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Adolescent Social Media Use: Pitfalls and Promises in Relation to Cybervictimization, Friend Support, and Depressive Symptoms

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Abstract

The saturation of social media use in adolescents' lives has raised questions about both the risks and positive outcomes that may be associated with use. This study filled this gap by examining longitudinal associations among active social media use and depressive symptoms for male and female adolescents and the mediating role of friend support and cybervictimization. These relations were investigated in a sample of 800 13–15-year-old (M = 14.45) adolescents (57% female, 81% White) across four waves of data over two years. The results indicated that higher levels of active social media use led to reduced depressive symptoms for female adolescents, while active social media use predicted more cybervictimization for male adolescents. In contrast, cybervictimization predicted higher levels of active social media use for female adolescents. Friend support predicted more active social media use for male and female adolescents. Overall, findings reveal a complex picture of social media use for both male and female adolescents and further research is needed which examines types of social media use and their associations with both online and offline experiences.

Keywords

social media; adolescents; cybervictimization; friend support; depression

Introduction

Social media has become ubiquitous in the lives of adolescents, and communication with peers happens more frequently online rather than face-to-face (Gomez-Baya et al., 2019), making this a critical context to better understand the implications for adolescent well-being. Self-disclosure and self-presentation are important for adolescents, and social media use allows for this in a different way than face-to-face communications, as it can be more anonymous, asynchronous (i.e., allowing for editing or carefully targeting messages), and accessible to a large audience (Valkenburg & Peter, 2011). The relation between social media use and adolescent well-being is complex and the causal relation has been questioned by numerous scholars (Hall et al., 2019; Song et al., 2014), suggesting other factors may be involved in explaining this relationship. For example, the Goldilocks Hypothesis (Przybylski & Weinstein, 2017) suggests that moderate screen use can lead to more positive outcomes,

with over-engagement or under-engagement being problematic for an individual's well-being. Although there has been concern that online communication and social media may replace time spent in more meaningful interactions and pursuits, thus impairing relationships and functioning, more research has supported the stimulation hypothesis that social media use improves friendship quality (Valkenburg & Peter, 2011). Social media use, however, also puts adolescents at risk for cybervictimization (Kowalski, et al., 2019), which can lead to depression and create transactional interactions where depression drives cybervictimization, which in turn predicts further depression (Rose & Tynes, 2015). Many existing studies are cross-sectional and do not examine type of social media use. Longitudinal studies are needed to examine active social media use (e.g., posting, commenting, as opposed to passive scrolling; Escobar-Viera et al., 2018) in relation to positive (friend support) and negative (depression, cybervictimization) outcomes for adolescents. The current study examined longitudinal associations among active social media use and depressive symptoms for adolescents and the mediating role of friend support and cybervictimization in these relations.

Social Media Use and Internalizing Problems

There are concerns about how screen media can impact adolescent development and mental health, leading to calls to reduce screen time and increase parental monitoring (Twenge et al., 2018). During adolescence, there is heightened risk for mental health difficulties, including depression. Approximately 13% of adolescents (20% females, 7% males) aged 12- to 17-years have experienced symptoms related to at least one major depressive episode (e.g., depressed mood or irritability, lack of interest in activities, somatic symptoms; National Institute of Mental Health [NIMH], 2017). Rates may be even higher given that adolescent depression is often undiagnosed; internationally 34% of adolescents between the ages of 10 – 19 years self-reported elevated depressive symptoms (Shorey et al., 2021). This corresponds to a developmental period in which social media use is common; the median first age of social media use is 14 and average trends for adolescents who use social media indicate that female adolescents reported an average of 2:17 hours and males reported an average of 1:31 hours per day (Rideout & Robb, 2018). Further, prevalence of adolescent depression has increased internationally in the past decade, corresponding with the surge in cell phone and social media use (Shorey et al., 2021).

Recent systematic reviews and meta-analyses (e.g., Keles et al., 2020; Odgers et al., 2020) conclude there is a modest positive correlation (e.g., $r = .11$; Ivie et al., 2020) between social media use and youth depressive symptoms, but noted that longitudinal studies are needed. One factor that may relate to internalizing problems is time spent on social media. Supporting the aforementioned Goldilocks Hypothesis, individuals with no and high screen media use are at greater risk for depression (Lin et al., 2016) and suicide risk (Lee et al., 2016) than those reporting moderate use. The type of social media use, which can be passive (e.g., browsing, reading others' posts and comments) or active (e.g., online social interaction, posting, commenting; Escobar-Viera et al., 2018) appears to play an important role in this relationship. Passive social networking site use has been associated with depressive symptoms for college students and adults (Burnell et al., 2019; Escobar-Viera et al., 2018). In contrast, active social media use has been found to be unrelated to depression

(Escobar-Viera et al., 2018) and decreased loneliness (Deters & Mehl, 2013). Active social media use, as indicated by number of Instagram followers, has concurrent associations with subjective happiness, likely because of social stimulation and the rewards of extending social networks in the online world (Longobardi et al, 2020). This is also consistent with the social enhancement hypothesis where people get more social capital through online and offline social networking (Cheng et al., 2019). To better understand the relation between social media use and internalizing problems, both time spent and active use should be considered.

Social Media Use, Cybervictimization and Internalizing Problems

Cyberbullying is a type of aggressive behavior through digital media that occurs between two (or more) individuals involving a power dynamic, repetition, and is distressing to the victim (Englander et al., 2017). About 15% to 34% of adolescents between 12- and 17-years-old report experiencing cybervictimization (Modecki et al., 2014). Cybervictimization peaks late in middle school and continues to rise into high school (Hinduja & Patchin, 2015), coinciding with an increase in social media use and autonomy with devices (Rideout, 2017).

In a recent meta-analysis, the correlation between internet use and later cybervictimization was small but significant ($r = .12$; Marciano et al., 2020). Social networking sites are the most common venues for cybervictimization (Kowalski et al., 2019). Despite these correlations and some longitudinal evidence of technology and social media use predicting later cybervictimization, other longitudinal studies have indicated that cybervictimization predicts problematic internet use (Gámez-Guadix et al., 2013; Müller et al., 2018). The Excessive Reassurance Pathway for Problematic Mobile Phone Use framework (Billieux et al., 2015), posits that targets of cybervictimization may engage in excessive or problematic phone use in an attempt to maintain relationships (Domoff et al., 2020); however, they apply to internet instead of phone use. Although adolescents' Instagram follower counts are positively associated with happiness, higher follower counts are also associated with exposure to cybervictimization, lessening the positive relation between follower counts and happiness (Longobardi et al., 2020).

Cybervictimization is associated with increased internalizing problems (Fredrick & Demaray, 2018; Kwon et al., 2020). Cybervictimization is unique in that targets may not be able to escape its permanence, it is experienced across settings (e.g., home, school), and can reach a wide audience quickly (Tokunaga, 2010). The few longitudinal studies which have examined cybervictimization and mental health using cross-lagged panel models with three or more waves of data among adolescents have supported a symptoms-driven model, with internalizing symptoms driving the victimization (Holfeld & Mishna, 2019; van den Eijnden et al., 2014). The underlying theory of a symptoms-driven model is that depressive symptoms drive problems with peers, such as victimization and exclusion (Davis et al., 2019). Other longitudinal studies have supported a transactional model, with depressive symptoms and cybervictimization having bidirectional relations (Rose & Tynes, 2015). That is, victimization leads to depressive symptoms, but the depressive symptoms further interfere with peer relations and lead to victimization (Davis et al., 2019). Longitudinal studies that include multiple time periods and the constructs of social media use, cyberbullying,

and internalizing symptoms are needed to determine whether cybervictimization puts adolescents at risk for internalizing problems, if depressive symptoms drive victimization, or if the relations are transactional.

Social Media Use, Friend Support, and Internalizing Problems

Although most research on social media use focuses on adverse outcomes, 81% of adolescents report that social media helps them feel more connected to their friends and two-thirds perceive social media as making them feel supported during tough times (Pew Research Center, 2018). Adolescents—particularly females—use social media to communicate with peers, engage with school and community groups, and to access resources (Rideout & Robb, 2018). Adolescents have more positive than negative associations with social media (71% feel included vs. 25% excluded; 69% feel confident vs. 26% insecure; Pew Research Center, 2018), and 43% of high school students indicate that interacting online made their friendships closer (Reich et al., 2012), consistent with the stimulation hypothesis that online communication can enhance quality of relationships (Valkenburg & Peter, 2011).

A meta-analysis revealed that social support from peers and friends has a small to moderate inverse association with depressive symptoms, and support from the general peer group had a stronger negative relation with depressive symptoms than did support from close friends (Rueger et al., 2016). In longitudinal studies in adolescence, friendship support has been found to have an inverse association with later depressive symptoms (Burke et al., 2017; Mak et al, 2021), suggesting a promotive effect of the support. In addition, depressive symptoms led to decreased friendship support (Burke et al., 2017). Some studies have also found social support from friends to mediate the relation between peer victimization (not cyberbullying specifically) and depressive symptoms (Jenkins et al., 2018; Pouwelse et al., 2011). In a cross-sectional study of adolescents in Belgium, active Facebook use was associated with lower levels of depressive symptoms through perceived online social support (Frison & Eggermont, 2016). Thus, perceived social support may be a mechanism through which active media use predicts positive outcomes, although to better understand this process and its temporal sequence, longitudinal studies are needed.

Gender Differences

Although rates of depressive symptoms increase over the course of adolescence for both females and males, they increase earlier and are more prevalent among females (Shorey et al., 2021). According to the cognitive vulnerability-transactional stress theory of depression, biological (e.g., genetic), psychological (e.g., neuroticism), cultural (e.g., beauty standards, gender roles) and experiential (e.g., relational aggression, sexual abuse) predisposing factors contribute to cognitive vulnerabilities (e.g., rumination, negative attributions) and heightened reactivity to negative events, ultimately resulting in depression (Hankin & Abramson, 2001). In turn, depressed individuals experience more negative events (e.g., peer rejection, cybervictimization), perpetuating the cycle. These predisposing factors are elevated among female compared with male adolescents, contributing to the greater vulnerability to depression observed in female adolescents (Hankin & Abramson, 2001; Shorey et al., 2021).

In addition to having more depressive symptoms (NIMH, 2017), female adolescents, compared to male adolescents, spend more time on social media (Rideout & Robb, 2018; Twenge & Martin, 2020), focus more on social relationships (Twenge & Martin, 2020), and report more friend support (Mak et al., 2021). This is not surprising, given that females are socialized to prioritize relationships and tend to be more emotionally invested in their friendships compared with males (Johnson, 2004), consistent with social role theory (Eagly, 1997). In addition, associations between heavy (vs. light) social media use and lower well-being have been found to be larger among female adolescents, whereas relations between light (vs. no) social media use and higher well-being were stronger among male adolescents (Twenge & Martin, 2020). In one study, perceived social support reduced depressive symptoms in early adolescence among females (Tanigawa et al., 2011), whereas another study with late elementary students found that social support mediated the relation between peer victimization and depression for male adolescents, but for female adolescents, depressive feelings were predicted directly by lack of social support and not by victimization (Pouwelse et al., 2011). Other studies have not found gender differences in the relation between friend support and depression (Mak et al., 2021; Rueger et al., 2016).

Current Study

This study examined the longitudinal relations among social media use, friend support, cybervictimization, and depressive symptoms among male and female adolescents across four waves over 18 months. It was hypothesized that adolescents' active social media use would predict cybervictimization (Marciano et al., 2020), which would, in turn predict depressive symptoms, although a transactional relation was expected between cybervictimization and depressive symptoms (Rose & Tynes, 2015). Furthermore, cybervictimization was expected to predict more social media use, consistent with the Excessive Reassurance Pathway for Problematic Mobile Phone Use framework (Billieux et al., 2015). A pathway from adolescent active social media use to increased friend support was also predicted, supporting the stimulation (Valkenburg & Peter, 2011) and social enhancement/rich-get-richer hypotheses (Cheng et al., 2019), which was expected to relate to reduced depressive symptoms (Frison & Eggermont, 2016). Because prior research has found more robust relations between social media use and lower well-being for female adolescents, higher levels of depressive symptoms (Twenge & Martin, 2020), and more friend support (Mak et al., 2021), it was predicted that these relations would be stronger for female adolescents, aligning with the cognitive vulnerability-transactional stress theory of depression (Hankin & Abramson, 2001).

Methods

Participants and Procedure

Adolescents between the ages of 13 – 15 years (N = 800, M = 14.45, SD = 0.85) were recruited between October, 2014 – June, 2016 from a metropolitan area in Western New York to participate in a study of Teen Relationships and Health. Slightly more than half of the sample was female (57%). Participants self-identified as White (81%), Black/African American (12%), Asian (1%), Native American (< 1%) and multiracial (4%); 6.6% reported

White Hispanic/Latino ethnicity. The majority of participants attended a public (85%) vs. private (12%) or charter (3%) school. Participants were in grades 7 – 11 at baseline, with 90% being in 8th (32%), 9th (35%), or 10th (23%) grades. Nearly 70% of the adolescents lived with both parents. Mother-reported median family income was ≥ $80,000.

Participants were recruited using address-based sampling that targeted neighborhoods with high concentrations of families with children in the 13–15-year age range. Mailings addressed to the head of household or current resident printed on the university letterhead included a brief description of the study along with an invitation to participate and information for contacting the study via phone, electronic (e-mail), or US mail. Two mailings were sent to each household, approximately two weeks apart. In an effort to increase sample diversity, additional sample targeting households in urban communities and with high concentrations of ethnic and racial minorities was also purchased and up to four mailings were sent to these addresses.

Individuals who responded to mailings were screened for eligibility over the phone. To be eligible, adolescents had to be between 13 and 15 years of age, attending a public, charter, or private school (i.e., not home schooled), and living with a mother or legal female guardian who was willing to provide demographic and other background information. Of the 1,152 individuals who responded to the mailing who met eligibility criteria, 916 were enrolled in the study. Of these, 29 declined to participate and 86 adolescents who were sent links did not complete the baseline survey. There were 801 adolescents who completed the baseline surveys; one of these was of questionable veracity (i.e., provided different dates of birth across survey administrations) and was removed from the final sample, leaving a total of 800.

After obtaining electronic parental consent and adolescent assent, adolescent participants completed a series of four web-based surveys, administered six months apart over a two-year period. All surveys were administered using a secure server. Surveys completed by adolescents assessed demographics, social media use, peer relationship quality, victimization and perpetration of peer aggression including both in-person and cyber aggression, and internalizing symptoms. Mothers completed one survey at baseline and provided demographic information (e.g., family income). The surveys took about 1 ½ hours to complete and participants were compensated for their time at each assessment with a $25 check. Rolling baseline recruitment occurred between October, 2014- June, 2016. Participation took place over the course of two years from completion of the baseline survey; all participation was completed by July, 2018. Study procedures were approved by the university Institutional Review Board. Retention across the four waves was strong: 93.9% at Wave 2, 91.9% Wave 3, and 90.4% Wave 4.

Measures

Demographics.—At the baseline assessment, adolescents self-reported their date of birth, gender, race and ethnicity, year in school, and with whom they lived. Mothers provided data on family income at baseline; all other data were provided by adolescent participants.

Active social media use.—At each wave, participants answered questions about their social media use in the past six months. Participants identified which type of social media they used (e.g., Instagram, Twitter, Facebook, Snapchat, etc.), and the amount of time they spent per day on social media sites. Active social media use was measured with four items, "How often do you post something on social media about yourself?"; "How often do you post something on social media about other people?"; "How often do you post pictures/videos of yourself?"; "How often do you post pictures/videos of other people?" Responses were: *Never, Rarely, Sometimes*, *Somewhat Frequently*, and *Very Frequently*. A CFA conducted for the current study with baseline data initially indicated poor model fit (χ^2 [2] = 58.77, $p < .001$, CFI = .897, RMSEA = .198, SRMR = .064). Modification indices indicated a relation among the two items assessing posting about other people and among two items assessing posting about yourself. When error terms associated with these items were allowed to covary, the CFA indicated good fit to the data, χ^2 (1) = 16.93, $p < .001$, CFI = .971, RMSEA = .149, SRMR = .026. These modifications were theoretically justified and kept in the model (Kelly et al., 2020; Martin et al., 2018). Standardized factor loadings ranged from .56 to .80 and coefficient omega was ω = .77, 95% CI (.73, .80) for the total sample. Coefficient omega was ω = .78, 95% CI (.73, .83) and ω = .71, 95% CI (.65, .77) for males and females, respectively.

Cybervictimization.—Cybervictimization was measured at each wave using five items. Three items were taken from Ybarra et al. (2007) that assessed non-sexual online bullying. Two additional items developed by the project were also used: "Someone made me feel worried or threatened because they were bothering or harassing me online;" and "Someone threatened or embarrassed me by posting or sending messages/pictures of me online for others to see." Respondents reported on the frequency with which each experience occurred within the past 6 months (response options: 1 = *Never Happened* to 7 = *Every Day or Almost Every Day*). A CFA conducted for the current sample indicated adequate fit (χ^2 [5] = 28.27, $p < .001$, CFI = .859, RMSEA = .076, SRMR = .046). Although the CFI was below the recommended threshold of .90 (Hooper et al., 2008), factor loadings ranged from .47 to .78, coefficient omega was ω = .78, 95% CI (.71, .85), and modification indices did not indicate similarities among variables. Thus, the model was retained for analyses (Fabrigar et al., 2010). Coefficient omega was ω = .76, 95% CI (.63, .90) and ω = .78, 95% CI (.71, .86) for males and females, respectively.

Friend support.—The four-item Friend subscale of the Multidimensional Scale of Perceived Social Support (Canty et al., 2000; Zimet et al., 1988) was used to assess friend support (e.g., "My friends really try to help me;" "I can talk about my problems with my friends"). Items were scored on a scale from 1 *Very Strongly Disagree* to 7 *Very Strongly Agree*, with higher scores indicating more support. A CFA conducted for the current study with baseline data indicated acceptable model fit (χ^2 [2] = 39.57, $p < .001$, CFI = .960, RMSEA = .154, SRMR = .020). Standardized factor loadings ranged from .85 to .93 and coefficient omega for total sample was ω = .94, 95% CI (.93, .95). Coefficient omega was ω = .93, 95% CI (.91, .95) and ω = .94, 95% CI (.93, .96) for male and female adolescents, respectively.

Depressive symptoms.—Past week depressive symptoms were measured with the 10-item Center for Epidemiologic Studies of Depression Short Form (CESD-10; Bradley et al., 2010). Participants used a four-point ordinal scale (1 to 4) to indicate whether they had experienced each symptom using *"Rarely or None of the Time (<1 day), Some or a Little of the Time (1–2 days), Occasionally or a Moderate Amount of the Time (3–4 days), Most or All of the Time (5–7 days)*." Scores range from 10 to 40, with higher scores indicating more symptoms. At baseline, 32% of the sample had a score of 20 or higher, indicating a clinically significant level of depressive symptoms. This rate is consistent with international rates of depressive symptoms reported among adolescents ages 10 – 19 years (34%; Shorey et al., 2021). The CESD-10 has been validated for use with adolescents and has a high internal consistency ($\alpha = .87$) (Bradley et al., 2010). A CFA was conducted with the baseline data, which initially did not indicate good model fit, χ^2 (35) = 212.62, $p < .001$, CFI = .887, RMSEA = .080, SRMR = .060. There were low factor loadings (< .30) for the item assessing "everything I did was an effort" and for a reverse coded item "I felt hopeful about the future," consistent with other studies (Bradley et al., 2010; Kilburn et al., 2018; Mohebbi et al., 2018). Model fit was acceptable after deleting these items, χ^2 (20) = 61.37, $p < .001$, CFI = .968, RMSEA = .051, SRMR = .032. Standardized factor loadings ranged from .47 to .82 and coefficient omega for total sample was $\omega = .82$, 95% CI (.80, .84). Coefficient omega was $\omega = .75$, 95% CI (.70, .80) and $\omega = .84$, 95% CI (.81, .86) for males and females, respectively.

Data Analysis

IBM SPSS Statistics 26 and Mplus version 8.3 (Muthén & Muthén, 2019) were used for descriptive statistics and main analyses, respectively. The MLR estimator was used to account for nonnormality and Full Information Maximum Likelihood Estimation (FIML) for handling missing data. FIML generates population parameter estimates using available data and is considered best practice for missing data estimation (Schafer & Graham, 2002). Sixty-three percent of participants had no missing data at the item level across all four waves. FIML handled missing data for the remainder of the participants (only 11% of participants had 50% or more missing data at item level). Measurement invariance across time and gender for each latent construct (active social media use, depressive symptoms, cybervictimization, friend support) was examined, which involved comparing an unconstrained model that specified the same factor structure for each group (i.e., configural model) to a model that constrained factor loadings (i.e., metric model) across groups (ΔCFI > .01 and ΔRMSEA > .015 were used as criteria for determining invariance; Cheung & Rensvold, 2002). Model fit of the measurement model and structural model was then examined. Chi-square statistics, the comparative fit index (CFI) > .90, the root mean square error of approximation (RMSEA) < .08, and the standardized root mean squared residual (SRMR) < .08 were used to determine adequate model fit (Hooper et al., 2008). The fit of the freely estimated cross-lagged panel model (CLPM) was compared with constrained CLPMs (i.e., equality constraints placed on auto-regressive paths, cross-lagged paths, and residual within-wave covariances across time points). Multi-group CLPMs were utilized to examine gender differences (i.e., paths in one model were equated across sex and freely estimated in another model). Satorra–Bentler-scaled Chi-square difference testing was conducted to examine differences in model fit. One item was used to control for effects of

frequency of social media use or apps (response options < *30 minutes per day, 30 minutes to one hour per day, About an hour and 30 minutes per day, 2–3 hours per day, > three hours per day)* on active social media use at each wave.

Results

Table 1 provides means, standard deviations, and response rates for all variables at each time point and Table 2 provides bivariate correlations among all variables. At baseline, 78 (9.7%) participants reported they had not used any social media in the past six months, 42.2% used Facebook in the past 6 months, 50.1% used Twitter, 71.6% used Snapchat, 82% used Instagram, 15.9% used Tumbler, and 8.7% used anonymous sites. Both male and female adolescent participants reported using Snapchat and Instagram most often. See Table 3 for frequency of social media use by gender for all participants. One-way ANOVAs were conducted to investigate gender differences in the variables across all waves. Female adolescents reported higher levels of active social media use, depressive symptoms, and friend support compared with males across all waves. Female adolescents also reported higher levels of cybervictimization at T1; however, males reported higher levels at T4 (no significant differences were found for T2 and T4 cybervictimization). Measurement invariance was examined separately for each variable across time; metric invariance was evident across the four waves for each variable (see Table 4). Metric invariance is sufficient for examining structural paths (Kang et al., 2016; Vandenberg & Lance, 2000). The measurement model included four latent constructs (i.e., representing each wave) for active social media use, depressive symptoms, cybervictimization, and friend support—measured by each scale's respective items as indicators. The measurement model indicated good fit (χ^2 [3203] = 5505.46, $p < .001$; CFI = .923, RMSEA = 0.030, SRMR = .049). Residual within-wave covariances, cross-lagged paths, and autoregressive paths were then constrained to be equal across time and compared with the freely estimated structural model; the freely estimated model fit the data significantly better (ΔS-B χ^2 [54] = 264.917, $p < .001$). The freely estimated model also fit the data significantly better when residual within-wave covariances (ΔS-B χ^2 [36] = 220.62, $p < .001$), cross-lagged paths (ΔS-B χ^2 [30] = 235.19, $p < .001$), and auto-regressive paths (ΔS-B χ^2 [45] = 144.61, $p < .001$) were released. The freely estimated structural model indicated acceptable fit (χ^2 [3571] = 6180.37, $p < .001$; CFI = .915, RMSEA = 0.030, SRMR = .057) and was retained for analyses.

Active Social Media Use and Depressive Symptoms

The CLPM (see Figure 1) revealed significant autoregressive paths across all four waves for active social media use and depressive symptoms ($p < .001$). Higher levels of active social media use at T2 predicted higher levels of T3 depressive symptoms ($B = .06$, SE = .02, $p = .010$). No other cross-lagged effects between active social media use and depressive symptoms were significant. There were no significant within-wave covariances between active social media use and depressive symptoms.

Cybervictimization, Depressive Symptoms, and Friend Support

Regarding cybervictimization, significant autoregressive paths were observed across all four waves for cybervictimization ($p < .01$). A reciprocal relation was found between

cybervictimization and depressive symptoms with positive cross-lagged effects from T1 cybervictimization to T2 depressive symptoms (B = .09, SE = .04, p = .018), and from T2 depressive symptoms to T3 cybervictimization (B = .15, SE = .07, p = .032), indicating that cybervictimization led to depressive symptoms six months later, which in turn predicted increased cybervictimization six months after that. There was a significant within-wave covariance between T1 cybervictimization and T1 depressive symptoms (r = .36, SE = .05, p < .001), and between T4 cybervictimization and T4 depressive symptoms (r = .14, SE = .06, p = .022).

Regarding friend support, significant autoregressive paths were observed across all four waves for friend support (p < .001). Higher levels of T3 cybervictimization predicted lower levels of T4 friend support (B = −.22, SE = .11, p = .039), indicating that adolescents experiencing victimization were less likely to report being supported by friends six months later. More friend support at T1 also predicted higher levels of T2 active social media use (B =.06, SE = .03, p = .029). No other cross-lagged effects regarding friend support were significant. There was a significant positive within-wave covariance between T1 friend support and T1 active social media use (r = .16, SE = .05, p = .001), as well as a negative within-wave covariance between T1 cybervictimization (r = −.12, SE = .05, p = .038), and T1 depressive symptoms (r = −.21, SE = .04, p < .001). There was also a significant residual within-wave covariance between T2 friend support and T2 active social media use (r = .20, SE = .07, p = .003) and T4 friend support and T4 depressive symptoms (r = .10, SE = .05, p = .033).

Gender Differences

Multiple group analyses were conducted to examine gender differences in the CLPM. Crossgroup equality constraints were imposed on the autoregressive and cross-lagged paths; the Chi-square difference was significant (ΔS-B χ^2 [52] = 127.25, p < .001), indicating the unconstrained model fit significantly better than the constrained model. Thus, gender differences were interpreted with the unconstrained CLPM (see Figures 2 and 3 for male and female adolescents, respectively).

For male adolescents, higher levels of T1 depressive symptoms predicted lower levels of T2 friend support (B = −.62, SE = .24, p = .011). Further, higher levels of T2 cybervictimization predicted higher levels of T3 depressive symptoms (B = .08, SE = .02, p = .04). More active social media use at T2 predicted higher levels of T3 cybervictimization (B = .05, SE = .24, p = .042), which in turn predicted lower levels of T4 friend support (B = −.79, SE = .38, p = .036). Higher levels of friend support at T3 predicted higher levels of T4 active social media use (B = .07, SE = .03, p = .030). Autoregressive paths were significant across all waves for active social media use, friend support, and depressive symptoms (p < .001) and from T1 cybervictimization to T2 cybervictimization (p < .01), and T2 to T3 cybervictimization (p < .01), but not T3 to T4 cybervictimization. Significant within-wave covariances were found between T1 cybervictimization and T1 friend support (r = −.19, SE = .08, p = .015) and T1 depressive symptoms (r = .23, SE = .06, p < .001), T1 depressive symptoms and T1 friend support (r = −.20, SE = .07, p = .009), T2 active social media use and T2 friend support (r = .36, SE = .09, p < .001), T2 cybervictimization and T2 friend support (r = −.19, SE = .08, p

= .028), T4 active social media use and T4 friend support (r = −.24, SE = .08, p = .003), and T4 active social media use and T4 cybervictimization (r =.16, SE = .08, p = .039).

For females, autoregressive paths were significant across waves for active social media use, friend support, and depressive symptoms (p < .001). Cybervictimization at T1 predicted T2 cybervictimization (p < .05) and T3 cybervictimization predicted T4 cybervictimization (p < .001); however, T2 to T3 was not significant. A reciprocal relation was found between cybervictimization and depressive symptoms with positive cross-lagged effects observed from T1 cybervictimization to T2 depressive symptoms (B = .16, SE = .05, p = .003), and from T2 depressive symptoms to T3 cybervictimization (B = .17, SE = .08, p = .022). A negative relation was also found between friend support and depressive symptoms, with higher levels of T2 depressive symptoms predicting lower levels T3 friend support (B = −.34, SE = .16, p = .027). Higher levels of friend support also predicted higher levels of active social media use from T1 to T2 (B = .09, SE = .04, p = .014). Higher levels of cybervictimization at T3 predicted higher levels of T4 active social media use (B = .18, SE = .08, p = .018). Interestingly, higher levels of T1 active social media use predicted lower levels of T2 depressive symptoms (B = −.07, SE = .03, p = .035). Significant within-wave covariances were found between T1 cybervictimization and T1 depressive symptoms (r = .39, SE = .06, p < .001), an inverse association between T1 friend support and T1 depressive symptoms (r = −.35, SE = .06, p < .001), T3 cybervictimization and T3 depressive symptoms (r = .20, SE = .08, p = .010), and T3 cybervictimization and T3 friend support (r = .14, SE = .05, p = .007).

Discussion

Despite calls to reduce screen time and increase parental monitoring of adolescents' social media use (Twenge et al., 2018), prior research has not found a robust relation between time spent on social media and depressive symptoms among adolescents (Ivie et al., 2020). This suggests that in addition to time spent on social media use, other factors and online (or offline) experiences may influence the relation between social media use and depressive symptoms. Further, despite much of prior research focusing on negative associations with adolescent social media use, most adolescents report positive experiences with social media and indicate that social media helps them to connect with friends (Pew Research Center, 2018). Current theories on media use (e.g., Goldilocks Hypothesis; Przybylski & Weinstein, 2017, stimulation hypothesis; Valkenburg & Peter, 2011, Excessive Reassurance Pathway; Billieux et al., 2015) suggest a complex relation between adolescents' online experiences and their well-being. Longitudinal studies with an integrated theoretical lens are needed to more comprehensively examine and capture the complexity of adolescents' social media behavior. Thus, the current study provided a much-needed prospective and nuanced look at how active social media use (i.e., commenting, posting) is related to positive (friend support) and negative (cybervictimization, depressive symptoms) outcomes among adolescents over time. More specifically, the longitudinal associations among active social media use and depressive symptoms for male and female adolescents and the mediating role of friend support and cybervictimization in these relations were examined.

Overall, findings from the current study indicated the pattern of associations among male and females differed and the pattern for females was more complex. There was a reciprocal relationship between cybervictimization and depressive symptoms across the first three waves, partially supporting the hypothesis regarding a transactional model of cybervictimization and depressive symptoms (Davis et al., 2019). Active social media use was hypothesized to predict increased friend support and fewer depressive symptoms (consistent with the stimulation hypothesis [Valkenburg & Peter, 2011] and social enhancement/rich-get-richer hypothesis [Cheng et al., 2019]), but instead findings indicated that for female adolescents, active social media use was protective against depressive symptoms through a direct and inverse relationship. Female adolescents who were high in depressive symptoms were more likely to experience cybervictimization and reduced friend support. Cybervictimization at Time 3 was associated with subsequent active social media use for female adolescents, supporting the Excessive Reassurance Pathway for Problematic Mobile Phone Use framework (Billieux et al., 2015). However, whether this increased use reflects efforts to seek online support or to retaliatory cyberbullying cannot be determined from these data and should be explored in future research. Among male adolescents, active social media use predicted higher levels of cybervictimization. Cybervictimization was also detrimental for male adolescents, with results indicating increased depressive symptoms and decreased friend support at subsequent waves. For both male and female adolescents, high levels of friend support predicted higher levels of active social media use and high levels of depressive symptoms predicted reduced friend support.

Social Media Use and Internalizing Problems

Prior research has focused on passive social media use predicting increased depressive symptoms and considerably less research has examined how active social media use may be associated with adolescent well-being. In the current study, active social media use predicted an increase in depressive symptoms for the total sample; however, this association was small and was no longer significant when effects were examined by gender. In contrast, for female adolescents, active social media use led to *decreased* depressive symptoms. Previous studies have found that moderate internet use was associated with the lowest rates of suicide attempts, as compared to no use or high levels of use (Kim, 2012; Lee et al., 2016). Our results suggest that being socially active on media has the potential to enhance well-being (i.e., reduce depressive symptoms) for female adolescents, consistent with research finding that adolescents report positive associations with social media use, such as feeling included and confident (Pew Research Center, 2018). These findings are also consistent with the Goldilocks Hypothesis (Przybylski & Weinstein, 2017), which suggests that moderate social media use may be associated with more positive well-being compared to low or excessive use. Social role theory suggests that female adolescents emphasize relationships more so than males; thus, female adolescents may experience more reinforcement for their active social media use (e.g., followers or likes by their peers on their posts or comments) and thus reduce depressive symptoms. This finding (i.e., higher levels of active social media use predicting fewer depressive symptoms for female adolescents across one wave) was the only significant direct finding between active social media use and depressive symptoms, suggesting that other experiences are important when investigating the link between types of social media use and well-being among adolescents.

Social Media Use, Cybervictimization, and Internalizing Problems

Findings from the current study revealed that experiencing cyberbullying predicted later depressive symptoms for both male and female adolescents, consistent with previous research (Fredrick & Demaray, 2018; Kwon et al., 2020). For female adolescents, cybervictimization predicted depression, which then further led to more cybervictimization and then increased active social media use. Prior longitudinal studies have supported a symptoms-driven model, with internalizing symptoms driving victimization (Holfeld & Mishna, 2019), and a reciprocal or transactional model, with depression and cybervictimization having bidirectional relations (Rose & Tynes, 2015). The current study further showed that this cyclical pattern was then followed by females being more active on social media. These findings are also consistent with longitudinal studies which have found cybervictimization to predict increased media use (Müller et al., 2018) and problematic internet use (Gámez-Guadix et al., 2013). Although problematic media use was not examined, these findings align with the Excessive Reassurance Pathway (Billieux et al., 2015), suggesting that female adolescents may post more comments or pictures on social media (about themselves or others) after experiencing online victimization. More active media use following victimization may be due to female adolescents wanting to maintain their online reputation or status following a public victimization (e.g., someone posting an embarrassing picture) or for responding to individuals engaging in victimization (e.g., replying to embarrassing posts or pictures, retaliation). Further, female adolescents engaged in higher levels of active social media use compared to males across all waves and both positive (friend support) and negative (cybervictimization) experiences with peers increased active social media use for females. Prior studies have also found that female adolescents may be more likely to use social media for social interaction, while male adolescents may use it to view videos or photos (i.e., more passive use; Martinez-Ferrer et al., 2021), which may be why this finding was significant for female adolescents only. Interestingly, higher levels of active social media use predicted more experiences with cybervictimization for male adolescents (but not females); thus, being more active on social media (as opposed to scrolling, viewing videos, photos) may place male adolescents more at risk for victimization.

Social Media Use, Friend Support, and Internalizing Problems

Friend support predicted increased active social media use for both male and female adolescents, supporting the social enhancement hypothesis which posits that individuals with greater offline social capital (e.g., perceived friend support) are more likely to use social media to increase and enhance social interactions (Cheng et al., 2019). Given that cybervictimization also predicted active social media use for female adolescents, females may also use social media to not only enhance social interactions, but to protect (or repair) social relationships and status. For both male and female adolescents, depressive symptoms predicted less friend support, suggesting that depressive symptoms may inhibit or reduce friend support. For male adolescents, cybervictimization predicted less friend support, indicating that males experiencing victimization may subsequently feel rejection and isolation from their peer group. Interestingly, cybervictimization did not predict friend support for female adolescents, but did predict more active social media use. Again, this indicates that females may be more actively utilizing social media to connect with peers

or maintain their social status, whereas male adolescents may utilize social media for other purposes.

Limitations

Several limitations of the study should be noted. First, the measure of active social media was limited in scope. Future research should examine other aspects of social media use, including problematic use (e.g., preoccupation, tolerance, withdrawal, interference with functioning; Bányai et al., 2017; Kurcamburun & Griffiths, 2019), as well as other mechanisms such as fear of missing out (Burnell et al., 2019), sleep quality, and emotional connections to social media (Clelan-Woods & Scott, 2016). Further, externalizing problems (e.g., aggressive behavior) and cyberbullying perpetration may also be important to examine as they relate to social media behavior, especially for males. Second, the study relied on self-report which may be biased and not portray true adolescent online behavior. Further, future research should investigate these relations with a more diverse sample in terms of race/ethnicity and socioeconomic status to increase generalizability of findings. Applying traditional guidelines to interpret effect sizes (Cohen, 1992; Ferguson, 2009), cross-lagged effect sizes in the current study would be interpreted as small (i.e., β; $\leq .20$); however, small effect sizes are often meaningful in longitudinal studies when controlling for stability effects of constructs, particularly for models with more waves of data (Adachi & Willoughby, 2015).

Conclusion

Adolescents' social media use is complex and there is a need for studies to examine and capture this complexity through an integrated theoretical lens and longitudinal designs. The current study addressed this gap in the literature by examining longitudinal associations among active social media use and depressive symptoms for male and female adolescents and the mediating role of friend support and cybervictimization across four waves. Findings indicated that associations among the variables show a complex picture regarding both positive and negative associations with adolescents' active social media use, particularly for females. Female adolescents were more likely to engage in active social media use across all waves, and this use was associated with reduced depressive symptoms for females only. For male adolescents, however, active social media use predicted more cybervictimization. Thus, female adolescents may be much more likely to gain benefits from social media use, as more positive perceptions of friend support led to higher levels of active use, which may be protective against depressive symptoms. However, overall, active social media use was much more likely to be an outcome rather than a predictor for males and females, suggesting that adolescents' well-being (e.g., depressive symptoms) and experiences (e.g., friend support, victimization) may influence online behavior as opposed to the other direction. Parents and practitioners working with adolescents should monitor or ask adolescents about online behavior (and changes in online behavior) as it may be indicative of mental health or peer relationship problems. Findings support the notion of nuanced implications of social media use. Social media use on its own may not be as important as the surrounding context and experiences (e.g., cybervictimization and reduced friend support much more likely to drive increases in depressive symptoms and not social media use). Further methodologically

rigorous research is needed to thoroughly investigate adolescents' online behavior and related experiences to inform how adolescents can utilize social media in positive ways and reduce associated risks.

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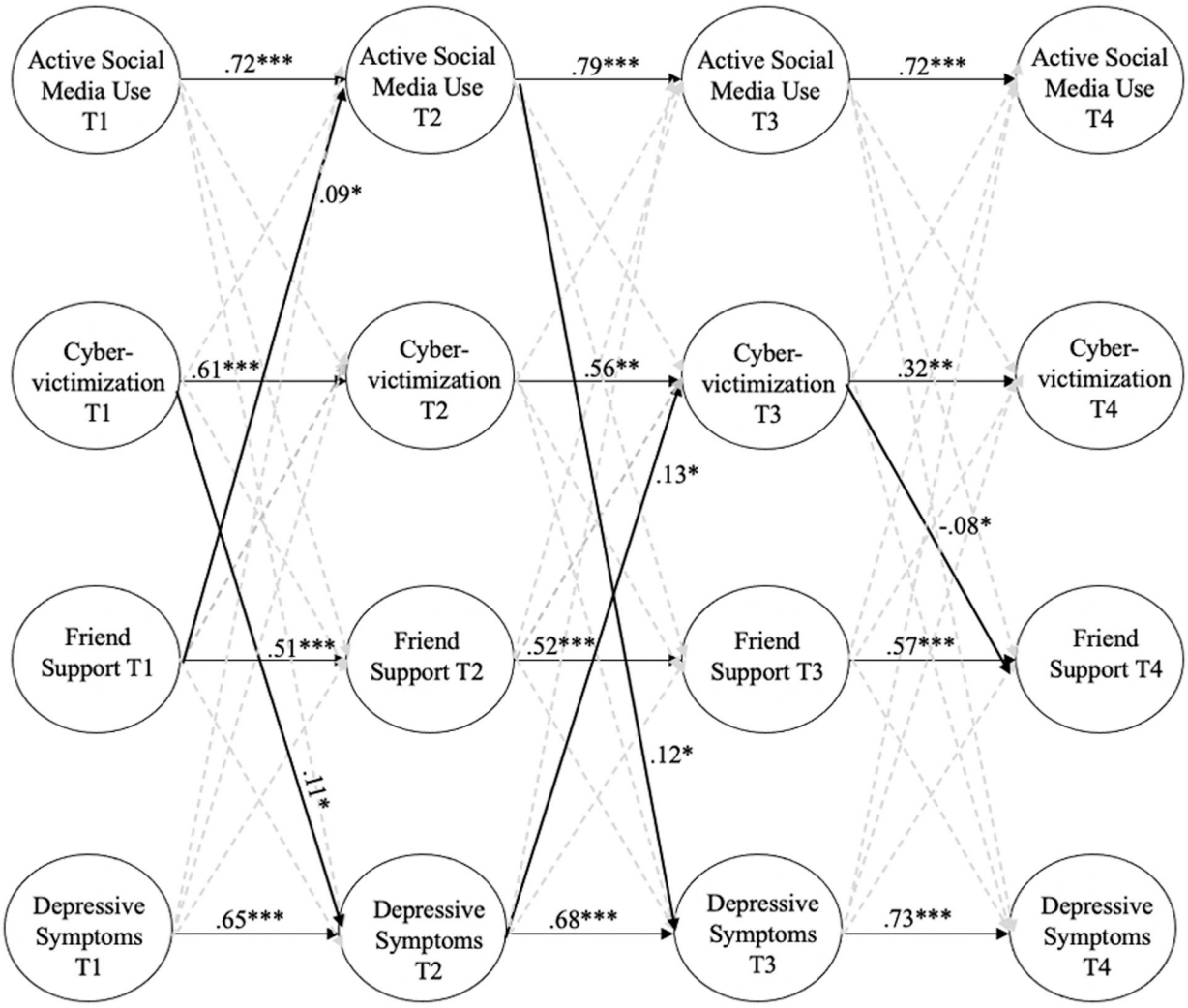

Figure 1.

Cross Lagged Panel Model Showing Relations Among Active Social Media Use, Cybervictimization, Friend Support, and Depressive Symptoms For Total Sample Across Four Waves

Note. Standardized estimates reported. Grey dashed paths indicate nonsignificant estimates. Indicators, within-wave covariances, and social media use covariate not shown.

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

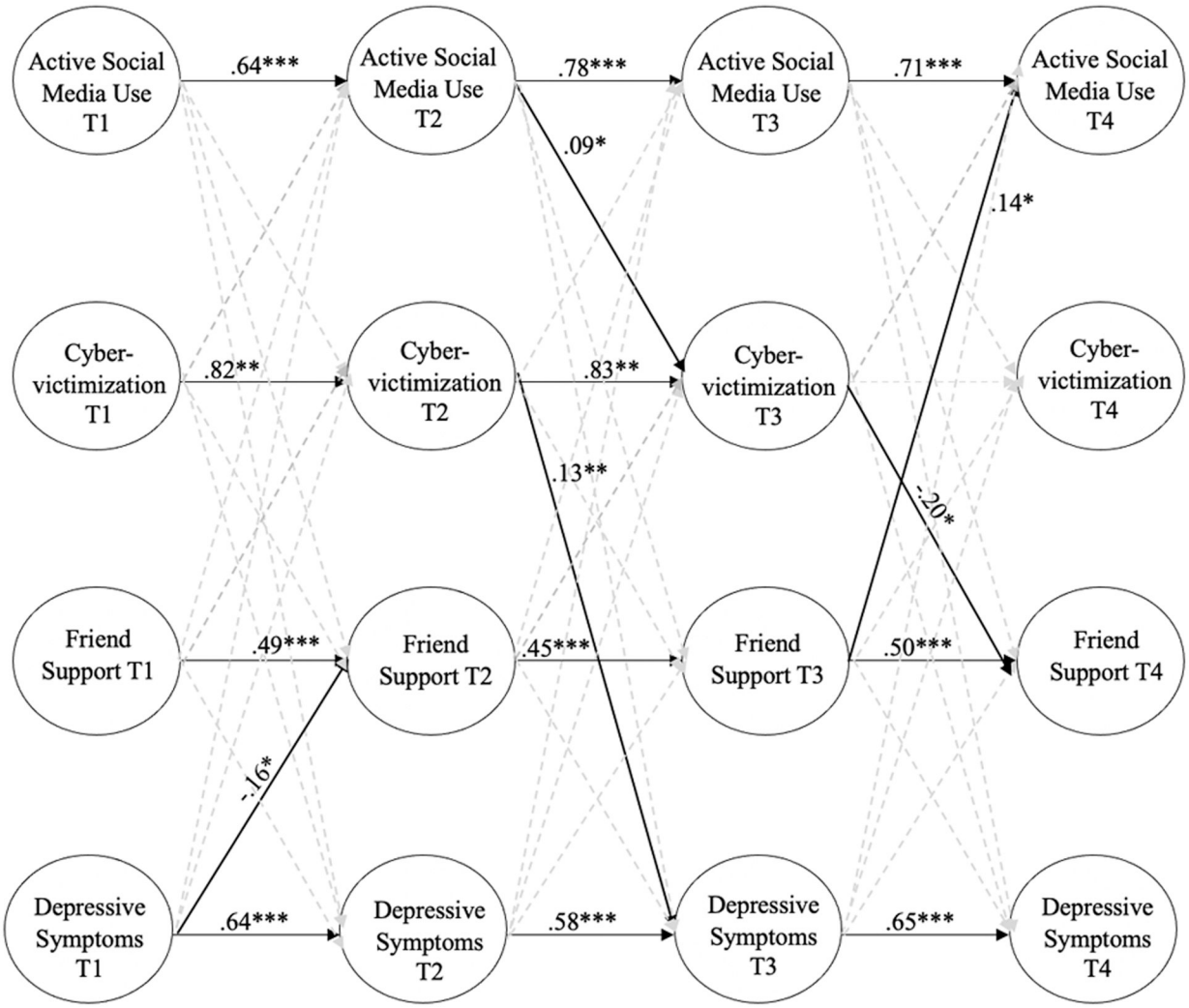

Figure 2.

Cross Lagged Panel Model Showing Relations Among Active Social Media Use, Cybervictimization, Friend Support, and Depressive Symptoms For Males Across Four Waves

Note. Standardized estimates reported. Grey dashed paths indicate nonsignificant estimates. Indicators, within-wave covariances, and social media use covariate not shown.

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

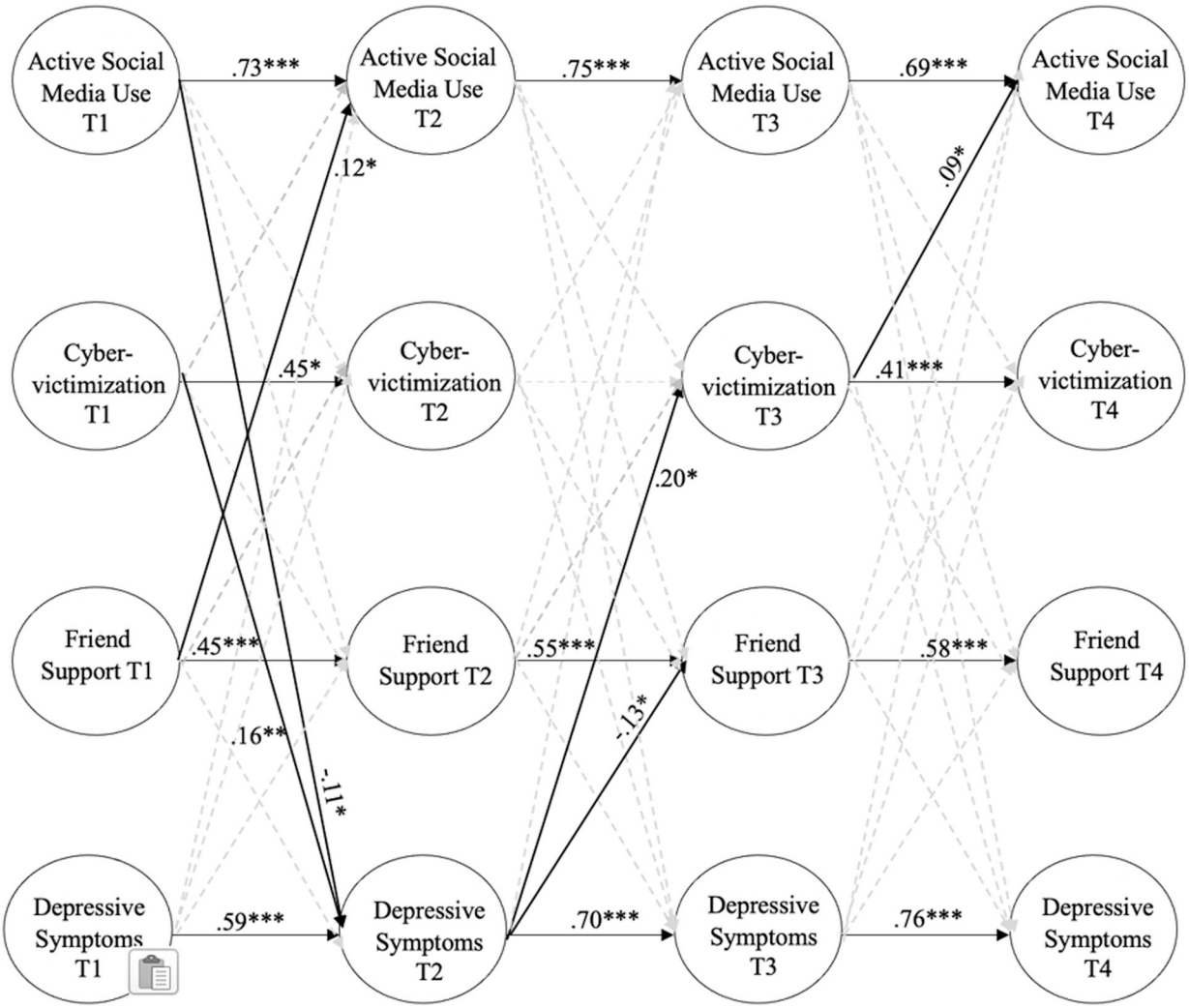

Figure 3.

Cross Lagged Panel Model Showing Relations Among Active Social Media Use, Cybervictimization, Friend Support, and Depressive Symptoms For Females Across Four Waves

Note. Standardized estimates reported. Grey dashed paths indicate nonsignificant estimates. Indicators, within-wave covariances, and social media use covariate not shown.

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

Table 1

Means and Standard Deviations for Total Sample and by Gender

	Males			Females			Total		
Variable	***M***	***SD***	***N***	***M***	***SD***	***N***	***M***	***SD***	***N***
T1 Active Social Media Use	8.35	2.84	289	10.45	3.03	432	9.61	3.13	721
T1 Depressive Symptoms	16.73	4.28	341	19.26	5.60	459	18.18	5.23	800
T1 Cybervictimization	5.75	1.87	338	6.05	2.21	458	5.92	2.08	796
T1 Friend Support	21.19	5.50	338	23.43	4.99	459	22.48	5.33	797
T2 Active Social Media Use	8.58	2.91	251	10.75	3.29	400	9.91	3.32	651
T2 Depressive Symptoms	16.80	4.18	296	19.50	5.87	424	18.39	5.40	720
T2 Cybervictimization	5.93	2.64	290	5.84	2.41	417	5.88	2.50	707
T2 Friend Support	20.61	5.84	283	22.80	5.52	405	21.90	5.75	688
T3 Active Social Media Use	8.44	2.84	258	10.53	3.23	394	9.70	3.25	652
T3 Depressive Symptoms	16.92	2.78	293	19.24	5.76	413	18.28	5.49	706
T3 Cybervictimization	5.73	2.00	290	5.69	2.05	404	5.71	2.03	694
T3 Friend Support	20.42	6.24	271	22.73	5.75	401	21.80	6.05	672
T4 Active Social Media Use	8.26	2.69	239	10.75	3.35	388	9.80	3.34	627
T4 Depressive Symptoms	16.60	5.23	274	18.69	5.82	398	17.84	5.67	672
T4 Cybervictimization	5.70	2.24	275	5.42	1.17	399	5.53	1.69	674
T4 Friend Support	20.31	6.53	275	22.46	5.99	399	21.58	6.30	674

Note. Possible ranges for Active Social Media Use 4–20, Depressive Symptoms 10–40, Cybervictimization 5–45, and Friend Support 4–28.

Table 2

Bivariate Correlations by Gender

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. T1 Active Social Media Use	--	.08	.14**	.02	.56**	−.04	.09	−.01	.57**	.01	.11*	.02	.54**	.10	.23**	−.00
2. T1 Depressive Symptoms	.04	--	.36**	−.30**	.01	.58**	.19**	−.25**	−.01	.53**	.19**	−.26**	.02	.58**	.13**	−.18**
3. T1 Cyber-victimization	.04	.24**	--	−.03	.07	.32**	.45**	−.13**	.10	.31**	.45**	−.09	.15**	.30**	.24**	−.06
4. T1 Friend Support	.01	−.22**	−.21**	--	.12*	−.22**	.01	.45**	.13**	−.19**	−.01	.36**	.15**	−.28**	−.08	.33**
5. T2 Active Social Media Use	.54**	−.04	.10	−.02	--	−.07	.08	.07	.60**	−.01	.06	.07	.51**	.01	.14**	.02
6. T2 Depressive Symptoms	.01	.52**	.20**	−.18**	.00	--	.23**	−.18**	−.06	.63**	.25**	−.22**	−.07	.65**	.10*	−.14**
7. T2 Cyber-victimization	.06	.14*	.44**	−.06	.07	.09	--	−.08	.00	.22**	.47**	−.11*	.08	.21**	.32**	−.13*
8. T2 Friend Support	−.01	−.23**	−.15*	.48**	.11	−.25**	−.18**	--	.11*	−.21**	−.08*	.55**	−.02	−.23**	−.13*	.40**
9. T3 Active Social Media Use	.35**	.02	.13*	−.04	.60**	.06	.20**	.04	--	.02	.07	.11*	.58**	.06	.15**	.04
10. T3 Depressive Symptoms	−.02	.50**	.22**	−.16**	−.01	.52**	.15*	−.20**	.08	--	.32**	−.23**	.00	.68**	.15**	−.17**
11. T3 Cyber-victimization	−.03	.14*	.46**	−.15*	.07	.17**	.49**	−.07	.17**	.18**	--	−.01	.08	.23**	.32**	−.00
12. T3 Friend Support	−.04	−.23**	−.04	.47**	.07	−.23**	−.06	.40**	.02	−.23**	−.12*	--	.04	−.20**	−.09*	.56**
13. T4 Active Social Media Use	.33**	.04	.06	.03	.53**	−.01	.15*	.07	.59**	.04	.14*	.19**	--	.05	.17**	.03
14. T4 Depressive Symptoms	.10	.47**	.24**	−.25**	.02	.51**	.24**	−.23**	.06	.64**	.18**	−.28**	.02	--	.20**	−.20**
15. T4 Cyber-victimization	−.05	.15*	.16**	−.13*	.13	.11	.35**	−.08	.19**	.18**	.37**	−.06	.20**	.22**	--	−.08*
16. T4 Friend Support	.02	−.16**	−.11	.38**	.05	−.25**	−.19**	.45**	.05	−.21**	−.19**	.51**	−.03	−.24**	−.11	--

Note. T1 = Time 1. T2 = Time 2. T3 = Time 3. T4 = Time 4. Males are below the diagonal and females are above the diagonal.

* $p < .05$

** $p < .01$.

Table 3

Frequency of Social Media Use

	Time 1		Time 2		Time 3		Time 4	
	Males	Females	Males	Females	Males	Females	Males	Females
Time on social media per day	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**
Less than 30 minutes per day	88 (31%)	57 (13%)	66 (26%)	40 (10%)	57 (22%)	35 (9%)	47 (20%)	22 (6%)
30 minutes to one hour per day	86 (30%)	83 (19%)	66 (26%)	70 (18%)	71 (28%)	68 (17%)	59 (25%)	63 (16%)
About an hour and 30 minutes per day	44 (15%)	83 (19%)	48 (19%)	87 (22%)	56 (22%)	75 (19%)	60 (25%)	78 (20%)
2–3 hours per day	46 (16%)	110 (26%)	37 (15%)	115 (29%)	43 (17%)	115 (29%)	47 (20%)	128 (33%)
More than three hours per day	24 (8%)	98 (23%)	34 (14%)	88 (22%)	31 (12%)	102 (26%)	27 (11%)	97 (25%)

Table 4

Measurement Invariance Across Time and Gender

	χ^2	df	RMSEA	CFI	ΔRMSEA	ΔCFI
Measurement Invariance Across Time						
Active Social Media Use						
Configural	550.89***	70	.094	.904	--	--
Metric	572.05***	79	.090	.902	.004(−)	.002
Depressive Symptoms						
Configural	666.79***	410	.028	.968	--	--
Metric	692.73***	431	.028	.967	.000	.001
Cybervictimization						
Configural	403.22***	134	.050	.837	--	--
Metric	370.025***	146	.044	.865	.006(−)	.028(+)
Friend Support						
Configural	264.36***	74	.057	.972	--	--
Metric	276.24***	83	.054	.972	.003(−)	.000
Measurement Invariance Across Gender						
Active Social Media Use						
Configural	917.70***	235	.086	.890	--	--
Metric	937.76***	250	.084	.889	.002(−)	.001
Depressive Symptoms						
Configural	1812.54***	1300	.031	.951	--	--
Metric	1856.50***	1398	.031	.950	.000	.001
Cybervictimization						
Configural	930.75***	268	.079	.739	--	--
Metric	947.84***	298	.074	.744	.005(−)	.005(+)
Friend Support						
Configural	476.55***	240	.050	.978	--	--
Metric	505.51***	255	.050	.976	.000	.002

*** $p < .001$.