



Research article

Teens, screens and quarantine; the relationship between adolescent media use and mental health prior to and during COVID-19

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ABSTRACT

This study examines associations between media use and mental health for adolescents prior to and during the COVID-19 pandemic. Using two separate datasets that sampled adolescents (8th, 10th, and 12th graders) in 2018 (n = 31,825) and 2020 (n = 1,523), mental health (hopelessness and happiness), media use (time spent using a variety of media), and personal health habits (sleep) were assessed. Overall, we found that there were significant differences by year in adolescent hopelessness, with adolescents reporting less hopelessness in 2020 (during COVID-19) than in 2018 (pre COVID-19). There were not practical significant differences in adolescent happiness and loneliness. Adolescents also reported getting more sleep in our 2020 sample than the 2018 sample. Adolescents in 2020 spent significantly more time watching movies and video chatting, but less time texting and on social media than adolescents in 2018. Finally, we found that time spent video chatting and sleep had a different relationship with various aspects of mental health (happiness, hopelessness, or loneliness) in 2018 vs. 2020.

1. Introduction

When COVID-19 first swept the globe, work and school moved into living rooms, visits with grandma went digital, sweatpants came on, and toilet paper ran out. As COVID-19 continued to spread, governments and organizations focused on the testing, reduction of transmission, and care of critical patients. Nonetheless, healthcare professionals cautioned that COVID-19 could have negative effects on individual's mental health and urged a renewed emphasis on providing mental health resources alongside efforts to track and contain the virus (Cullen et al., 2020; Pfefferbaum and North, 2020). With the closure of schools and the transition to digital learning all around the world (Camera, 2020; UNESCO 2021), concern for child and adolescent mental health rose (de Figueiredo et al., 2021; Imran et al., 2020). Given the ongoing exploration of the relationship between media use and mental health (Keles et al., 2019) and the shifts in adolescent media use due to lifestyle changes triggered by the pandemic (Cellini et al., 2020; Pahayahay and Khalili-Mahani, 2020), it is prudent to examine adolescent mental health during COVID-19 in the

context of media use. Thus, the purpose of this paper is to examine associations between adolescent media use and mental health by comparing adolescents in 2018 (pre-pandemic) and adolescents in 2020 (during COVID-19).

1.1. Adolescent media use

Smartphone ownership and use and have become practically ubiquitous during adolescence. In 2018, 95% of American adolescents reported they owned a smartphone or had access to one (Anderson and Jiang, 2018). A survey of adolescents in Scotland reported that 97% of their sample used social media (Woods and Scott, 2016). Other prevalent forms of media use in adolescence, aside from social media use, include television/movies, video games, video chatting, and texting (e.g., Boers et al., 2019; Coyne et al., 2017; Sherman et al., 2013). As adolescents' social lives seem to occur largely via smartphone technology or other forms of media (Crone and Konijn, 2018; Domahidi et al., 2016), it is

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unsurprising that media use in its many forms is so prevalent among adolescents.

1.2. Media and mental health during adolescence

In addition to the prominent place of media and technology in adolescent's lives, over the past few years, adolescent depression, anxiety, and suicidality have increased quite dramatically (Twenge, 2020; UC Davis Health, 2021). Given the concurrent increasing availability of smartphone and social media use, researchers and popular media were quick to examine the relationship between media use and mental health. Overall, the findings on the relationship between media use and mental health in adolescence are somewhat nuanced. While a large amount of literature suggests that media use (social media, texting, gaming, etc.) is linked to poor mental health (e.g., Brunborg et al., 2014; Coyne et al., 2021; Coyne et al., 2017; Twenge and Campbell, 2018), other research finds no direct relationship (e.g., Boers et al., 2019; Coyne et al., 2020). These mixed findings are likely due to the host of nuances in the various contexts surrounding media use, such as how media is used (e.g., Thorisdottir et al., 2019), gender of the individual (e.g., Twenge and Farley, 2020; Twenge and Martin, 2020), peer context (e.g., Domahidi et al., 2016), and the time of day of media use (e.g., Woods and Scott, 2016), among others. Collectively, these studies show that context matters when examining the impact of media use on mental health. One salient context is the COVID-19 pandemic. The pandemic may have moderated both media use in general and how media use relates to mental health for adolescents. Thus, while previous research has examined the relationship between different forms of media use on adolescence, little research has examined how the unique context of Covid-19 has influenced patterns of adolescent media use, and how these new patterns of media use inform mental health.

1.3. The unique context of COVID-19

Examining the relationship between adolescent media use and mental health during COVID-19 is important for several reasons. First, as the effects of the pandemic continue to prolong due to new variants (CDC, 2020), understanding adolescent mental health and media use patterns in this unique context continues to be of practical importance for parents, educators, and policy makers, especially as the social pressures typically faced by adolescents are somewhat altered due to social restrictions related to COVID-19 lockdowns.

For example, fear of missing out (or FOMO), is often highlighted as a mechanism which drives the relationship between social media use and mental health (e.g., Barry et al., 2017; Hunt et al., 2018). However, in the unique context of COVID-19, FOMO might be somewhat lessened, due to lockdown and quarantine restrictions, where there may be simply fewer social activities to be afraid of missing out on. Furthermore, due to restrictions on social gatherings, media has become a primary way for adolescents (alongside everyone else) to socially connect with friends and family (UC Health, 2020). Thus, individuals may use media in a more active capacity (e.g., to connect) rather than in a passive way (e.g., mindlessly scrolling). For example, while video games are often stereotyped as being isolating, some have suggested that video games may help connect people across social-distancing restrictions as they play together from different locations (e.g., Zhu, 2020).

Due to the unique social context of COVID-19, examining the relationship between various types of media use and mental health is an opportune moment to further examine the displacement hypothesis. The displacement hypothesis essentially posits that while media use is not inherently maladaptive for overall mental health, media use may take the place of important developmental processes or activities such as sleep (Woods and Scott, 2016), exercise (Chekroud et al., 2018), or hanging out with friends and family (Domahidi et al., 2016; Krossbakken et al., 2018); however, this hypothesis is only provisionally supported. While several studies have found that media use displaces activities such as

sleep (which has been linked to mental health outcomes; e.g., Zhang et al., 2017), there is still debate regarding if media use displaces important social processes, or if it provides an additional context for the formation of friendships (Hall et al., 2018). Because there are fewer in-person social interactions available to adolescents during COVID-19, an examination of the relationship between media use and mental health during this context provides an opportunity to examine if media displaces social processes, or potentially provides a platform for social interaction. Thus, examining adolescent media use and mental health in the context of COVID-19 provides not only important practical information for families and educators, but an opportunity to further understand the relationship between adolescent media use and mental health in a unique social context.

1.4. Current study

The purpose of this paper is to examine the relationship between various types of media and mental health in a sample of U.S. adolescents both before (2018) and during (2020) the pandemic. While similar studies have been conducted with adult samples (Twenge and Joiner, 2020), it is important to address this topic in an adolescent sample due to the unique relationship between media use and mental health for adolescents. As such, this paper will examine five different types of media use; television/movies, social media, texting, video chatting, and video games. To examine how these relationships differed during COVID-19 compared to other contexts, we compare adolescents in the 2018 Monitoring the Future (MtF; administered by the Institute for Social Research at the University of Michigan) to a sample of adolescents in 2020. Although MtF survey data was obtained in the school setting (thus, in person), a similar questionnaire was administered online due to the nature of school closures during COVID-19. Both surveys were obtained through adolescent self-reports and are thus comparable. We examine the following hypotheses;

Hypothesis 1. Adolescents in 2020 will have significantly worse mental health (lower happiness, higher hopelessness and loneliness) than adolescents in 2018.

Hypothesis 2. Adolescents in 2020 will use significantly more media (all types, video games, texting, social media, video chatting and television/movies) than adolescents in 2018.

Hypothesis 3. Media use and sleep will have significantly different relationships with mental health in 2020 than in 2018.

By assessing these hypotheses, we are better able to understand how media use shapes adolescent mental health, especially in the unique context of COVID-19. As COVID-19 is a period marked by drastic changes in how adolescents connect with one another, family, and other social circles, this is a unique period to better understand how different contexts may result in different relationships between adolescent media use and mental health.

2. Methods

Participants for this study came from two different datasets from the United States: Monitoring the Future Survey (MtF) collected in 2018 and a new data collection effort in 2020. The MtF sample (2018) was included to serve as a control and comparison group to adolescents surveyed in 2020. For the 2020 sample, the survey sample provider Ipsos collected a sample of 1,523 adolescents from the United States. The sampling strategy aimed to match the demographic profile of the 2018 MtF participants. Participation was restricted to adolescents enrolled in 8th, 10th, and 12th grade (the grades included in MtF) as of March 1, 2020. Second, sampling was conducted to fill quotas for gender, race/ethnicity, urban/rural location, and region of the country, to mirror the composition of the 2018 MtF participants. Finally, the final 2020 data were weighted to make the 2020 sample demographically representative

of the 2018 MtF sample. As many of the MtF participants were missing on all mental health items (hopelessness, loneliness, and happiness), these participants were dropped from the analysis for a final total of 33,348 participants ($n = 31,825$ in 2018, $n = 1,523$ in 2020).

In 2018, 46.21% of participants were in 8th grade ($n = 14,706$), 47.18% in 10th grade ($n = 15,014$), and 6.61% in 12th grade ($n = 2,105$). 47.02% of participants in 2018 were male ($n = 14,963$) and 46.86% were female ($n = 14,912$) with 6.13% missing. Furthermore, in 2018, 20% of participants lived in a single-parent household ($n = 6,364$), with 64.43% living in two-parent households ($n = 20,505$; 15.57% missing). In regards to race and ethnicity, 11.34% of 2018 participants identified as Black/African American ($n = 3,609$), 44.86% were White ($n = 14,278$), and 20.72% identifying as Hispanic/Latino/a ($n = 6,594$).

In 2020, roughly a third of participants were in 8th, 10th, and 12th grade (33.09%, 33.42%, and 33.49% respectively). Roughly half of participants were male (50.89%, $n = 775$), while 49.11% were female ($n = 748$). Furthermore, 17.93% of participants lived in single-parent households ($n = 273$), with 77.68 in two-parent households ($n = 1,183$) with 4.40% missing, in the 2020 sample. Finally, 13.72% of the 2020 sample identified as Black or African American ($n = 209$), with 67.04% White ($n = 1,021$), and 2.63% Hispanic/Latino/a ($n = 40$).

Participants in both datasets answered the same questions regarding frequency of various types of media use, mental health, and other contextual factors. Parents gave consent for their adolescents to participate. The study complies with all ethical regulations and informed consent was obtained from parents and adolescents who participated. This study was approved by the Brigham Young University Institutional Review Board and complies with all ethical regulations.

2.1. Measures

2.1.1. Sleep

Adolescent sleep was assessed using a self-report. Adolescents were asked "In the last 30 days, how often did you get at least seven hours of sleep". Participants responded on a 6-point scale; "Never", "Seldom", "Sometimes", "Most days", "Nearly Every day", "Every day". Higher scores indicate more consistently getting seven hours of sleep.

2.1.2. Media use

Adolescent media use was assessed using self-reports. Adolescents were asked "About how many hours on an average DAY do you spend... on social networking sites like Facebook, Twitter, Instagram, etc." or "Video chatting (Skype, etc.)", "Texting", "Playing games on a computer, TV, phone, or other electronic device" and "Watching video, TV, or movies on a electronic device (such as a TV, computer, tablet or smartphone)". Participants responded on a 7-point ratio scale, "None", "Less than an hour", "1–2 h", "3–4 h", "5–6 h", "7–8 h", or "9 h or more". For all types of media use, higher scores indicate more time spent using that particular type of media each day.

2.1.3. Mental health

Three different assessments of mental health were used; a measure of happiness, hopelessness, and loneliness.

Happiness. Happiness was assessed using the Monitoring the Future single item question "Taken all together, how would you say things are these days- would you say that you are not too happy, pretty happy, or very happy?". Participants responded on a three-point Likert-type scale, "not too happy", "pretty happy", or "very happy". Scores on happiness range from 1-3, with higher scores indicating higher levels of happiness.

Hopelessness. Hopelessness was assessed using a Monitoring the Future (MtF) questionnaire, made up of four items. All items were responded to on a five-point Likert-type scale; "Disagree", "Mostly disagree", "Neutral", "Mostly agree", and "Agree". Items asked were; "Life often seems meaningless", "I enjoy life as much as anyone", "The future often seems hopeless", and "It feels good to be alive". Items 2 and 4 ("I enjoy life as much as anyone" and "it feels good to be alive") were reverse

coded so that higher scores indicated higher levels of hopelessness. The four items were averaged to create an overall observed variable. Scores ranged between 1-5, with higher scores indicating higher levels of hopelessness. Cronbach's alpha was sufficiently high for analysis; $\alpha = .82$.

Loneliness. Loneliness was assessed using the Monitoring the Future loneliness questionnaire, which is made up of six questions. All items were responded to on a five-point Likert-type scale; "Disagree", "Mostly disagree", "Neutral", "Mostly agree", and "Agree". Items asked were; "A lot of times I feel lonely", "There is always someone I can turn to if I need help", "I often feel left out of things", "There is usually someone I can talk to, if I need to", "I often wish I had more good friends", and "I usually have a few friends around that I can get together with". Items 2, 4, and 6, ("There is always someone I can turn to if I need help", "There is usually someone I can talk to, if I need to", and "I usually have a few friends around that I can get together with") were reverse coded. The six items were averaged to create an overall observed variable. Scores ranged between 1- 5, with higher scores indicating higher feelings of loneliness. Cronbach's alpha was sufficiently high for analysis; $\alpha = .70$.

2.2. Plan of analysis

Due to limitations in our data, this paper will assess differences between adolescent mental health, media use, and the relationship between different types of media use and mental health in 2018 and 2020. To examine mean differences between adolescent levels of happiness, hopelessness, and loneliness in 2018 compared to 2020 ([hypothesis 1](#)), we used an analysis of variances (ANOVA). To examine mean differences between adolescent media use (specifically times spent using various types of media; [hypothesis 2](#)), we used a multivariate analysis of variance (MANOVA) and Welch's t-test in SPSS 28. Finally, to assess the difference in the relationship between adolescent media use and mental health in 2018 compared to 2020, we used a regression framework. We examined interaction effects within the regression analysis, and calculated simple slopes for each significant interaction. These analyses were driven by the theoretical supposition that due to the unique context of COVID-19, patterns of media use were changing, and may have a different relationship to mental health than prior to the pandemic. These analyses allow us to see how adolescent media use was associated with mental health in 2018 and 2020, and how these relationships differed from one another.

3. Results

3.1. Mental health and media use

A One-way ANOVA was run to determine differences in mental health based on year while controlling for gender, grade, race/ethnicity, and family structure, three measures of mental health were used: happiness, hopelessness, and loneliness (see [Table 1](#) for descriptive statistics of adolescent mental health and media use). There was a significant difference between levels of happiness in 2018 and 2020 ($F(1) = 27.07, p < .001, \eta^2 = .002$), with adolescents reporting higher levels of happiness in 2020 than 2018. Looking at mean levels of happiness in our 2020 and 2018 samples however, these mean-level differences are quite small, and likely are not of practical significance. It is likely that observed differences may be due to sample size more than actual difference in happiness. There was also a significant difference in levels of loneliness between 2018 and 2020 ($F(1) = 12.11, p < .001, \eta^2 = .008$) with adolescents reporting lower levels of loneliness in 2020 than in 2018. Again, when we examine mean levels of loneliness in our 2018 and 2020 samples, these differences are quite small and are likely not of practical significance. Again, the observed difference may be due to sample size rather than a practical difference in the samples. Finally, there was a significant difference between levels of hopelessness in 2018 and 2020 ($F(1) = 24.45, p < .001, \eta^2 = .007$), with adolescents in 2020 showing

Table 1. Descriptive statistics: Mental health and media use.

	2018						2020					
	Overall		Male		Female		Overall		Male		Female	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Sleep	3.96	1.52	4.10	1.51	3.83	1.52	4.55	1.19	4.59	1.13	4.51	1.24
Hopelessness	2.22	1.06	2.10	1.00	2.32	1.10	2.06	0.85	2.07	0.82	2.06	0.88
Loneliness	2.38	0.87	2.28	0.84	2.46	0.89	2.34	0.73	2.34	0.71	2.34	0.75
Happiness	1.96	0.59	2.02	0.58	1.92	0.58	2.00	0.66	2.05	0.67	1.94	0.65
Movies/TV	3.65	1.40	3.62	1.37	3.66	1.40	3.92	1.25	3.92	1.26	3.91	1.24
Video Games	3.74	1.65	3.95	1.50	3.51	1.75	3.64	1.45	4.07	1.40	3.19	1.38
Texting	3.43	1.72	3.08	1.58	3.75	1.77	3.23	1.36	3.14	1.34	3.32	1.37
Video Chatting	2.07	1.44	1.89	1.33	2.22	1.48	2.64	1.32	2.69	1.37	2.59	1.26
Social Media	3.572	1.75	3.17	1.62	3.96	1.76	3.565	1.49	3.45	1.52	3.69	1.45

Note. All means (M) and standard deviations (SD) are based on scales for each construct;

Sleep: Range = 1–6; higher scores indicate more sleep.

Hopelessness: Range = 1–5; higher scores indicate higher hopelessness.

Loneliness: Range = 1–5; higher scores indicate higher loneliness.

Happiness: Range = 1–3; higher scores indicate higher happiness.

Media Use (all types): Range = 1–7; higher scores indicate more of that types of media use.

significantly lower levels of hopelessness as compared with adolescents in 2018. Furthermore, there was a significant effect of year on sleep ($F(5) = 63.58, p < .001, \eta^2 = .033$), with adolescents in 2020 reporting getting more sleep than adolescents in 2018. These mean level differences were small, but of some practical significance.

3.1.1. Media use

A MANOVA was run to determine the effect of year on media use. Five measures of media use were used: time spent on social media, gaming, texting, video chatting, watching movies or television. There was a significant multivariate effect of year on media use, $F(18036) = 80.01, p < .001$. Univariate effects were significant for social media ($F(1) = 5.02, p = .025$), video chatting ($F(1) = 167.89, p < .001$), texting ($F(1) = 34.41, p < .001$), and time spent watching movies ($F(1) = 64.15, p < .001$). Adolescents in 2020 spent significantly more time watching movies and video chatting, but less time texting and on social media than adolescents in 2018.

3.1.2. Media use, sleep, and hopelessness

A regression analysis (see Table 2) of media use and happiness found that overall, while controlling for gender, age, race, and family structure

Table 2. Regression analysis of media use and sleep on happiness.

	Happiness		
	β	SE	p
Direct Effects			
Year	-.45	.09	<.001
Social Media	-.006	.006	.313
Movies/TV	-.022	.006	<.001
Video Chatting	.008	.006	.197
Texting	.004	.006	.446
Video Games	-.010	.005	.039
Sleep	-.097	.005	<.001
Interactions			
Year + Social Media	-.018	.015	.218
Year + Movies/TV	-.012	.016	.460
Year + Video Chatting	.083	.016	<.001
Year + Texting	-.031	.016	.057
Year + Video Games	.020	.013	.123
Year + Sleep	.049	.014	<.001

time spent watching movies ($\beta = 0.06; SE = .010; p < .001$) and gaming ($\beta = 0.05; SE = .009; p < .001$) was associated with greater levels of hopelessness. Conversely, sleep was associated with lower levels of hopelessness ($\beta = -0.22; SE = .008; p < .001$).

When examining the interactions between year (2018 vs. 2020) and media use on hopelessness, only video chatting had a different association with hopelessness based on year ($\beta = 0.12; SE = .025; p < .001$). Simple slopes analysis revealed that video chatting did not have a significant association with hopelessness in 2018, but was associated with higher hopelessness in 2020 (see Figure 3).

3.1.3. Media use, sleep and happiness

A regression analysis (see Table 3) of media use and happiness found that overall, while controlling for gender, age, race, and family structure, watching movies ($\beta = -0.02; SE = .006; p < .001$), and gaming ($\beta = -0.01; SE = .005; p = .039$) were all related to lower levels of happiness. Conversely, sleep was associated with greater levels of happiness ($\beta = 0.10; SE = .005; p < .001$).

There were significant interactions between year (2018 vs 2020) and media use for levels of happiness for video chatting ($\beta = 0.08; SE = .016; p < .001$) and sleep ($\beta = 0.05; SE = .014; p < .001$). Simple slopes

Table 3. Regression analysis of media use and sleep on hopelessness.

	Hopelessness		
	β	SE	p
Direct Effects			
Year	-.04	.15	.776
Social Media	.01	.009	.171
Movies/TV	.06	.010	<.001
Video Chatting	.01	.010	.177
Texting	.003	.009	.783
Video Games	.05	.008	<.001
Sleep	-.22	.008	<.001
Interactions			
Year + Social Media	.002	.024	.947
Year + Movies/TV	-.03	.026	.272
Year + Video Chatting	.121	.025	<.001
Year + Texting	-.044	.026	.088
Year + Video Games	-.003	.021	.874
Year + Sleep	.004	.022	.843

analyses revealed that video chatting had no significant effect association with happiness in 2018, but was positively associated with happiness in 2020 (see Figure 1). Finally, while sleep had a significant positive association with happiness in both 2018 and 2020, sleep had a greater positive effect on happiness in 2020 (see Figure 2).

3.1.4. Media use and loneliness

A regression analysis (see Table 4) of media use and loneliness found that overall, while controlling for gender, age, race, and family structure, year ($\beta = -0.31$; $SE = .099$; $p = .002$; year was dummy coded 0 = 2018, 1 = 2020) was associated with a decrease in loneliness. In contrast, time spent on social media ($\beta = 0.03$; $SE = .012$; $p = .009$), and time spent watching movies ($\beta = 0.03$; $SE = .013$; $p = .016$) were both significantly associated with increases in loneliness. It is important to note that as the Monitoring the Future did not ask participants about loneliness and sleep patterns within the same questionnaire (as they use different forms for their large sample), we were unable to test the effect of sleep on loneliness.

When examining the interactions between year (2018 vs. 2020) and media use on loneliness, only video chatting had a different association with loneliness based on year ($\beta = 0.11$; $SE = .024$; $p < .001$). While video chatting had no significant association with loneliness in 2018, in 2020, video chatting had a significant positive association with loneliness (see Figure 4).

4. Discussion

The purpose of this paper was to first, examine differences in adolescent mental health (happiness, hopelessness, and loneliness) in 2018 vs. 2020. Second, to examine differences in adolescent media use (video games, texting, social media, video chatting, and television/movies) in 2018 vs. 2020. Finally, the relationship between adolescent media use and mental health in 2018 vs. 2020 was examined. Overall, we found that there were significant differences by year in adolescent

hopelessness, with adolescents reporting less hopelessness in 2020 (during COVID-19) than in 2018 (pre COVID-19). There were not practical significant differences in adolescent happiness and loneliness. Adolescents reported getting more sleep in our 2020 sample than the 2018 sample. Adolescents in 2020 spent significantly more time watching movies and video chatting, but less time texting and on social media than adolescents in 2018. Finally, we found that time spent video chatting and sleep had a different relationship with various aspects of mental health (happiness, hopelessness, or loneliness) in 2018 vs. 2020.

4.1. Mental health

Whereas adults seemed to show a significant increase in depressive symptoms during COVID-19 (2020) compared to previous years (2019; Twenge and Joiner, 2020), adolescents seemed to display lower levels of hopelessness compared to 2018, and no practical significant difference in happiness and loneliness between the two years. It is possible that adolescents' mental health was not drastically worse in 2020 compared to the 2018 sample as the restrictions caused by COVID-19 removed stressors from adolescents' lives (such as in-person school and adjacent social stressors, juggling extracurricular activities, etc.) that benefitted mental health, and by allowing for adolescents to also get more sleep, which has been strongly linked to mental health (e.g., Zhang et al., 2017). As adolescents in our 2020 sample also were getting significantly more sleep in than our 2018 sample, it is possible that increased sleep served to protect adolescent's mental health from the unique stressors of COVID-19. However, as this data is not longitudinal and merely a comparison between the two years, it is impossible make causal claims to the mechanism underlying these patterns. In addition, it is important to acknowledge that the 2020 sample was collected at the beginning of the pandemic. It is possible that early on, COVID-19 provided this relief from stressors, but later began to have a negative effect on adolescent mental health.

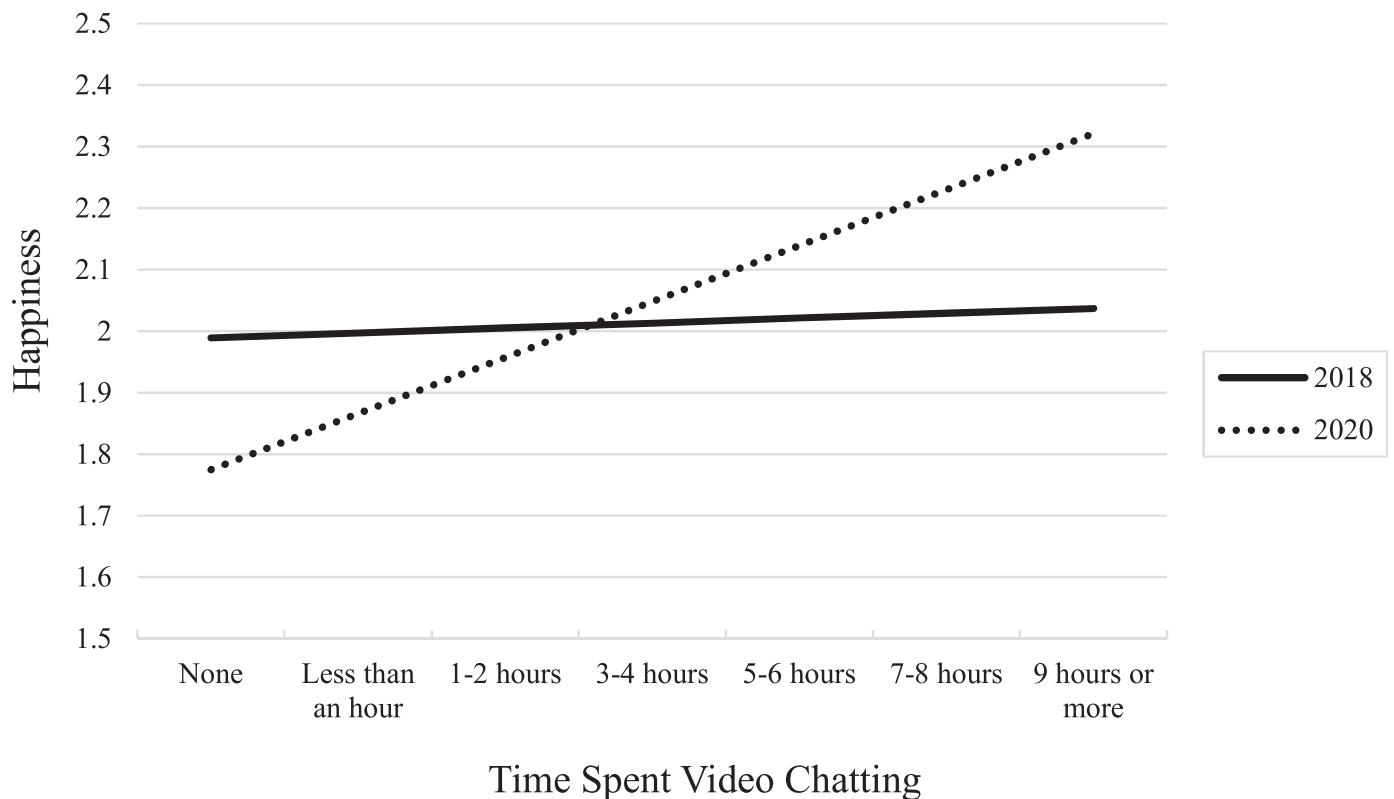


Figure 1. Simple slopes of significant interactions between year and types of media use; Happiness and Video Chatting. Note. 2018 ($r = .008$, $S.E. = .006$, $p = .197$); 2020 ($r = .091$, $S.E. = .014$, $p = .001$).

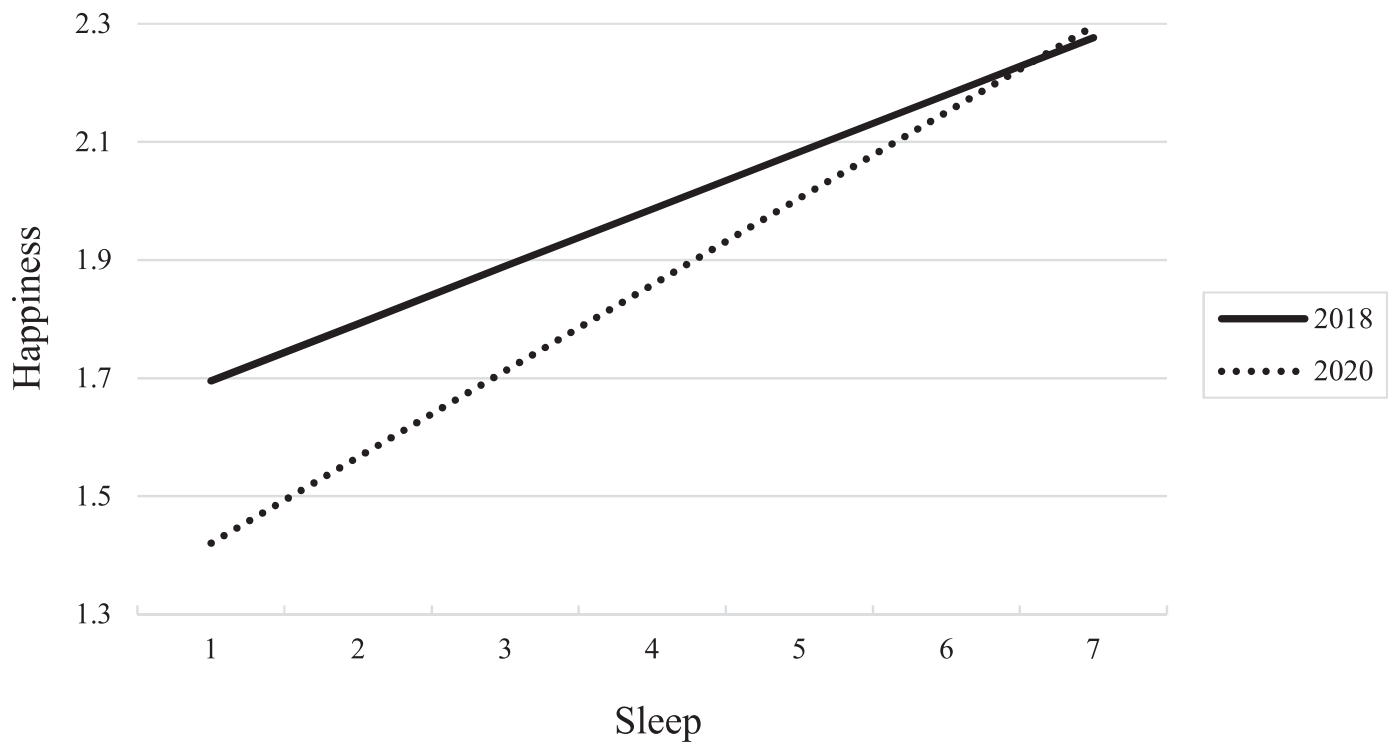


Figure 2. Simple slopes of significant interactions between year and types of media use; Happiness and Sleep. *Note.* 2018 ($r = .097$, S.E. = .005, $p = .001$); 2020 ($r = .146$, S.E. = .013, $p = .001$).

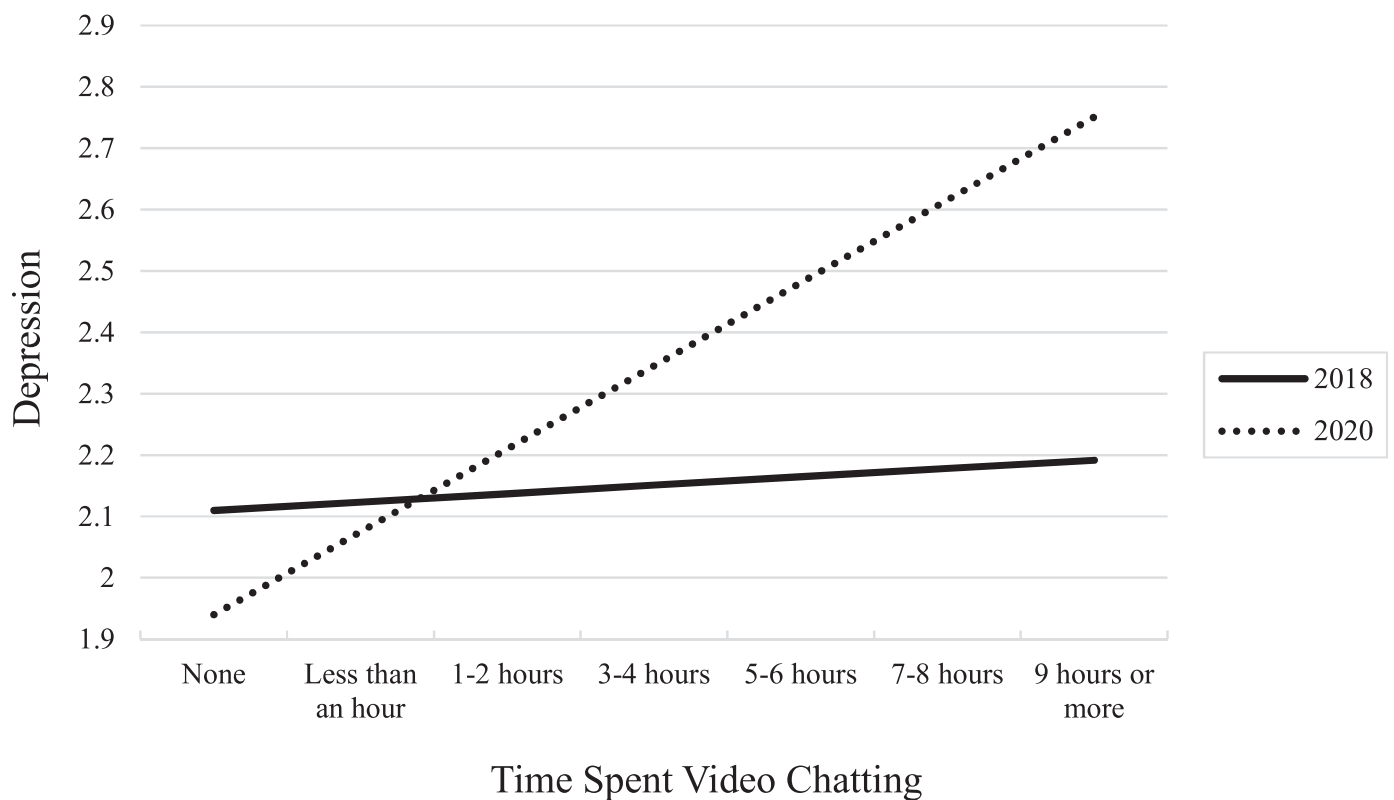


Figure 3. Simple slopes of significant interactions between year and types of media use; Hopelessness and Video Chatting. *Note.* 2018 ($r = .014$, S.E. = .010, $p = .117$); 2020 ($r = .135$, S.E. = .023, $p < .001$).

4.1.1. Media use

Additional insight into the patterns of difference in mental health in the 2018 and 2020 samples were found when we consider differences in

how adolescents used media in 2018 and 2020. Adolescents in 2020 engaged in more video chatting and watched television more than our adolescent sample in 2018. These findings are somewhat unsurprising, as

Table 4. Regression analysis of media use on loneliness.

	Loneliness		
	β	SE	p
Direct Effects			
Year	-.311	.098	.002
Social Media	.031	.012	.009
Movies/TV	.031	.013	.016
Video Chatting	-.022	.012	.069
Texting	-.008	.012	.521
Video Games	.012	.011	.241
Interactions			
Year + Social Media	.010	.023	.660
Year + Movies/TV	-.009	.025	.726
Year + Video Chatting	.109	.024	<.001
Year + Texting	-.017	.025	.483
Year + Video Games	.028	.020	.165

video chatting was used for virtual school, and was the primary way for adolescents to “see” family and friends while in lockdown; and television probably was an easy way to spend time when other activities were no longer available. Additionally, adolescents in 2020 texted and used social media less than our sample of adolescents in 2018. Perhaps adolescents used texting less because they were video chatting with friends more (as these forms of media use accomplish the similar purpose of talking to friends and family), but also because texting is heavily utilized during school hours (Coyne et al., 2017; Tulane et al., 2014). As school moved online, it is possible that adolescents in 2020 were able to communicate with their friends via messaging with online video technology (e.g., the messenger feature on Zoom) instead of texting. Additionally, perhaps the decrease in social media use was because adolescents had less to post about (due to the decrease in social activities), or a decrease in FOMO

(fear of missing out), as it may have been much more likely that their peers had less to post about due to lockdowns. While our data are not sufficient to make any substantial claim about why we are observing these differences in media use patterns in adolescents in 2020 compared to 2018, these possibilities may help us understand better why adolescent mental health looked different in 2018 when compared to 2020 (pre and during COVID-19).

4.2. Mental health and media use

Finally, it is important to acknowledge the different ways that various types of media were associated with adolescent mental health between the two years.

4.2.1. Social media

Despite the research debate regarding the relationship between social media use and well-being (Coyne et al., 2020; Keles et al., 2019), findings from the current study suggest that increased time on social media was associated with lower levels of happiness and increased loneliness, regardless of year. As adolescents spend increasing amounts of time on social media, they might be less happy and lonelier, possibly because of how social media is used. Passive social media use is often characterized as mindlessly scrolling without interacting with other social media users (typically through liking, commenting, etc.) and has been linked to anxiety and hopelessness (Thorisdottir et al., 2019). Conversely, adolescents may use social media as a means to cope with feelings of unhappiness. While we were not able to determine directionality between constructs, it is important to note that adolescents' unhappiness is linked to increased time spent on social media, despite living through a pandemic.

4.2.2. Video chatting

Video chatting had a positive association with happiness in both 2018 and 2020, but a much greater positive association with happiness in 2020

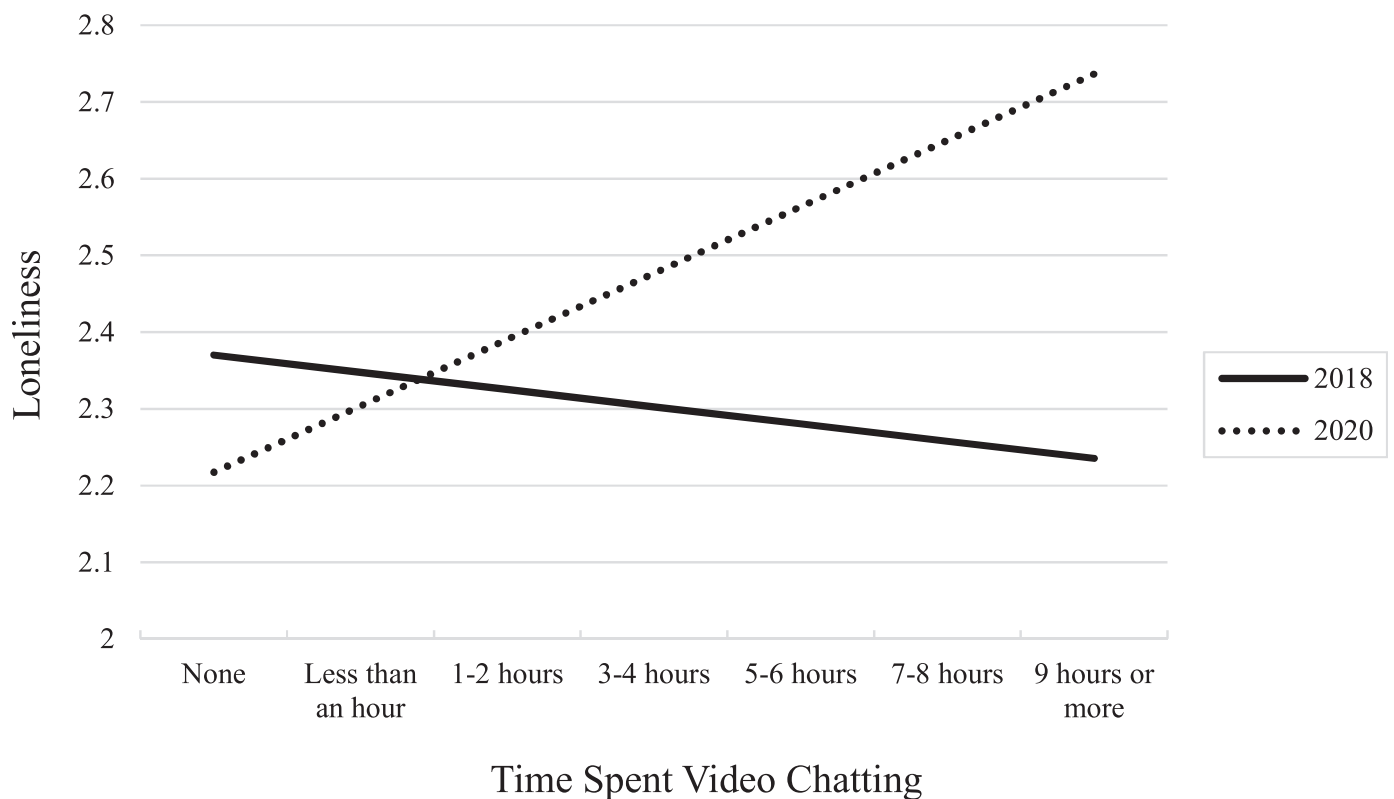


Figure 4. Simple slopes of significant interactions between year and types of media use; Loneliness and Video Chatting. Note. 2018 ($r = -.022$, S.E. = .012, $p = .069$); 2020 ($r = .087$, S.E. = .021, $p < .001$).

than in 2018. These findings are hopeful for parents and practitioners alike—video chatting might help adolescents feel happier because of the positive way they are able to chat with their friends and extended family in a pseudo “face to face” way. Especially during lockdowns and quarantines in 2020, adolescents might have been able to connect with others via technology. However, simple slopes analysis revealed that video chatting did not have a significant association with hopelessness in 2018 but was associated with a significant increase in hopelessness in 2020. Video chatting also had no significant association with loneliness in 2018, but in 2020, video chatting had a significant positive association with loneliness. Adolescents in 2018 were able to connect with their friends both via video chatting and spending time face to face in other activities, thus video chatting may not have been associated with hopelessness or feelings of loneliness. In contrast, due to lockdowns brought by COVID-19, adolescents in 2020 could spend time with their friends only via video chatting and not in person. Face to face interaction via technology (video chatting) might help adolescents connect with others to feel happier, but may not be able to replace in person face to face connection which might impact feelings of hopelessness and loneliness for adolescents. It is important to note however, that it is equally possible that more hopeless or lonely adolescents tried to reach out to their friends or family via video chatting, which may also explain the relationship between video chatting and increased hopelessness and loneliness. Additional research is needed to establish how video chatting specifically has affected adolescent mental health during COVID.

4.2.3. Video gaming

Regardless of year, time spent video gaming was associated with greater levels of hopelessness overall. However, video gaming only had a significant negative association with happiness in 2018 (and not in 2020). These findings are perhaps explained by the displacement hypothesis, as during a typical increased gaming would displace important social interactions. During 2020, however, it is possible that video games were not displacing social interactions (as there were fewer social interactions to be displaced). Furthermore, as video games can provide a means to socially connect with friends, it is possible that the social interactions created through video games helped to stay the negative effects of social isolation during COVID-19.

4.2.4. Watching Movies/TV

Time spent watching movies and/or TV was associated with greater levels of hopelessness and loneliness, despite year. It is possible that adolescents watch movies and TV with other people in the room yet may not connect with them in meaningful ways that could spark connection and strengthen relationships. Watching movies or TV might also be a means to cope with feelings of hopelessness and loneliness (Boursier et al., 2021). Future research could further examine the relationship between adolescent mental health and the time adolescents spend watching movies/TV to better help parents and practitioners understand how to help adolescents who experience hopelessness and loneliness.

4.3. Limitations and future research

There are several limitations of this study. First, while each sample was quite large and nationally representative, the 2018 and 2020 samples did not survey the same participants, thus examining change over time in our constructs is not possible. While we attempted to match the demographic characteristics of the 2018 MtF sample as closely as possible, it is important to note that the 2020 sample had a much smaller proportion of Hispanic/Latino adolescents than in the 2018 sample. Also, modes of recruitment differed; MtF was administered in schools in 2018, but the 2020 survey was administered at home via a parent’s electronic device. In addition, variables were examined on the correlation level, thus causality and directionality between constructs were not able to be determined. Ongoing longitudinal research within the same sample, collecting data prior to, during, and eventually after COVID-19, should

further examine the effects of COVID-19 on adolescent mental health in addition to other factors (e.g., time spent on different types of media), while also examining long term implications. Finally, it is important to note that the timing of data collection likely has affected our findings, as it is likely that as restrictions and lifestyle shifts caused by COVID-19 continue and change, adolescent mental health and media use will continue to evolve and shift. Additional research should continue to examine adolescent mental health as we continue to navigate COVID-related restrictions, particularly as these effects of COVID-19 continue to permeate adolescent’s lives.

5. Conclusion

The overall purpose of this paper was to examine the relationship between mental health and media use before and during in two samples of adolescents. Overall, we found little difference by year in adolescent happiness and loneliness, although adolescents reported less hopelessness in 2020 (during COVID-19) than in 2018 (pre COVID-19). Furthermore, adolescents used media differently in 2020 than in 2018, specifically watching more television/movies and video chatting, and texting and using social media less. In addition, we found that time spent video chatting, playing video games, and texting all were associated with mental health differently in 2018 compared to 2020. These findings help us better understand how COVID-19 has affected adolescent mental health, how media habits differ, and the potential implications of these shifts in media use. We believe that this research highlights the importance of continual research examining the contexts which media use takes place in, as our results indicate that the unique context of COVID-19 has yielded different relationships between adolescent media use and mental health. Furthermore, this research can also help parents, educators, other professionals, and adolescents themselves better understand how COVID-19 is impacting adolescents, and how their differences in media use may be playing a role in adolescent mental health.

Declarations

Author contribution statement

Jane Shawcroft; Megan Gale: Analyzed and interpreted the data; Wrote the paper.

Sarah M. Coyne; Jean M. Twenge; Jason S. Carroll; W. Brad Wilcox; Spencer James: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

The data that has been used is confidential.

Declaration of interest’s statement

The authors declare no conflict of interest.

Additional information

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