






#Grateful: Longitudinal Associations Between Adolescents' Social Media Use and Gratitude During the COVID-19 Pandemic

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During the COVID-19 pandemic, some ways of using social media—such as directly communicating with friends—may have helped adolescents thrive. We examined longitudinal associations between high school adolescents' social media use and gratitude across a 15-month period before and during the pandemic ($n = 704$, $M_{\text{age}} = 15.10$; 52% girls). The trajectories of gratitude and the importance of social media for meaningful conversations with friends—but not frequency of social media use—were positively associated over time. At the within-person level, gratitude predicted increased importance of social media for meaningful conversations, but not vice-versa. Findings suggest that gratitude may be associated with and may motivate using social media to foster social connection, but may not increase overall social media use.

Key words: adolescence – gratitude – social media

The COVID-19 pandemic has had an enormous impact on individuals' social and psychological lives. For adolescents, the reduced in-person interaction with peers necessitated by the pandemic may pose unique challenges (Orben, Tomova, & Blakemore, 2020). To overcome the social distancing guidelines that restrict in-person interactions, many adolescents have been using social media to connect with peers during COVID-19 (Common Sense Media, 2020; Hamilton et al., in press). Despite prevailing discussions about the risks of adolescent social media use, positive engagement with peers on social media offers benefits, including opportunities to reap social support and engage in self-disclosure (Uhls, Ellison, &

Subrahmanyam, 2017). Directly communicating with close friends on social media when in-person interactions are prohibited may be key to helping adolescents thrive during the isolation of COVID-19 (Hamilton et al., in press; Orben et al., 2020).

Gratitude, defined broadly as a general orientation toward “seeing the positive,” particularly in the context of social relationships (Wood, Froh, & Geraghty, 2010), may also help adolescents cope with the social deprivation of the pandemic. Notably, research has shown that gratitude both promotes positive social relationships and, simultaneously, is often enhanced in the context of close relationships (see Wood et al., 2010). With limited opportunities for in-person interaction, adolescents with higher trait gratitude may be more inclined to seek alternative, online routes to meaningful social interaction. Additionally, adolescents who have maintained social connection with friends on social media during the pandemic may have more opportunities to experience kindness and supportive relationships, which may in turn induce feelings of gratitude. In this study, we examine bidirectional associations between adolescents' gratitude and motivation to use social media

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for meaningful communication with friends across a 15-month period leading up to and during the COVID-19 pandemic.

Adolescent Peer Interactions and the COVID-19 Pandemic

One of the most notable characteristics of adolescent development is the increased salience and importance of peers. Relative to children, adolescents spend more time with peers and peer relationships become more intimate and complex (Brown & Larson, 2009). Nearly all adolescents have at least one friend (Anderson & Jiang, 2018), and friendships provide adolescents with support and mutual responsiveness, as well as opportunities to build social skills like conflict management and perspective-taking (Bagwell & Bukowski, 2018).

Although some challenges of the pandemic have affected only a subset of adolescents—including financial disruptions and death of loved ones—nearly all adolescents have had to contend with restrictions on peer interactions, increasing the risk for mental health problems (Loades et al., 2020; Racine et al., 2020). In numerous studies from the early months of the pandemic, adolescents reported that one of their greatest concerns about COVID-19 social distancing was about maintaining friendships remotely (e.g., Efuribe, Barre-Hemingway, Vaghefi, & Suleiman, 2020; Ellis, Dumas, & Forbes, 2020). Although evidence is still emerging, some findings suggest that the ability to stay connected to friends is protective against mental health challenges related to social distancing during the pandemic (Magson et al., 2021). Adolescents who have been able to safely continue meaningfully connecting with friends during the pandemic may have better mental health and more opportunities to experience positive emotions.

Adolescent Social Media Use

Social media refers to websites and applications that allow for social interaction (Hamilton et al., in press; Nesi, Choukas-Bradley, & Prinstein, 2018). To contend with limitations on in-person interactions, many adolescents have turned to social media, even more so than usual, for peer connection during the pandemic (Common Sense Media, 2020; Ellis et al., 2020; Munasinghe et al., 2020). Some parents have reported that their children's social media use has become "excessive" (Caffo, Scandroglio, & Asta, 2020), and many have sought

strategies to reduce their children's media use given concerns about its potential negative effects (Vanderloo et al., 2020). Indeed, there is a small positive association between frequency of social media use and adolescent internalizing symptoms that has received ample research attention in recent years (Keles, McCrae, & Grealish, 2020; Sarmiento et al., 2020). However, it is necessary to disentangle frequency of use (i.e., "screen time") from quality of use (see Granic, Morita, & Scholten, 2020; Marino, 2018; Odgers & Jensen, 2020), particularly in an era when most or all peer interactions occur on these platforms.

Prior to the pandemic, adolescents reported that a primary motivation to use social media was to interact with peers and 81% said that social media helped them feel more connected to friends (Anderson & Jiang, 2018). Although theories on the affordances of social media highlight the differences between in-person and technology-mediated communication (e.g., boyd, 2010; Nesi et al., 2018; Subrahmanyam & Smahel, 2011), the features of social media do not preclude positive social experiences. For example, to varying degrees, interactions on social media can be asynchronous and provide limited interpersonal social cues (Nesi et al., 2018). However, the asynchronicity and constant availability of social media allows for adolescents to communicate with their friends more frequently than in-person interactions would allow. Increasingly, social media platforms also offer a range of features, such that adolescents may have opportunities to post publicly, chat privately, or video chat with their friends, all on the same platform.

Relative to the large body of work on the risks of social media use, research examining the potential positive impacts of social media use on adolescents is extremely sparse. Preliminary evidence suggests that benefits are accrued in large part through positive social connection, feelings of social belonging, and direct communication with friends (Allen, Ryan, Gray, McInerney, & Waters, 2014; Uhls et al., 2017). Specifically, when social media is used to foster close relationships, some evidence suggests that adolescents can feel positive emotions, such as higher self-esteem, well-being, and relational satisfaction (Best, Manktelow, & Taylor, 2014; Hall & Baym, 2011; Uhls et al., 2017). Given the strong associations between various positive emotions and the uniquely social component of gratitude (Wood et al., 2010), gratitude may also theoretically result from *online* social connection. Gratitude may also prompt adolescents to engage in positive interactions on social media, yet no

prior work has examined positive emotional antecedents of different types of social media use.

The Role of Gratitude

In the limited prior work on adolescents' positive use of social media, no studies have examined the role of gratitude. Although higher gratitude may both encourage and stem from meaningful peer interaction on social media, gratitude may be of particular relevance during the COVID-19 pandemic. Being thankful for close relationships and one's life circumstances is an adaptive, natural coping response when those people and circumstances are threatened during a crisis (Fredrickson, Tugade, Waugh, & Larkin, 2003). Indeed, a sentiment analysis of public Twitter posts found that expressions of gratitude increased during the early months of the pandemic (Lwin et al., 2020).

Gratitude can be defined as both an emotion and a trait. In terms of emotionality, grateful affect (e.g., feeling thankfulness after receiving aid from others) can vary in frequency and intensity across people and time (Wood et al., 2010). Gratitude as a trait is broadly conceptualized as an "orientation toward noticing and appreciating the positive in the world" (Wood et al., 2010; pg. 891), and higher trait gratitude is characterized by consistently higher levels of grateful affect (McCullough, Emmons, & Tsang, 2002). Research in the field of positive psychology indicates that positive emotions such as gratitude—not just the absence of negative emotions—are central to health, wellness, resilience, and human flourishing (see Seligman & Csikszentmihalyi, 2000). Robust evidence with adults and adolescents indicates that gratitude is associated with lower risk of psychopathology and higher well-being (Bono et al., 2019; Froh, Bono, & Emmons, 2010; Kwok, Gu, & Cheung, 2019; Wood et al., 2010; Yang, Yan, Jia, Wang, & Kong, 2020).

Gratitude is also a uniquely social emotion, given that gratitude is often felt toward others and in the context of interpersonal relationships. Theoretical work highlights that gratitude plays a central evolutionary role in promoting social well-being and mutual responsiveness in close relationships (Algoe, 2012), suggesting that gratitude may impact well-being indirectly through positive social experiences. Empirical findings also suggest a bidirectional association between gratitude and positive social connection. For example, among adults, gratitude for a romantic partner both originates from and promotes relationship maintenance behaviors (Kubacka, Finkenauer, Rusbult, &

Keijsers, 2011). Among adolescents, longitudinal findings show that gratitude and positive social outcomes, including social integration and prosocial behavior, are mutually reinforcing (Bono et al., 2019; Froh et al., 2010). Although research has not examined mutually reinforcing associations between gratitude and *online* social connection, these prior findings likely apply to social media contexts. Gratitude is likely not sufficient to fully shield individuals from the challenges and tragedies of the COVID-19 pandemic, yet gratitude and meaningful online communication may have benefits for some adolescents.

The Present Study

The current study examines associations between changes in gratitude and motivations to use social media before and during the COVID-19 pandemic among U.S. high school adolescents. Although prior work has focused almost exclusively on the risks of social media use, in this study we sought to identify associations between social media use and gratitude—a positive emotional experience—particularly in a context when in-person social interaction is not possible. During the pandemic, gratitude may motivate social interaction (Jiang, 2020; Syropoulos & Markowitz, 2021), even when only online social contact is permitted. Additionally, social interaction—particularly when social deprivation is high—may spur feelings of gratitude. We sought to understand how adolescents' motivation to use social media for direct, meaningful conversations could be related to gratitude, above and beyond the effects of frequency of social media use. We predicted that gratitude and the importance of social media for meaningful conversations with friends would be bidirectionally associated over time.

METHOD

Participants were 743 adolescents between the ages of 13 and 18 at baseline ($M_{\text{age}} = 15.10$, $SD_{\text{age}} = 1.01$) recruited from a large, diverse suburban high school district in the U.S. state of Florida as part of a longitudinal study assessing adolescents' character development and social media use. The vast majority ($n = 724$) attended a single school, ten participants attended a second school, and the remaining participants ($n = 9$) attended four other schools. Adolescents self-reported their gender identity at each time point. The sample included 52.2% girls and 44.5% boys; 3.1% reported another gender

identity or reported different gender identities at different time points. One participant had missing data for gender identity. Data were collected and de-identified by the Character Lab Research Network (CLRN) before being shared with the research team. The CLRN is a consortium of schools and researchers working together to collect school-based data and facilitate developmental research. Students completed online surveys during regular school hours. All study procedures were approved by the university's Institutional Review Board.

Sample demographic information regarding race and socioeconomic status (SES) was obtained from school student information systems data. The sample was 53.97% Hispanic/Latinx, 26.11% White non-Hispanic/Latinx, 7.40% Black, 6.46% Asian, and 6.06% multiracial or another race/ethnicity. Nearly half of participants (43.61%) indicated that they were eligible for free or reduced-price lunch, which was used in this study as a proxy for lower SES.

Participants completed an online survey at four time points: two before the pandemic (October 2019 [T1] and February 2020 [T2]), and two during the pandemic (October 2020 [T3] and January 2021 [T4]). During COVID-19, all participants at one school ($n = 10$) attended school fully virtually. The remaining schools were operating under a hybrid learning environment, such that some students were fully in-person and others were fully virtual. A minority of these students were engaging in in-person learning at T3 (15.21%) and T4 (27.46%); the remaining students were learning virtually. Independent samples t tests compared those who were learning virtually to those who were learning in-person at both time points during COVID-19. There were no significant differences in frequency of social media use at T3 ($t = -.35, p = .72$) or T4 ($t = .13, p = .89$), no significant differences in gratitude at T3 ($t = -.13, p = .90$) or T4 ($t = -.87, p = .39$), and no significant differences in the importance of social media for meaningful conversations with friends at T3 ($t = -.60, p = .55$) or T4 ($t = -.97, p = .33$).

Measures

Frequency of social media use. A single item was developed for the current study to assess time spent using social media. At each time point, the survey packet indicated to participants that "Social media refers to any apps or websites that involve social interaction, such as Instagram, Snapchat, or

Facebook." Participants reported, on average, how many hours they spent on social media per day. Response options ranged from 0 = *less than one hour* to 10 = *10 hours or more*. Similar single-item measures of frequency of social media use are commonly used among adolescent samples (e.g., Ellis et al., 2020).

Importance of social media for meaningful conversations. Using a survey instrument developed by Common Sense Media (2020), participants responded to the item, "How important is social media to you for having meaningful conversations with your close friends?" Responses ranged from 1 = *Not important at all* to 5 = *Extremely important*.

Gratitude. To assess adolescents' trait gratitude, participants completed the Gratitude Questionnaire-Six Item Form at each time point (GQ-6; McCullough et al., 2002). The scale assesses the level of gratitude participants experience in their daily lives. Example items include "I have so much in life to be thankful for," "I am grateful to a wide variety of people," and "As I get older, I find myself more able to appreciate the people, events, and situations that have been a part of my life history." Response options range from 1 = *Strongly disagree* to 7 = *Strongly agree*. A mean score is calculated across items, with higher scores indicating greater gratitude. The GQ-6 can be reliably used with adolescent samples (Froh et al., 2011) and showed good reliability in the current study (T1 $\alpha = .80$, T2 $\alpha = .79$, T3 $\alpha = .77$, T4 $\alpha = .79$).

Analysis Plan

Descriptive statistics, including means, standard deviations, and bivariate correlations among all study variables, were first examined using R version 3.6.1. The remainder of analyses were conducted within a structural equation modeling framework in MPlus 8.5 (Muthén & Muthén, 1998–2017). Any participants who had data for any study variables of interest (i.e., gratitude, importance of social media for meaningful conversations, and frequency of social media use) at Time 3 or Time 4 (i.e., during the COVID-19 pandemic) were included in analyses. Full information maximum likelihood with robust standard errors (MLR) was used for estimation and to handle missing data. When comparing fit between two nested models, chi-square difference tests using an MLR correction (Sartorra & Bentler, 2010) were used to determine relative model fit. For the latent growth curve

model, covariates included gender (i.e., boy, other gender; girl as reference group), race/ethnicity (i.e., White, Black, Asian, other race/ethnicity; Hispanic/Latinx as reference group), SES (i.e., dummy code for free/reduced-price lunch), and school (i.e., a dummy code for the largest school).

First, a multivariate latent growth curve model with four time points was constructed to examine trajectories and relations among variables of interest. Time was coded in models so as to account for unequal intervals between time points (i.e., factor loadings set to -1.2 , $-.8$, 0 , and $.3$). The intercept for all variables was set to Time 3, the first time point during the COVID-19 pandemic. Unconditional univariate latent growth models were first conducted to determine the optimal functional form of each variable and to examine the time-specific residual structure. A multivariate model was then constructed, controlling for demographic covariates, with each of the three primary variables examined in parallel, modeling covariances among latent growth factors.

Next, a random-intercept cross-lagged panel model was constructed to examine the direction of effects in within-person associations between variables. The model simultaneously included all three variables with autoregressive and cross-lagged paths estimated between time points and within-time covariances among the variables. Separate models were tested with constraints setting equal the cross-lagged paths, the autoregressive paths, and their combination. These models were compared to a baseline model with no constraints. We retained the most parsimonious model that did not worsen fit compared to the baseline model.

RESULTS

Descriptive statistics for all study variables and bivariate correlations are presented in Table 1.

Univariate Latent Growth Models

Unconditional univariate latent growth models were first constructed for each variable. Intercept-only models were first conducted for each, followed by models with both latent intercept and slope factors, and finally, latent intercept, slope, and quadratic factors. Equality constraints on time-specific residuals were then compared against a heteroscedastic residual structure. For gratitude, a linear model with heteroscedastic residuals was the best-fitting and most

TABLE 1
Descriptive Statistics and Bivariate Correlations Among Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. T1: Frequency SM use	—											
2. T2: Frequency SM use	.56***	—										
3. T3: Frequency SM use	.57***	.49***	—									
4. T4: Frequency SM use	.54***	.49***	.57***	—								
5. T1: Importance of SM for meaningful conv.	.19***	.18***	.18***	.18**	—							
6. T2: Importance of SM for meaningful conv.	.14**	.16***	.18***	.14**	.47***	—						
7. T3: Importance of SM for meaningful conv.	.05	.07	.11**	.13**	.37***	.37***	—					
8. T4: Importance of SM for meaningful conv.	.01	.03	.05	.10*	.35***	.29***	.48***	—				
9. T1: Gratitude	-.20***	-.17**	-.18***	-.11	.06	.04	.06	.03	—			
10. T2: Gratitude	-.10	-.15***	-.06	-.08	.14**	.16***	.14**	.23***	.51***	—		
11. T3: Gratitude	-.09	-.11*	-.11*	-.11*	.13*	.04	.22***	.23***	.39***	.50***	—	
12. T4: Gratitude	-.10	-.07	-.13*	-.10	.03	.02	.21***	.29***	.31***	.45***	.69***	—
M (SD)	3.57 (2.27)	3.88 (2.25)	4.20 (2.24)	4.14 (2.05)	3.82 (1.13)	3.66 (1.13)	3.67 (1.13)	3.60 (1.08)	4.62 (1.09)	4.42 (1.06)	4.36 (0.96)	4.37 (0.98)

Note. Frequency SM use = frequency of social media use on a typical day; Importance of SM for meaningful conv. = importance of social media for meaningful conversations with friends; SM = social media.
* $p < .05$; ** $p < .01$; *** $p < .001$.

parsimonious, with excellent fit, $\chi^2(5) = 6.48$, $p = .262$, $RMSEA = .02$, $SRMR = .05$, $CFI = 1.00$, $TLI = .99$. For frequency of social media use, a linear model with homoscedastic residuals was determined to be the optimal model form, with excellent fit, $\chi^2(8) = 12.18$, $p = .143$, $RMSEA = .03$, $SRMR = .04$, $CFI = 0.99$, $TLI = .99$. For importance of social media for meaningful conversations, a linear model with homoscedastic residuals was also best, with excellent fit, $\chi^2(8) = 16.71$, $p = .033$, $RMSEA = .04$, $SRMR = .07$, $CFI = 0.97$, $TLI = .98$. Results of these models suggested a significant negative slope ($b = -0.15$, $SE = .03$, $p < .001$) and positive intercept ($b = 4.36$, $SE = .03$, $p < .001$) for gratitude. Similarly, a significant negative slope ($b = -0.10$, $SE = .04$, $p = .005$) and positive intercept ($b = 3.63$, $SE = .03$, $p < .001$) were revealed for importance of social media for meaningful conversations. The slope of frequency of social media use was positive and significant ($b = 0.40$, $SE = .60$, $p < .001$), and the intercept was positive ($b = 4.14$, $SE = .07$, $p < .001$). Variances of slopes and intercepts were significant ($p < .001$) for all models with the exception of the slope variance for frequency of social media use ($p = .48$).

Multivariate Model

These best-fitting univariate models were then combined into a single, multivariate model with covariances between all latent growth factors and correlations between time-specific residuals (see Figure 1). Setting correlations between time-specific residuals to be equal across time did not result in a significant decrement in model fit; thus, these constraints were retained for parsimony. The final model included time-invariant covariates of gender, race/ethnicity, SES, and school. Model fit was excellent, $\chi^2(102) = 118.73$, $p = .123$, $RMSEA = .02$, $SRMR = .03$, $CFI = 0.99$, $TLI = .98$.

In the final model, the slope of importance of social media for meaningful conversations was significantly associated with the slope of gratitude, controlling for overall trajectories of social media use. This indicates that youth who experience steeper decreases in the importance they attribute to social media for meaningful conversations also report steeper decreases in gratitude over time. Similarly, youth who experience steeper increases in the importance of social media for meaningful conversations also report steeper increases in gratitude. However, there was no association between the slope of frequency of social media use and slope of gratitude. See Table 2 for covariances

among all latent growth factors in the final, conditional multivariate model.

Within-Person Cross-Lagged Associations

Finally, a random-intercept cross-lagged panel model was used to examine within-person change in gratitude, time on social media, and importance of social media for meaningful conversations with friends (see Figure 2). Nested model comparisons suggested that the cross-lagged paths could be constrained to be equal, but constraining autoregressive paths resulted in a significant decrement in model fit; thus, in the final model, cross-lagged paths were constrained, whereas autoregressive paths were allowed to freely vary. The model fit the data well, $\chi^2(33) = 45.24$, $p = .076$, $RMSEA = .02$, $SRMR = .04$, $CFI = 0.99$, $TLI = .98$. The stable between-person part of the model (i.e., the random intercept) showed a significant negative covariance between gratitude and time on social media ($b = -0.24$, $SE = .08$, $p = .003$), a significant positive covariance between time on social media and importance of social media for meaningful conversations with friends ($b = 0.28$, $SE = .08$, $p < .001$), and a nonsignificant association between gratitude and importance of social media for conversations with friends ($b = 0.07$, $SE = .04$, $p = .078$).

The within-person part of the model indicated a significant cross-lagged path from gratitude to importance of social media for meaningful conversations with friends. Adolescents who reported higher levels of gratitude at a given time point (compared to their average) reported higher importance of social media for meaningful conversations with friends at subsequent time points ($b = 0.11$, $SE = .05$, $p = .045$). The opposite direction of effects was not supported: within-person change in importance of social media for conversations with friends was not significantly associated with within-person change in gratitude at a subsequent time point ($b = 0.03$, $SE = .04$, $p = .432$). Within-person change in frequency of social media use was not associated with subsequent change in gratitude ($b = 0.01$, $SE = .03$, $p = .852$) or importance of social media for meaningful conversations with friends ($b = -0.02$, $SE = .03$, $p = .435$). Within-person change in frequency of social media use was also not predicted by prior change in gratitude ($b = -0.01$, $SE = .10$, $p = .884$) or importance of social media for meaningful conversations with friends ($b = 0.12$, $SE = .07$, $p = .092$). See Table 3 for the within-person autoregressive and cross-lagged

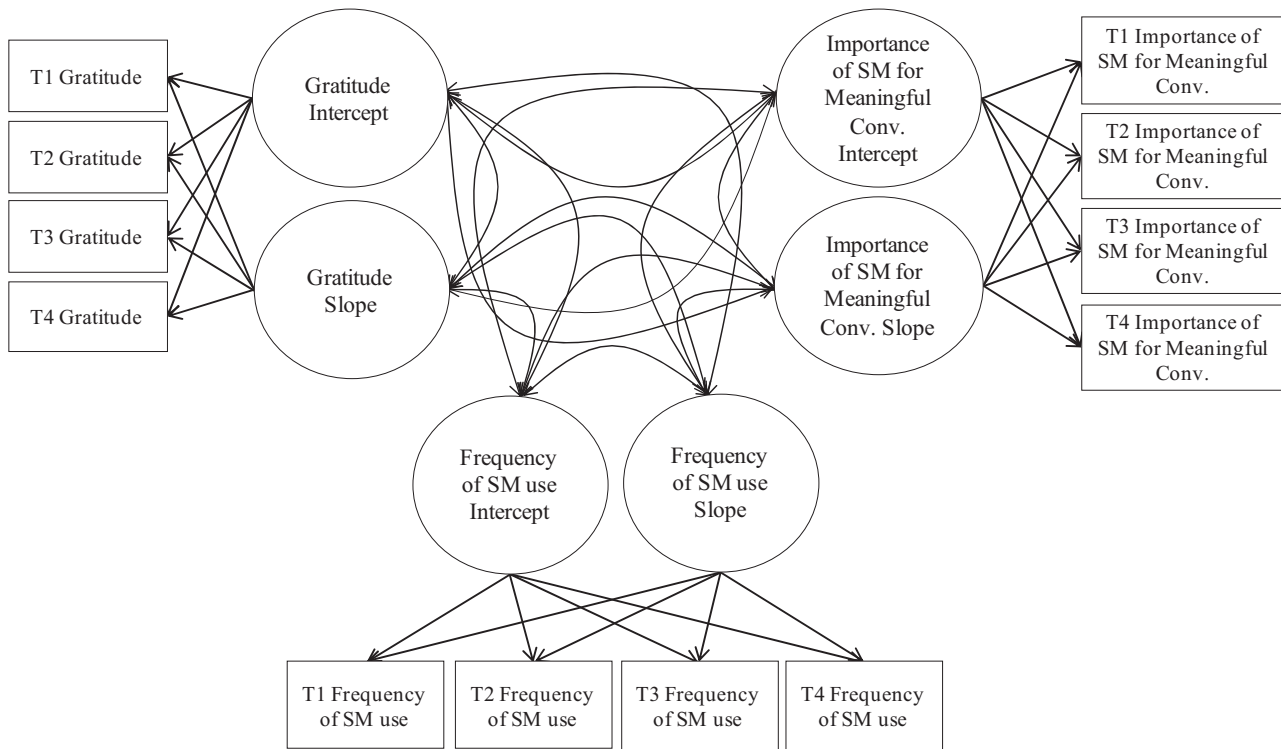


FIGURE 1 Multivariate latent growth model for gratitude, importance of social media for meaningful conversations with friends, and frequency of social media use. *Note.* SM = social media. Importance of SM for meaningful conv. = importance of social media for meaningful conversations with friends.

TABLE 2
Covariances Among Latent Factors in the Conditional Multivariate Latent Growth Curve Model

<i>Gratitude</i>				<i>Importance of SM for meaningful conv.</i>				<i>Frequency of social media use</i>			
<i>Intercept</i>		<i>Slope</i>		<i>Intercept</i>		<i>Slope</i>		<i>Intercept</i>		<i>Slope</i>	
b (SE)	p	b (SE)	p	b (SE)	p	b (SE)	p	b (SE)	p	b (SE)	p
Gratitude											
Intercept	—										
Slope	0.17 (.03)	<.001	—								
Importance of SM for meaningful conv.											
Intercept	0.17 (.03)	<.001	0.09 (.03)	.007	—						
Slope	0.11 (.03)	.001	0.08 (.04)	.031	0.05 (.03)	.160	—				
Frequency of social media use											
Intercept	-0.21 (.07)	.002	0.08 (.07)	.264	0.23 (.07)	.001	-0.17 (.07)	.009	—		
Slope	0.05 (.06)	.346	-0.03 (.07)	.688	0.09 (.06)	.103	0.07 (.07)	.280	-0.04 (.14)	.795	—

Note. Importance of SM for meaningful conv. = importance of social media for meaningful conversations with friends.

path coefficients and within-person, within-wave covariances.

DISCUSSION

The current study examined U.S. adolescents' gratitude and social media experiences across a 15-month period leading up to and during the

COVID-19 pandemic. Overall, results show that gratitude and the importance adolescents attribute to using social media for meaningful conversations with friends are associated over time. Across the four time points of the study, gratitude and importance of social media for meaningful conversations with friends went down on average, but were positively associated with each other over time. In

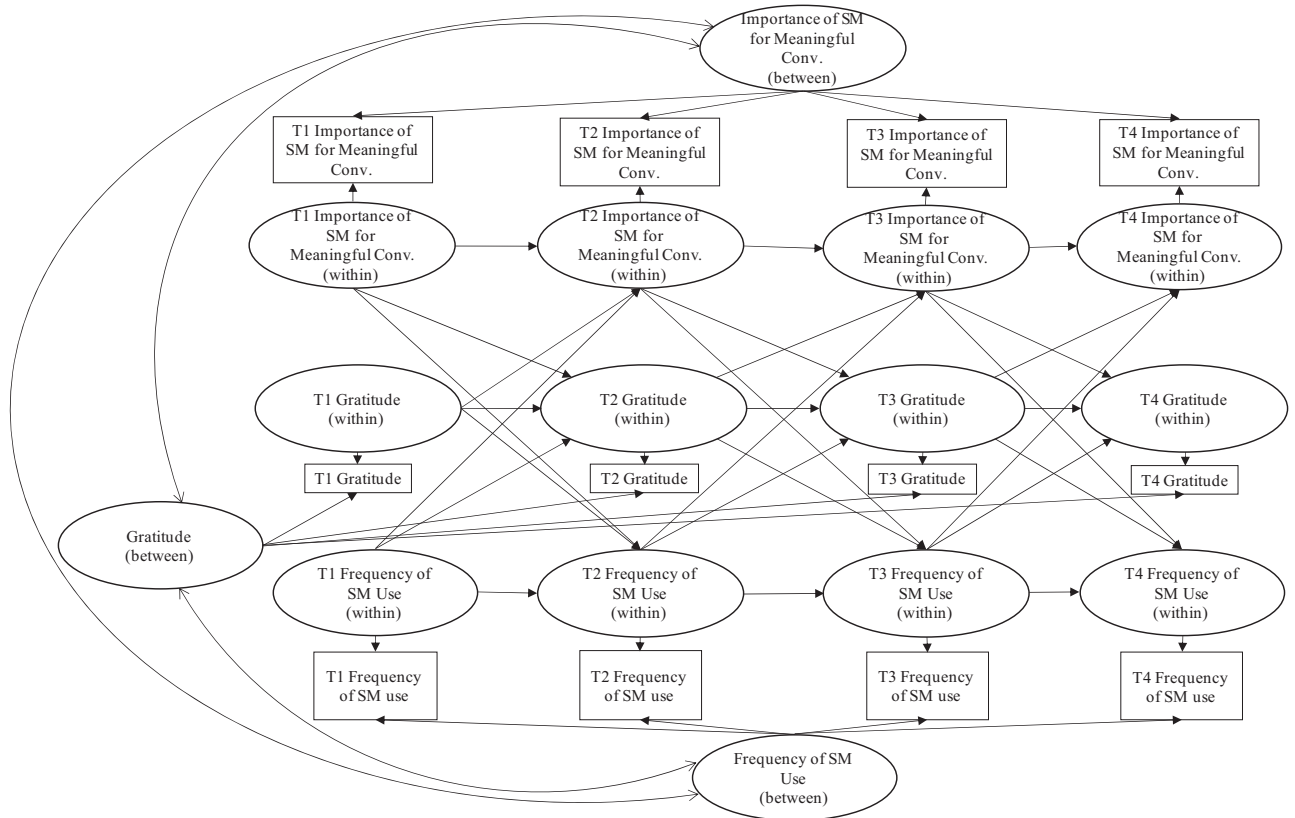


FIGURE 2 Within-person random-intercept cross-lagged model of gratitude, importance of social media for meaningful conversations with friends, and frequency of social media use. *Note.* SM = social media. Importance of SM for meaningful conv. = importance of social media for meaningful conversations with friends. Within-person, within-wave covariances are not shown for ease of presentation.

other words, those who reported greater importance of social media for having meaningful conversations over time also reported higher levels of gratitude over time. Furthermore, at the within-person level, higher-than-average gratitude was associated with subsequent increases in the importance of social media for meaningful conversations, but not vice-versa, suggesting that within-person increases in gratitude may spur motivation to use social media to connect with friends. Across models, frequency of social media use was generally not significantly associated with gratitude, or in some cases was negatively associated. Thus, gratitude may be associated with using social media to foster social connection, but not necessarily all social media use.

Benefits of Social Media Use During the COVID-19 Pandemic

The COVID-19 pandemic has threatened the mental health of adolescents in numerous ways, including by limiting their in-person social

interactions during a developmental period when peers are of the utmost importance. Online communication, primarily through social media, may be the only way adolescents can continue relationships with friends and stay connected to a broader peer network. Prior work has shown that adolescents' frequent social media use is associated with worse mental health (Keles et al., 2020; Sarmiento et al., 2020). However, the effects of social media use on adolescent well-being likely depend on the type of social media use in question. For example, one recent study found that more frequent social media use during the pandemic was associated with negative outcomes for some adolescents, yet frequent direct online communication with friends was associated with lower levels of loneliness (Ellis et al., 2020). In line with this prior work, the present results highlight that intraindividual change in using social media to foster or maintain close relationships with friends may co-occur with changes in gratitude and may be more important to consider than overall frequency of social media use.

TABLE 3
Autoregressive and Cross-Lagged Paths and Within-Person Within-Wave Covariances from the Random-Intercept Cross-Lagged Panel Model

	b	SE	β	p
Autoregressive (lagged) paths				
Gratitude T1 → gratitude T2	0.28	.09	.26	.003
Gratitude T2 → gratitude T3	0.22	.08	.25	.008
Gratitude T3 → gratitude T4	0.51	.08	.50	<.001
Importance of SM for meaningful conv. T1 → importance of SM for meaningful conv. T2	0.26	.07	.25	<.001
Importance of SM for meaningful conv. T2 → importance of SM for meaningful conv. T3	0.10	.06	.11	.094
Importance of SM for meaningful conv. T3 → importance of SM for meaningful conv. T4	0.23	.06	.23	<.001
Frequency of SM use T1 → frequency of SM use T2	0.11	.10	.10	.266
Frequency of SM use T2 → frequency of SM use T3	-0.04	.09	-.05	.600
Frequency of SM use T3 → frequency of SM use T4	0.05	.09	.06	.561
Cross-lagged paths				
Gratitude → importance of SM for meaningful conv.	0.11	.05	.09, .10	.045
Importance of SM for meaningful conv. → gratitude	0.03	.04	.03	.432
Gratitude → frequency of SM use	-0.01	.10	-.01	.884
Frequency of SM use → gratitude	0.01	.03	.01	.852
Importance of SM for meaningful conv. → frequency of SM use	0.12	.07	.07, .08	.092
Frequency of SM use → importance of SM for meaningful conv.	-0.02	.03	-.03, -.04	.435
Within-person within-wave covariances				
Gratitude T1 with importance of SM for meaningful conv. T1	-0.01	.05	-.01	.915
Gratitude T2 with importance of SM for meaningful conv. T2	0.10	.05	.12	.050
Gratitude T3 with importance of SM for meaningful conv. T3	0.13	.04	.20	.002
Gratitude T4 with importance of SM for meaningful conv. T4	0.13	.04	.22	.002
Gratitude T1 with frequency of SM use T1	-0.14	.09	-.11	.110
Gratitude T2 with frequency of SM use T2	-0.17	.08	-.13	.035
Gratitude T3 with frequency of SM use T3	-0.01	.08	-.01	.876
Gratitude T4 with Frequency of SM use T4	0.03	.06	.03	.604
Frequency of SM use T1 with importance of SM for meaningful conv. T1	0.13	.09	.10	.131
Frequency of SM use T2 with importance of SM for meaningful conv. T2	0.09	.08	.06	.251
Frequency of SM use T3 with importance of SM for meaningful conv. T3	-0.01	.09	-.01	.937
Frequency of SM use T4 with importance of SM for meaningful conv. T4	0.04	.08	.04	.581

Note. Cross-lagged paths are constrained to be equal across time. Some standardized cross-lagged paths vary over time due to different variances.

Importance of SM for meaningful conv. = importance of social media for meaningful conversations with friends; SM = social media.

Directional Associations Between Gratitude and Social Media Use

To our knowledge, no prior work has examined how the importance adolescents attribute to social media for having meaningful communication with friends is associated with gratitude—or any positive emotion—over time. Yet prior work has found that gratitude is associated with better individual mental health both directly and indirectly through increased positive social experiences (Wood et al., 2010). The association between gratitude and interpersonal relationships is often mutually reinforcing in an “upward spiral,” with gratitude contributing to positive social experiences and these experiences in turn enhancing gratitude (e.g., Bono et al., 2019; Fredrickson, 2004; Froh et al., 2010). The inclination toward positive social engagement for those high in gratitude is likely not limited to in-person

interactions. Social media offers a unique venue for engaging in social connection and building gratitude, particularly when other forms of interpersonal connection are limited—such as during a pandemic.

In the current study, at the within-person level, increases in gratitude relative to one’s average were associated with subsequent increases in the importance of social media for meaningful conversations, yet increases in the importance of social media for meaningful conversations were not directly associated with later increases in gratitude. Thus, our findings highlight that gratitude may encourage social media use aimed at fostering close peer connections, without increasing overall social media use. As such, gratitude may be a key underexplored mechanism in enhancing positive social media use. Broadly speaking, these results

highlight an important and often overlooked point for an understanding of adolescent social media use: while researchers usually focus on how social media use predicts subsequent adjustment, adolescents' sense of well-being may also drive how they engage with social media. One recent study showed that life satisfaction predicted less frequent social media use among adolescents (Orben, Dienlin, & Przybylska, 2019), but the effect of emotional states on specific social media behaviors remains underexplored. Additionally, although adolescents' specific uses of social media have occasionally been examined as an outcome of psychopathology (Radovic, Gmelin, Stein, & Miller, 2017), we are unaware of prior studies investigating how adolescents' *positive* socioemotional states or traits predict specific forms of social media use.

Beyond the COVID-19 Pandemic: Implications for Future Research and Intervention

Although the present results may be specific to the context of the COVID-19 pandemic, the results likely have broad implications. For adolescents experiencing isolation—whether physical or emotional—some forms of social media use may be related to positive emotional experiences, such as gratitude (Orben et al., 2020). Additionally, adolescents who experience positive emotions such as gratitude may benefit from social media as a context for positive interpersonal experiences (e.g., connection, support), given that it is available 24/7, unlike in-person social interactions (Nesi et al., 2018). For example, adolescents who are physically isolated from their communities, such as those living in rural settings, may benefit from using social media to foster and maintain meaningful connections with their close friends (Chew, LaRose, Steinfield, & Velasquez, 2011), which may contribute to an upward spiral of positive emotions and positive social interactions. Future research should explore other potential positive emotional experiences beyond gratitude that may be associated with certain positive forms of social media use. Researchers can use findings on adolescent social media use during the era of COVID-19 as a foundation from which to understand the potential for social media to foster connection, perhaps especially among isolated adolescents (for a theoretical commentary, see Hamilton et al., in press).

More broadly, current and future research on adolescent social media use should examine *how* adolescents are using social media and what socioemotional experiences precede and arise from

these experiences (see Granic et al., 2020; Keles et al., 2020; Marino, 2018; Odgers & Jensen, 2020). The vast majority of previous work focuses on frequency of social media use. Results from this prior work provide important insights into the effects of frequent social media use, yet collapse a variety of different social media behaviors into a single metric of use. In the current study, we found that overall social media use functioned very differently from adolescents' reported importance of social media for meaningful conversations with close friends. Future research should attend to the diversity and nuances of adolescents' potential positive and negative experiences online, made possible by the affordances of social media (boyd, 2010; Nesi et al., 2018; Subrahmanyam & Smahel, 2011).

Notably, very little prior work has specifically examined adolescents' motivations for using social media for meaningful conversations with friends, perhaps due to an assumption that online interactions are more superficial or transient. However, to the extent that youth are engaging in the majority of their peer interactions via social media, it is critical to understand how online engagement is supporting key socio-developmental tasks such as the development of more intimate, complex peer relationships. Given that some recent work has found that online social support may not provide the same psychological benefits as face-to-face support among young adults (e.g., Shensa et al., 2020), future research should aim to understand how features of different social media tools (e.g., private text messaging, video chatting, public posting) afforded by online communication alter adolescents' meaningful conversations with friends.

Importantly, the current results highlight possible avenues of intervention to increase adolescents' positive emotional experiences using social media. Until recently, most social media-related interventions have focused on limiting social media use directly or reducing the negative effects of social media (e.g., Galla, Choukas-Bradley, Fiore, & Esposito, 2021; Tamplin, McLean, & Paxton, 2018; Walther, Hanewinkel, & Morgenstern, 2014). Fewer interventions have sought to increase positive experiences on social media or foster the antecedents (e.g., gratitude) of positive social media use. In a recent school-based gratitude intervention, adolescents who used a novel social media app to express gratitude for their peers showed increases in trait gratitude, positive affect, life satisfaction, and friendship satisfaction and reductions in anxiety and negative affect (Bono, Mangan, Fauteux, & Sender, 2020). Interventions that aim to enhance

the positive aspects of social media use—particularly using the tools and platforms adolescents are already accessing—could broadly benefit adolescent mental health and specifically target teens who are struggling with physical or social isolation. Likewise, interventions aimed at boosting gratitude may contribute to increasing positive social media use and upward spirals of well-being.

Limitations and Future Directions

The current study has several strengths, including the use of a large sample of adolescents followed across a 15-month period leading up to and during the COVID-19 pandemic. However, the results from this sample may not generalize to other samples or contexts. For example, the negative effects of the COVID-19 pandemic have not been universally experienced; adolescents of color and those living in low-income contexts have been disproportionately negatively affected (Webb Hooper, Nápoles, & Pérez-Stable, 2020). The current sample is relatively diverse in terms of racial/ethnic identity and SES, yet each was measured with a one-item proxy reported by the school. Complex contextual factors affecting the adolescents in this sample remain unknown, limiting our ability to examine the role of these factors in the current models and to determine the generalizability of the present results. For adolescents struggling under the burden of poverty or discrimination, communication with friends online and experiences of gratitude may have benefits, but may not be sufficient to overcome systemic barriers to sustained well-being. Future research is critical to understand how these complex contextual and identity factors affect the online and socioemotional experiences of diverse adolescents.

Additionally, although we found no differences across participants who were learning in-person vs. virtually during COVID-19, we do not have sufficient information to understand how the present results may be directly affected by isolation from school-based peers. For example, even adolescents who have been attending school in-person during the pandemic may struggle with isolation if their friends are engaging in remote learning, whereas those learning remotely who are able to safely see friends in-person may be protected from loneliness despite broader isolation from peers. Future work that replicates the present findings in various contexts, including during the pandemic and in other situations of isolation, will help elucidate the unique effect of peer isolation on the present findings.

The present study also relies on correlational self-report data. Self-report measures are critical for understanding the subjective reactions adolescents have to online experiences. However, adolescents' reports of their frequency of social media use could be supplemented with passively collected phone-based data in future work, which can measure frequency of use without recall bias. Ecological momentary assessment procedures may also help capture immediate affective responses to social media experiences, providing more information about the temporal unfolding of short- and long-term effects of experiences on social media (e.g., Hamilton, Do, Choukas-Bradley, Ladouceur, & Silk, 2021). Moreover, while the current study provides information about the unfolding of adolescents' social media experiences and gratitude across four time points, causality cannot be determined without an experimental design.

CONCLUSION

The current study highlights associations between adolescents' gratitude and motivation to use social media to build social connection in the context of COVID-19. This study also highlights the value of including measures of specific social media behaviors beyond simply frequency of social media use to understand social-emotional development and sheds light on how some forms of social media use may be linked to positive emotional experiences. Furthermore, our results suggest gratitude is a predictor of positive social media use not previously studied among adolescents. Using social media to foster social connection, but not all social media use, may be associated with higher gratitude over time, and furthermore, gratitude may motivate adolescents' meaningful social media use. While our findings are preliminary, they suggest potential avenues for interventions that aim to enhance the positive aspects of social media use, which could be especially beneficial for teens struggling with physical or social isolation.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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