases containing outliers reported frequency of media use that was more than 6 hours per day, or high total scores on the SMFQ depression measure. I chose to keep outliers in the dataset because outlier removal did not change the main findings, and it is expected to see variability – and some unusual scores - in reports of technology use and mental health symptomatology. Future research should examine how children with clinically diagnosed internalizing disorders used technology across the pandemic; there may be differences in the amount of distraction-based use versus social-oriented use compared to those who reported average levels of internalizing symptoms.

Additionally, it would be important to examine how children who engaged with extremely high amounts of technology use were engaging with those technologies. The specific context of how technology is used matters. For example, video calling friends and family might have different effects compared to passively scrolling through social media. It is important to ask how children are using technology to understand how it is associated with mental health symptomatology.

The present study did not measure if the social support children were receiving was positive or negative. There are subtleties to social interaction; individuals can have a lot of social interactions, but the support they receive may not always be positive. This is particularly salient in online spaces, where children can post anonymously and not know who they are interacting with. There are instances of children engaging in cyberbullying, leading to long-term negative effects for the victims (Hamm et al., 2015). These data did not assess whether the social support reported in the data was helpful, so it is possible that the social support children reported receiving was unhelpful. Future studies should examine how children are receiving social support from others, particularly in online spaces.

The age of the sample may have affected the results. The present study examined child technology use in a sample of 8- to 13-year-olds. Social-oriented technology use (i.e., social media and texting) reports relied on children having access to these technologies. Typically, children cannot register for social media sites until they are 13 years old. Social media platforms such as Instagram, Facebook, and X (formerly known as Twitter) require children to be at least 13 years old to join their platforms. Despite these restrictions, children may have simply signed up for these sites or parents may have allowed children to register earlier by lying about their age. However, it is likely that many of the younger children in the sample (i.e., 8 to 9 years old) would have no access or limited access to social media during the study period. The age of the sample may partially explain the non-significant findings regarding social-oriented technology use. I included child age as a covariate during analyses; however, future studies should examine older samples, such as adolescents, to gain a broader understanding of social-oriented technology use during the pandemic, as they would likely have more experience in these online social worlds.

Lastly, there were no questions regarding if children had access to a cell phone during the study period. Accessibility to a cell phone may have helped to indicate which children were able to text and use social media during the pandemic. Future studies should clarify the types of technologies that children have access to, using a open-response format for caregivers to complete.

Clinical and Practical Implications

The present study allowed for the exploration of how technology was used by children across the early COVID-19 pandemic. Findings that certain technology use patterns fluctuated while others remained stable demonstrate the need for nuanced approaches when addressing technology use in children. For example, clinicians should consider that distraction-based technology use may have been a stable coping strategy during the pandemic, potentially offering temporary emotional relief from the stress of real-world events. However, when considering that none of these technologies consistently predicted fewer mental health symptoms, this suggests that any benefit may not have an impact on internalizing or PTSD symptoms.

The differences in technology use between children who attended virtual schooling and those with more variable in-person and virtual schooling highlight the importance of monitoring technology use in different educational settings. It may be important to know if a child is at risk of using a certain type of technology (e.g., engaging in higher levels of distraction-based technology use) because studies have shown distraction-based coping may be harmful over long periods of time (Evans et al., 2014; Richardson et al., 2020). While engaging in distraction-based technology use have been okay during the pandemic, as there were no consistent associations between distraction-based technology use and mental health symptoms across the study period, the outcomes may be different coming out of the pandemic. Policymakers and clinicians should consider the impact of increased technology use on both child and family well-being, particularly in high-stress environments.

The finding that social-oriented technology use — particularly social media use — was associated with higher mental health symptomatology suggests that online interactions may not effectively substitute for in-person social support. This highlights the need for clinicians to be cautious about recommending online spaces as a primary means of socialization, particularly for children with existing mental health concerns.

The study's findings should inform updated guidelines on children's screen time, particularly in the context of virtual schooling and pandemic-related stress. Prior to the pandemic, Ontario Premier Doug Ford was interested in developing more opportunities for virtual learning in high schools (Farhadi, 2019). Policymakers and educators should consider the present study's findings when developing future remote learning environments, ensuring that they incorporate strategies to minimize the potential negative effects of increased technology use.

Conclusions

The present study highlights the ways in which children in Southwestern Ontario, aged 8 to 13, engaged with technology during the early COVID-19 pandemic. While fluctuations in technology use were observed, particularly with computer use during school months, entertainment-based technologies like television, internet, video games remained stable across the study period. No significant differences were found between caregiver and child reports of technology use, potentially due to increased child-monitoring responsibilities during lockdowns.

Children that attended school virtually for majority of the study reported engaging in greater amounts of technology use, particularly computer use, than those who attended school virtually less frequently, mirroring the finding that those who reported high levels of family stress also reported greater computer use. The findings suggest a potential link between family stress and virtual school attendance.

Social-oriented technology use (i.e., social media and texting) did not significantly differ between children who reported low versus high social support, contradicting the rich-get-richer hypothesis. However, those who reported low social support from friends also reported engaging in greater entertainment-based technology use.

Perceived social support, particularly from family, was associated with fewer anxiety, depression, and PTSD symptoms across the pandemic, suggesting it may have been a protective factor against mental health symptomatology during the early pandemic. However, the anticipated benefits of social-oriented technology use were not found, with social media use predicting higher levels of mental health symptoms. These findings underscore the importance of considering the multifaceted roles of technology in children's lives. Future research should continue to explore how the functions of technology use evolve over time and their implications for child mental health.

REFERENCES

Abdulah, D. M., Abdulla, B. M. O., & Liamputtong, P. (2021). Psychological response of children to home confinement during COVID-19: A qualitative arts-based research. *The International Journal of Social Psychiatry*, *67*(6), 761–769. https://doi.org/10.1177/0020764020972439

Angold, A., Costello, E. J., Messer, S. C., & Pickles, A. (1995). Development of a short questionnaire for use in epidemiological studies of depression in children and adolescents. *International Journal of Methods in Psychiatric Research, 5*(4), 237-249.

Arduini, R. G., Augusto, J. A. D. O., Moraes, J. N. L. de, Stella, P. R. F., Fornasari, R. de C. C. V., Ferreira, T. F. L., & Ciasca, S. M. (2021). Perceptions of elementary school students about virtual classes during coronavirus (COVID-19) pandemic in Brazil. *Psychology*, *12*(9), Article 9. https://doi.org/10.4236/psych.2021.129089

Barnes, A. (2022). *Coping During COVID: Child Technology Use and Coping During the COVID-19 Pandemic* [M.A., University of Windsor (Canada)]. https://scholar.uwindsor.ca/etd/9122/

Barnes, A., Menna, R., Mastronardi, C., Rappaport, L. M., Mactavish, A., Amstadter, A. B., Battaglia, M. (2024, June 21-23). *Coping during COVID: Child technology use and coping during the COVID-19 pandemic* [Conference presentation]. CPA 2024 Convention, Ottawa, ON, Canada. https://convention.cpa.ca/

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Ben-Zur, H. (2009). Coping styles and affect. *International Journal of Stress Management*, *16*(2), 87–101. https://doi.org/10.1037/a0015731

Bergmann, C., Dimitrova, N., Alaslani, K., Almohammadi, A., Alroqi, H., Aussems, S., Barokova, M., Davies, C., Gonzalez-Gomez, N., Gibson, S. P., Havron, N., Horowitz-Kraus, T., Kanero, J., Kartushina, N., Keller, C., Mayor, J., Mundry, R., Shinskey, J., & Mani, N. (2022). Young children's screen time during the first COVID-19 lockdown in 12 countries. *Scientific Reports*, *12*(1), Article 1. https://doi.org/10.1038/s41598-022-05840-5

Besevegis, E., & Galanaki, E. P. (2010). Coping with loneliness in childhood. *European Journal of Developmental Psychology*, *7*(6), 653–673. https://doi.org/10.1080/17405620903113306

Birmaher, B., Brent, D. A., Chiappetta, L., Bridge, J., Monga, S., & Baugher, M. (1999). Psychometric properties of the screen for child anxiety related emotional disorders (SCARED): A replication study. *Journal of the American Academy of Child & Adolescent Psychiatry*, *38*(10), 1230–1236. https://doi.org/10.1097/00004583-199910000-00011

Birmaher, B., Khetarpal, S., Brent, D., Cully, M., Balach, L., Kaufman, J., & Neer, S. M. (1997). The Screen for Child Anxiety Related Emotional Disorders (SCARED): Scale construction and psychometric characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry*, *36*(4), 545–553. https://doi.org/10.1097/00004583-199704000-00018

Black, E., Ferdig, R., & Thompson, L. A. (2021). K-12 virtual schooling, COVID-19, and student success. *JAMA Pediatrics*, *175*(2), 119–120. https://doi.org/10.1001/jamapediatrics.2020.3800

Brauchli, V., Sticca, F., Edelsbrunner, P., von Wyl, A., & Lannen, P. (2024). Are screen media the new pacifiers? The role of parenting stress and parental attitudes for children's screen time in early childhood. *Computers in Human Behavior*, *152*, 108057. https://doi.org/10.1016/j.chb.2023.108057

Canadian Paediatric Society, Digital Health Task Force, Ottawa, Ontario. (2019). Digital media: Promoting healthy screen use in school-aged children and adolescents. *Paediatrics & Child Health*, *24*(6), 402-408.

Chiu, Y.-P., & Chang, S.-C. (2015a). Leverage between the buffering effect and the bystander effect in social networking. *Cyberpsychology, Behavior and Social Networking*, *18*. https://doi.org/10.1089/cyber.2014.0377

Chiu, Y.-P., & Chang, S.-C. (2015b). Leverage between the buffering effect and the bystander effect in social networking. *Cyberpsychology, Behavior and Social Networking*, *18*. https://doi.org/10.1089/cyber.2014.0377

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, *98*(2), 310. https://doi-org.ledproxy2.uwindsor.ca/10.1037/0033-2909.98.2.310

Compas, B. E., Jaser, S. S., Bettis, A. H., Watson, K. H., Gruhn, M. A., Dunbar, J. P., Williams, E., & Thigpen, J. C. (2017). Coping, emotion regulation, and psychopathology in childhood and adolescence: A meta-analysis and narrative review. *Psychological Bulletin*, *143*(9), 939–991. https://doi.org/10.1037/bul0000110

Cortez, P. A., da Silva Veiga, H. M., Stelko-Pereira, A. C., Lessa, J. P. A., Martins, J. Z., Fernandes, S. C. S., Priolo-Filho, S. R., Queluz, F. N. F. R., Trombini-Frick, L., & Peres, R. S. (2023). Brief assessment of adaptive and maladaptive coping strategies during pandemic. *Trends in Psychology*. https://doi.org/10.1007/s43076-023-00274-y

Delvecchio, E., Orgilés, M., Morales, A., Espada, J. P., Francisco, R., Pedro, M., & Mazzeschi, C. (2022). COVID-19: Psychological symptoms and coping strategies in preschoolers, schoolchildren, and adolescents. *Journal of Applied Developmental Psychology*, *79*, 101390. https://doi.org/10.1016/j.appdev.2022.101390

Desjarlais, M., & Willoughby, T. (2010). A longitudinal study of the relation between adolescent boys and girls' computer use with friends and friendship quality: Support for the social compensation or the rich-get-richer hypothesis? *Computers in Human Behavior*, *26*(5), 896–905. https://doi.org/10.1016/j.chb.2010.02.004

Ellis, W., Dumas, T., & Forbes, L. (2020). Physically isolated but socially connected: Psychological adjustment and stress among adolescents during the initial COVID-19 crisis. *Canadian Journal of Behavioural Science / Revue Canadienne Des Sciences Du Comportement*, *52*, 177–187. https://doi.org/10.1037/cbs0000215

Evans, L. D., Kouros, C., Frankel, S. A., McCauley, E., Diamond, G. S., Schloredt, K. A., & Garber, J. (2015). Longitudinal relations between stress and depressive symptoms in youth: Coping as a mediator. *Journal of Abnormal Child Psychology*, *43*(2), 355–368. https://doi.org/10.1007/s10802-014-9906-5

Farhadi, B. (2019). *In Doug Ford's e-learning gamble, high school students will lose.* The Conversation. https://theconversation.com/in-doug-fords-e-learning-gamble-high-school-students-will-lose-122826

Festinger, L. (1954). A theory of social comparison processes. Human Relations, 7(2) 117-140.

Fluharty, M., & Fancourt, D. (2021). How have people been coping during the COVID-19 pandemic? Patterns and predictors of coping strategies amongst 26,016 UK adults. *BMC Psychology*, *9*(1), 107. https://doi.org/10.1186/s40359-021-00603-9

Foa, E. B., Asnaani, A., Zang, Y., Capaldi, S., & Yeh, R. (2018). Psychometrics of the Child PTSD Symptom Scale for DSM-5 for trauma-exposed children and adolescents. *Journal of Clinical Child & Adolescent Psychology*, *47*(1), 38-46.

Folkman, S. (1984). Personal control and stress and coping processes: A theoretical analysis. *Journal of Personality and Social Psychology*, *46*(4), 839–852. https://doi.org/10.1037/0022-3514.46.4.839

Folkman, S., & Lazarus, R. S. (1980). An analysis of coping in a middle-aged community sample. *Journal of Health and Social Behavior*, *21*(3), 219–239. https://doi.org/10.2307/2136617

Gallagher-Mackay, K., Srivastava, P., Underwood, K., Dhuey, E., McCready, L., Born, K., Maltsev A., Perkhun A., Steiner, Barrett R., & Sander, B. (2021). COVID-19 and education disruption in Ontario: emerging evidence on impacts. *Ontario COVID-19 Science Advisory Table, 1*(1), 1-36. https://doi.org/10.47326/ocsat.2021.02.34.1.0

George, M. J., Russell, M. A., Piontak, J. R., & Odgers, C. L. (2018). Concurrent and subsequent associations between daily digital technology use and high-risk adolescents' mental health symptoms. *Child Development*, *89*(1), 78–88. https://doi.org/10.1111/cdev.12819

Government of Ontario. (2020). *Ontario Enacts Declaration of Emergency to Protect the Public.* Ontario Newsroom. https://news.ontario.ca/en/release/56356/ontario-enacts-declaration-of-emergency-to-protect-the-public

Government of Ontario. (2021). *COVID-19 vaccines for Ontario.* COVID-19 (Coronavirus) in Ontario. Retrieved July 20, 2024, from https://covid-19.ontario.ca/covid-19-vaccines-ontario

Hawke, L. D., Barbic, S. P., Voineskos, A., Szatmari, P., Cleverley, K., Hayes, E., Relihan, J., Daley, M., Courtney, D., Cheung, A., Darnay, K., & Henderson, J. L. (2020). Impacts of COVID-19 on youth mental health, substance use, and well-being: A rapid survey of clinical and community samples: Répercussions de la COVID-19 sur la santé mentale, l'utilisation de substances et le bien-être des adolescents : un sondage rapide d'échantillons cliniques et communautaires. *The Canadian Journal of Psychiatry*, *65*(10), 701–709. https://doi.org/10.1177/0706743720940562

Hawke, L. D., Szatmari, P., Cleverley, K., Courtney, D., Cheung, A., Voineskos, A. N., & Henderson, J. (2021). Youth in a pandemic: A longitudinal examination of youth mental health and substance use concerns during COVID-19. *BMJ Open*, *11*(10), e049209. https://doi.org/10.1136/bmjopen-2021-049209

Holen, S., Lervåg, A., Waaktaar, T., & Ystgaard, M. (2012). Exploring the associations between coping patterns for everyday stressors and mental health in young schoolchildren. *Journal of School Psychology*, *50*(2), 167–193. https://doi.org/10.1016/j.jsp.2011.10.006

Hoofman, J., & Secord, E. (2021). The effect of COVID-19 on education. *Pediatric Clinics*, *68*(5), 1071–1079. https://doi.org/10.1016/j.pcl.2021.05.009

Houghton, S., Kyron, M., Hunter, S. C., Lawrence, D., Hattie, J., Carroll, A., & Zadow, C. (2022). Adolescents' longitudinal trajectories of mental health and loneliness: The impact of COVID-19 school closures. *Journal of Adolescence*, *94*(2), 191–205. https://doi.org/10.1002/jad.12017

Hsieh, W.-J., Powell, T., Tan, K., & Chen, J.-H. (2021). Kidcope and the COVID-19 pandemic: Understanding high school students' coping and emotional well-being. *International Journal of Environmental Research and Public Health*, *18*(19), Article 19. https://doi.org/10.3390/ijerph181910207

Increased Screen Time for Children and Youth During the COVID-19 Pandemic. (2022). Ontario COVID-19 Science Advisory Table. https://doi.org/10.47326/ocsat.2022.03.59.1.0

Jensen, M., George, M. J., Russell, M. R., & Odgers, C. L. (2019). Young adolescents' digital technology use and mental health symptoms: Little evidence of longitudinal or daily linkages. *Clinical Psychological Science*, *7*(6), 1416–1433. https://doi.org/10.1177/2167702619859336

Katzman, R. (2022). *Parenting practices, technology use, and preschoolers' self regulation during COVID-19: A thematic analysis*. [M.A., University of Windsor (Canada)]. https://scholar.uwindsor.ca/etd/9016/

Katzman, R., Menna, R., Babb, K., Rappaport, L. M. (2024, June 21-23). *Parenting stress, young children's screentime and self-regulation: A thematic analysis* [Conference presentation]. CPA 2024 Convention, Ottawa, ON, Canada. https://convention.cpa.ca/

Kim, S., Favotto, L., Halladay, J., Wang, L., Boyle, M. H., & Georgiades, K. (2020). Differential associations between passive and active forms of screen time and adolescent mood and anxiety disorders. *Social Psychiatry and Psychiatric Epidemiology*, *55*(11), 1469–1478. https://doi.org/10.1007/s00127-020-01833-9

Klein, D., Dougherty, L., & Olino, T. (2005). Toward guidelines for evidence-based assessment of depression in children and adolescents. *Journal of Clinical Child and Adolescent Psychology : The Official Journal for the Society of Clinical Child and Adolescent Psychology, American Psychological Association, Division 53*, *34*, 412–432. https://doi.org/10.1207/s15374424jccp3403_3

Kluck, J. P., Stoyanova, F., & Krämer, N. C. (2021). Putting the social back into physical distancing: The role of digital connections in a pandemic crisis. *International Journal of Psychology*, *56*(4), 594–606. https://doi.org/10.1002/ijop.12746

Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukopadhyay, T., & Scherlis, W. (1998). A social technology that reduces social involvement and psychological well-being? *American Psychologist*. https://doi-org.ledproxy2.uwindsor.ca/10.1037/0003-066X.53.9.1017

Larsen, L., Helland, M. S., & Holt, T. (2022). The impact of school closure and social isolation on children in vulnerable families during COVID-19: A focus on children's reactions. *European Child & Adolescent Psychiatry*, *31*(8), 1–11. https://doi.org/10.1007/s00787-021-01758-x

Lewis, A. J., Bertino, M. D., Bailey, C. M., Skewes, J., Lubman, D. I., & Toumbourou, J. W. (2014). Depression and suicidal behavior in adolescents: A multi-informant and multi-methods approach to diagnostic classification. *Frontiers in Psychology*, *5*. https://www.frontiersin.org/articles/10.3389/fpsyg.2014.00766

Li, X., Vanderloo, L. M., Keown-Stoneman, C. D. G., Cost, K. T., Charach, A., Maguire, J. L., Monga, S., Crosbie, J., Burton, C., Anagnostou, E., Georgiades, S., Nicolson, R., Kelley, E., Ayub, M., Korczak, D. J., & Birken, C. S. (2021). Screen use and mental health symptoms in Canadian children and youth during the COVID-19 pandemic. *JAMA Network Open*, *4*(12), e2140875. https://doi.org/10.1001/jamanetworkopen.2021.40875

Liang, L., Ren, H., Cao, R., Hu, Y., Qin, Z., Li, C., & Mei, S. (2020). The effect of COVID-19 on youth mental health. *Psychiatric Quarterly*, *91*(3), 841–852. https://doi.org/10.1007/s11126-020-09744-3

Mactavish, A. (2022). *Contributions of Social Support to Mitigate the Impact of the COVID-19 Pandemic on Pediatric Depressive and Irritability Symptoms* [M.A., University of Windsor (Canada)]. https://www.proquest.com/docview/2728321234/abstract/828F99C4AC5446CDPQ/1

Mactavish, A., Mastronardi, C., Menna, R., Babb, K. A., Battaglia, M., Amstadter, A. B., & Rappaport, L. M. (2021). Children's mental health in Southwestern Ontario during summer 2020 of the COVID-19 pandemic. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, *30*(3), 177–190.

Marciano, L., Albanese, E., Viswanath, K., & Camerini, A.-L. (2023). The protective role of social-oriented digital media use in children's and adolescents' life satisfaction during the Covid-19 pandemic: A latent growth curve model. *European Journal of Health Communication*, *4*(1), Article 1. https://doi.org/10.47368/ejhc.2023.101

Marciano, L., Petrocchi, S., & Camerini, A.-L. (2022). Parental knowledge of children's screen time: The role of parent-child relationship and communication. *Communication Research*, *49*(6), 792–815. https://doi.org/10.1177/0093650220952227

Mariani, R., Renzi, A., Di Trani, M., Trabucchi, G., Danskin, K., & Tambelli, R. (2020). The impact of coping strategies and perceived family support on depressive and anxious symptomatology during the coronavirus pandemic (COVID-19) Lockdown. *Frontiers in Psychiatry*, *11*. https://www.frontiersin.org/articles/10.3389/fpsyt.2020.587724

Maroney, N., Williams, B. J., Thomas, A., Skues, J., & Moulding, R. (2019). A stress-coping model of problem online video game use. *International Journal of Mental Health and Addiction*, *17*(4), 845–858. https://doi.org/10.1007/s11469-018-9887-7

Messer, S. C., Angold, A., Costello, E. J., Loeber, R., Van Kammen, W., and Stouthamer-Loeber, M. (1995). Development of a short questionnaire for use in epidemiological studies of depression in children and adolescents: factor composition and structure across development. Int. J. Methods Psychiatr. Res. 5, 251–262.

Metherell, T. E., Ghai, S., McCormick, E. M., Ford, T. J., & Orben, A. (2022). Digital access constraints predict worse mental health among adolescents during COVID-19. *Scientific Reports*, *12*(1), Article 1. https://doi.org/10.1038/s41598-022-23899-y

Minahan, J., Falzarano, F., Yazdani, N., & Siedlecki, K. L. (2021). The COVID-19 pandemic and psychosocial outcomes across age through the stress and coping framework. *The Gerontologist*, *61*(2), 228–239. https://doi.org/10.1093/geront/gnaa205misingnoglic.

Monga, S., Birmaher, B., Chiappetta, L., Brent, D., Kaufman, J., Bridge, J., & Cully, M. (2000). Screen for child anxiety-related emotional disorders (SCARED): Convergent and divergent validity. *Depression and Anxiety*, *12*(2), 85–91. https://doi.org/10.1002/1520-6394(2000)12:2<85::AID-DA4>3.0.CO;2-2

Nagata, J. M., Chu, J., Ganson, K. T., Murray, S. B., Iyer, P., Gabriel, K. P., Garber, A. K., Bibbins-Domingo, K., & Baker, F. C. (2023). Contemporary screen time modalities and disruptive behavior disorders in children: A prospective cohort study. *Journal of Child Psychology and Psychiatry*, *64*(1), 125–135. https://doi.org/10.1111/jcpp.13673

Nagata, J. M., Singh, G., Sajjad, O. M., Ganson, K. T., Testa, A., Jackson, D. B., Assari, S., Murray, S. B., Bibbins-Domingo, K., & Baker, F. C. (2022). Social epidemiology of early adolescent problematic screen use in the United States. *Pediatric Research*, *92*(5), Article 5. https://doi.org/10.1038/s41390-022-02176-8

Nikolaidis, A., Paksarian, D., Alexander, L., Derosa, J., Dunn, J., Nielson, D. M., Droney, I., Kang, M., Douka, I., Bromet, E. and Milham, M. P., Stringaris, A., & Merikangas, K. R. (2021). The Coronavirus Health and Impact Survey (CRISIS) reveals reproducible correlates of pandemic-related mood states across the Atlantic. *Scientific Reports*, *11*(1), 1-13.

Ontario Ministry of Health. (2022, Jul 18). Report on Ontario's Provincial Emergency from March 17, 2020 to July 24, 2020 [website]. https://www.ontario.ca/document/ report-ontarios-provincial-emergency-march-17-2020-july-24-2020

Orben, A., Tomova, L., & Blakemore, S.-J. (2020a). The effects of social deprivation on adolescent development and mental health. *The Lancet Child & Adolescent Health*, *4*(8), 634–640. https://doi.org/10.1016/S2352-4642(20)30186-3

Orben, A., Tomova, L., & Blakemore, S.-J. (2020b). The effects of social deprivation on adolescent development and mental health. *The Lancet. Child & Adolescent Health*, *4*(8), 634–640. https://doi.org/10.1016/S2352-4642(20)30186-3

O'Sullivan, K., Clark, S., McGrane, A., Rock, N., Burke, L., Boyle, N., Joksimovic, N., & Marshall, K. (2021). A qualitative study of child and adolescent mental health during the COVID-19 pandemic in Ireland. *International Journal of Environmental Research and Public Health*, *18*(3), Article 3. https://doi.org/10.3390/ijerph18031062

Piteo, E. M., & Ward, K. (2020). Social networking sites and associations with depressive and anxiety symptoms in children and adolescents–a systematic review. *Child and Adolescent Mental Health*, *25*(4), 201-216. https://doi.org/10.1111/camh.12373

Prime, H., Wade, M., & Browne, D. T. (2020). Risk and resilience in family well-being during the COVID-19 pandemic. *American Psychologist*, *75*(5), 631–643. https://doi.org/10.1037/amp0000660

Prowse, R., Sherratt, F., Abizaid, A., Gabrys, R. L., Hellemans, K. G. C., Patterson, Z. R., & McQuaid, R. J. (2021). Coping with the COVID-19 pandemic: Examining gender differences in stress and mental health among university students. *Frontiers in Psychiatry*, *12*. https://www.frontiersin.org/articles/10.3389/fpsyt.2021.650759

Pulkki-Råback, L., Barnes, J. D., Elovainio, M., Hakulinen, C., Sourander, A., Tremblay, M. S., & Guerrero, M. D. (2022). Parental psychological problems were associated with higher screen time and the use of mature-rated media in children. *Acta Paediatrica*, *111*(4), 825–833. https://doi.org/10.1111/apa.16253

Rappaport, L. M., Mactavish, A., Mastronardi, C., Babb, K. A., Menna, R., Amstadter, A. B., & Battaglia, M. (2022). Monthly correlates of longitudinal child mental health during the COVID-19 pandemic according to children and caregivers. *European Child & Adolescent Psychiatry*. https://doi.org/10.1007/s00787-022-02121-4

Richardson, C. E., Magson, N. R., Fardouly, J., Oar, E. L., Forbes, M. K., Johnco, C. J., & Rapee, R. M. (2021). Longitudinal associations between coping strategies and psychopathology in pre-adolescence. *Journal of Youth and Adolescence*, *50*(6), 1189–1204. https://doi.org/10.1007/s10964-020-01330-x

Sampasa-Kanyinga, H., & Lewis, R. F. (2015). Frequent use of social networking sites is associated with poor psychological functioning among children and adolescents. *Cyberpsychology, Behavior, and Social Networking*, *18*(7), 380–385. https://doi.org/10.1089/cyber.2015.0055

Seguin, D., Kuenzel, E., Morton, J. B., & Duerden, E. G. (2021). School's out: Parenting stress and screen time use in school-age children during the COVID-19 pandemic. *Journal of Affective Disorders Reports*, *6*, 100217. https://doi.org/10.1016/j.jadr.2021.100217

Silverstein, W. K., Stroud, L., Cleghorn, G. E., & Leis, J. A. (2020). First imported case of 2019 novel coronavirus in Canada, presenting as mild pneumonia. *The Lancet*, *395*(10225), 734.

Skinner, E. A., Edge, K., Altman, J., & Sherwood, H. (2003). Searching for the structure of coping: A review and critique of category systems for classifying ways of coping. *Psychological Bulletin*, *129*, 216–269. https://doi.org/10.1037/0033-2909.129.2.216

Skinner, E. A., & Zimmer-Gembeck, M. J. (2007). The development of coping. *Annual Review of Psychology*, *58*(1), 119–144. https://doi.org/10.1146/annurev.psych.58.110405.085705

Taylor, S. E. (2012). Social support: A review. In H. S. Friedman (Ed.), *The Oxford Handbook of Health Psychology* (1st ed., pp. 190–214). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780195342819.013.0009

Tombeau Cost, K., Korczak, D., Charach, A., Birken, C., Maguire, J. L., Parkin, P. C., & Szatmari, P. (2020). Association of parental and contextual stressors with child screen exposure and child screen exposure combined with feeding. *JAMA Network Open*, *3*(2), e1920557. https://doi.org/10.1001/jamanetworkopen.2019.20557

Toombs, E., Mushquash, C. J., Mah, L., Short, K., Young, N. L., Cheng, C., Zhu, L., Strudwick, G., Birken, C., Hopkins, J., Korczak, D. J., Perkhun, A., & Born, K. B. (2022). *Increased Screen Time for Children and Youth During the COVID-19 Pandemic*. Ontario COVID-19 Science Advisory Table. https://doi.org/10.47326/ocsat.2022.03.59.1.0

Vaillancourt, T., Brittain, H., Krygsman, A., Farrell, A. H., Pepler, D., Landon, S., Saint-Georges, Z., & Vitoroulis, I. (2022). In-person versus online learning in relation to students' perceptions of mattering during COVID-19: A brief report. *Journal of Psychoeducational Assessment*, *40*(1), 159–169. https://doi.org/10.1177/07342829211053668

Valkenburg, P. M., & Peter, J. (2007). Preadolescents' and adolescents' online communication and their closeness to friends. *Developmental Psychology*, *43*(2), 267–277. https://doi.org/10.1037/0012-1649.43.2.267

Vallejo-Slocker, L., Sanz, J., García-Vera, M. P., Fresneda, J., & Vallejo, M. A. (2022). Mental health, quality of life and coping strategies in vulnerable children during the COVID-19 pandemic. *Psicothema*, *34.2*, 249–258. https://doi.org/10.7334/psicothema2021.467

Vuorre, M., Orben, A., & Przybylski, A. K. (2021). There is no evidence that associations between adolescents' digital technology engagement and mental health problems have increased. *Clinical Psychological Science*, *9*(5), 823–835. https://doi.org/10.1177/2167702621994549

Wade, M., Prime, H., & Browne, D. T. (2020). Why we need longitudinal mental health research with children and youth during (and after) the COVID-19 pandemic. *Psychiatry Research*, *290*, 113143. https://doi.org/10.1016/j.psychres.2020.113143

Wilder-Smith, A., & Freedman, D. O. (2020). Isolation, quarantine, social distancing and community containment: pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak. *Journal of travel medicine*, *27*(2), taaa020.

Wood, C. T., Skinner, A. C., Brown, J. D., Brown, C. L., Howard, J. B., Steiner, M. J., Perrin, A. J., Levine, C., Ravanbakht, S. N., & Perrin, E. M. (2019). Concordance of child and parent reports of children's screen media use. *Academic Pediatrics*, *19*(5), 529–533. https://doi.org/10.1016/j.acap.2019.04.002

Woods, H. C., & Scott, H. (2016). # Sleepyteens: Social media use in adolescence is associated with poor sleep quality, anxiety, depression and low self-esteem. *Journal of Adolescence*, *51*, 41-49. https://doi.org/10.1016/j.adolescence.2016.05.008

Zhu, S., Zhuang, Y., & Ip, P. (2021). Impacts on children and adolescents' lifestyle, social support and their association with negative impacts of the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, *18*(9), Article 9. https://doi.org/10.3390/ijerph18094780

Zimmer-Gembeck, M. J., & Skinner, E. A. (2011). Review: The development of coping across childhood and adolescence: An integrative review and critique of research. *International Journal of Behavioral Development*, *35*(1), 1–17. https://doi.org/10.1177/0165025410384923

Zimmer-Gembeck, M. J., & Skinner, E. A. (2016). The development of coping: Implications for psychopathology and resilience. In *Developmental Psychopathology* (pp. 1–61). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781119125556.devpsy410

VITA AUCTORIS

NAME:	Disha Pooja Rawal
PLACE OF BIRTH:	London, ON
YEAR OF BIRTH:	1999
EDUCATION:	Catholic Central High School, London, ON, 2017
	Western University, B.Sc. Hons, London, ON, 2022