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Seeking connectedness through social media use: associations with adolescent empathic understanding and perspective-taking

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Abstract

Adolescence is a significant developmental period for building social connections. Technology has provided new ways to engage with others, particularly through social media. The current study examines developmental characteristics that support seeking connection through social media and considers how the parent–child relationship influences adolescents. Within a nationally representative sample of adolescents ($N = 4952$, $M_{age} = 14.62$), adolescent-report of greater empathic concern (feeling similar emotions to others) and perspective-taking (ability to understand others' emotions) were associated with using social media for social connectedness. Furthermore, the parent–child relationship moderated these associations such that associations were no longer significant among adolescents who reported stronger parent–child relationships. While adolescents are drawn online for social connection, the family remains an important context.

Keywords Adolescence · Social Media · Family Relationships · Cognitive Development

Adolescence is a significant developmental period for building important social bonds and seeking social connections. Most adolescent researchers would say that this period of development is defined by social connections, such that the quality of relationships with same-age peers and adults (e.g., family, teachers, and mentors) become increasingly important (Burnett & Blakemore, 2009; Lamblin et al., 2017). The management of these social relationships often serves as a precursor for relationships into adulthood, such as intimate partnerships (Seiffge-Krenke et al., 2010), as well as the maintenance of positive mental health (Riley et al., 2019). Thus, understanding the context in which adolescents build social connections and relationships has important developmental implications.

Technology advances over the past decade have provided new ways for adolescents to build social connections, particularly through social media platforms (e.g., Facebook, Instagram, Twitter, and Snapchat). According to the Pew Research Center, 95% of adolescents in the United States own or have access to a smartphone capable of providing social media access, and 45% of adolescents report being online almost constantly (Anderson & Jiang, 2018). Indeed, the rate of social media use among adolescents has increased rapidly over the years. Yet the research on adolescent social media use has primarily focused on its negative associations with adolescent mental health, social relationships, and physical health. Broadly, this research supports the claim that higher levels of social media use are associated with greater social isolation, symptoms of depression and anxiety, and poorer physical health (Fomby et al., 2021; Riehm et al., 2019; Valkenburg & Peter, 2009), especially when adolescents experience cyberbullying or use social media use for the purpose of social comparison. Other work suggests that sometimes adolescent social media use can be associated with positive effects (Seabrook et al., 2016). Nonetheless,

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there is a gap in knowledge about why adolescents use social media, in general, and if the importance of social connection is a potential protective effect of social media use during adolescence.

Social connections are built within transactions that occur across multiple contexts (Sameroff, 2009). Adolescents with positive parent relationships (i.e., characterized by support) tend to have positive social connections with peers and adults outside the family and, ultimately, increased initiative to engage in social activities (Barber & Erickson, 2001). Thus, it is plausible that the advanced skills in relationship building and social connection that adolescents gain from face-to-face interactions are practiced and refined within social media platforms, which are often referred to as adolescents' "virtual playgrounds" (Wu et al., 2016). Additionally, particular interpersonal characteristics developed during adolescence might drive the desire to engage with others through social media, as research indicates that certain personality types predict adolescent engagement in social media (Hawk et al., 2019). Given the increase in technology use to communicate with peers and family (Anderson & Jiang, 2018), it is likely that adolescence is a prime time in development to seek connectedness through social media platforms.

There remain gaps in our understanding of adolescent social media use, including; (1) understanding why adolescents engage in social media use and (2) examining how increases in social skills contribute to social media use. The current study examines whether interpersonal characteristics that are necessary for relationship building during adolescence, such as empathy and perspective-taking, are associated with using social media for social connectedness and if this association is influenced by the quality of face-to-face connections (i.e., parent–child relationships).

Seeking connectedness: social media and adolescent relationship building

Social media use among adolescents has seen increasing rates over the past decade in both frequency (i.e., how often they check and log on to social media platforms) and duration (i.e., how much time they spend time on social media platforms). A majority of adolescents (44%) report checking their social media platforms as soon as they wake up, and 41% report that they use social media too much (Jiang, 2018). Much of the research on adolescent social media use has focused on the adverse effects that frequency and duration of social media use might have on internalizing symptoms and externalizing behaviors (Riehm et al., 2019), physical activity (Fomby et al., 2021), and social relationships (Valkenburg & Peter, 2009). For example, a recent systematic review found that adolescent social media use was associated with depression, anxiety, and psychological distress (Keles et al., 2020).

More recently, researchers have begun to consider the role that social media might play in positive outcomes, including adolescents' normative developmental processes. In particular, research suggests that social media use among adolescents is also associated with identity development and exploration (Michikyan & Suárez-Orozco, 2015), well-being and social support (Best et al., 2014), and building social relationships (Wu et al., 2016). Generally, the research suggests that social media use among adolescents might resemble a two-sided coin, with both negative and positive effects on mental health outcomes and well-being (Best et al., 2014). What is missing from the extant research on social media use among adolescents is a clear understanding of the developmental processes that draw adolescents to use social media for particular reasons and potential individual differences. Specifically, research on how adolescents use social media and why they have engaged in more social media use over the years has yet to be examined.

One plausible reason for the increasing rates of social media use among adolescents is the opportunity to connect with others. Social connectedness becomes increasingly important during adolescence (Burnett & Blakemore, 2009), and so engagement with contexts that encourage connection, such as social media platforms, might help to facilitate the developmental processes linked to social connectedness. Social connectedness is defined by the positive bonds, interactions, and relationships with people, places, and things that are present within a person's ecological context (Wu et al., 2016). Thus, adolescents have the opportunity to form social connections with multiple people and across different settings. Social connectedness is associated with a number of positive developmental outcomes, as research indicates that quality social connections are protective against adolescent engagement in risk behaviors and are also associated with improved mental health and well-being, including fewer symptoms of depression and anxiety (Jose et al., 2012).

Among adolescents who report that social media can have a positive influence on their behaviors, 40% believe that using social media is beneficial for connecting with family and friends (Jiang, 2018). Yet the research on adolescent social media use has almost exclusively examined time spent on social media and not the utility of social media, such as a means of making social connections. Further, the research on predictors of social media use has primarily focused on individual differences in personality characteristics (e.g., Big Five factors) (Hawk et al., 2019). A developmental approach to understanding predictors of adolescent social media use might clarify our understanding of which adolescents use social media and for what reasons.

Adolescent development of empathic concern and perspective-taking

As adolescents begin to understand their and others' perspectives, the desire to socially connect becomes increasingly important. Social media platforms likely serve as a context in which adolescents with increasing social skills can practice the developing skills necessary to maintain social relationships and connectedness, such as empathic concern and perspective-taking. Foundational theories of emotional and cognitive development suggest that adolescence is a unique developmental period for empathy and perspective-taking (Inhelder & Piaget, 1958; Keating, 2004). In particular, several advances in thinking occur during adolescence and set the stage for social-cognitive processing and social relationships, including thinking in multiple dimensions, thinking about possibilities, abstract thinking, metacognition, and relativism (Keating, 2004). Sharpening these skills is important to adolescents' abilities to build social connections. For example, metacognitive advances during adolescence provide perspectives for thinking not only about oneself but also thinking about others' thinking and are associated with feelings of uncertainty and worry in relation to social relationships (Thielsch et al., 2015).

By definition, empathy is the ability to experience and understand the feelings of others (Preston & de Waal, 2002) and is considered both a cognitive and affective process. Cognitive empathy (often referenced as perspective-taking) involves the relative awareness and cognitive understanding of other people's emotions, while affective empathy refers to experiencing and feeling emotions that are consistent with those of another person—resulting in empathic concern (Davis, 1983; Graaff et al., 2014). There are several ways that empathic concern and perspective-taking are involved in adolescents' social connections. For example, empathic concern and perspective-taking during adolescence are associated with a number of positive developmental outcomes and social relationships, including moral understanding (Eisenberg, 2000), reduction in bullying and peer victimization (Riley et al., 2019; van Noorden et al., 2015), and greater positive interpersonal relationships (De Wied et al., 2007).

Just as adolescents' social relationships cross various contexts, so do the skills necessary for building social connections, including empathic concern and perspective-taking. While much of the research on adolescent empathic concern and perspective-taking has focused on face-to-face social connections (Malin et al., 2014; Wölfer et al., 2012), more recently, research on adolescent social media use finds that greater frequency of social media is indeed associated with increases in empathy (both cognitive and affective) over time (Lozada & Tynes, 2017; Vossen & Valkenburg, 2016)—implicating social media's role in developing adolescents' psychosocial well-being. However, there is less research on how adolescents' developing social skills encourage social media engagement and goals. Understanding adolescents' reasons for engaging in social media use (i.e., not just the frequency of use) and the unique contributions of developmental shifts in empathy and perspective-taking are essential to identifying patterns of social media use behavior and the individual differences that contribute to both positive and negative psychosocial outcomes.

Family connectedness: merging relationships in real and virtual worlds

While the development of empathy and perspective-taking may provide some rationale for adolescent social media use as a means of social connection, this association might vary based on contextual factors, especially family dynamics. Concerns from popular media that social media use leads to conflict between adolescents and their caregivers, and less time spent with the family have not clearly emerged in the research (Jiang, 2018). For example, in a nationally representative sample of adolescents, Jensen et al. (2021) examined adolescents' daily social media use through ecological momentary assessment and did not find evidence that greater social media use was associated with decreased time spent with family members or conflict within the family. These findings suggest that social media and the parent–child relationship during adolescence are more complicated than we have previously thought, as adolescents and their families who report using technology to communicate within the family view social media use as a tool for family closeness (Williams & Merten, 2011).

While research on family dynamics and adolescent social media use is limited, research in early childhood development suggests that the family serves as a safe and secure social context to practice skills such as empathy and perspective-taking that are important to connect with others outside of the family (Morris et al., 2007). Thus, during adolescence, it is likely that continued patterns of greater communication in a safe and secure family context fulfill adolescents' desire for social connection or encourage social connectedness with others through social media use. Within adolescents' social context, proximal relationships with family, peers, and important others often serve as socializing agents for how to engage with people who are more distal and/or emerging social relationships (Smetana et al., 2014). In this sense, close relationships with parents might provide a context for shaping the development of empathy and perspective-taking, which adolescents can take into other

contexts and new relationships, including those developed through social media use.

Social connections formed through social media do not take the place of the social connections made in face-to-face interactions. In fact, while adolescents have increased the amount of time they spend on social media, they still maintain important social relationships within their everyday face-to-face interactions (Schacter & Margolin, 2019). Individual differences in how adolescents and their families manage to merge social connections across their "real" and virtual worlds might provide a clearer understanding of how or if social relationships in face-to-face interactions influence adolescents' desire to use social media for social connectedness.

Current study

The current study addresses the gaps in adolescent social media use research by examining the interpersonal characteristics of adolescent development that might lead to engagement in social media for the purpose of social connection. Given that we do not know all the reasons that adolescents use social media, we first examine the factor structure of the Adolescents' Digital Technology Interactions (ADTI) scale to define and understand the various reasons that adolescents use social media among a nationally representative sample of adolescents. The ADTI is a relatively new measure, with only one study reporting its factor structure to date.

Next, we examine empathy and perspective-taking as predictors of social media use for social connection. We hypothesize that greater empathic control and perspective-taking among adolescents will be associated with social media use for social connectedness. These emerging developments in social and cognitive processing likely encourage adolescents to seek rich social contexts to foster or practice skills necessary for relationship building. Given the shift in adolescence from prioritizing close family relationships to prioritizing social connections with peers, we examine whether the parent–child relationship affects the association between empathic understanding, perspective-taking, and social media use. While more work is needed on adolescent social media use and family dynamics, we hypothesize that the parent–child relationship will impact the association between adolescents' social media use for social connectedness, and empathic concern and perspective-taking. Specifically, the association between social media use for social connectedness, and empathic concern and perspective-taking will be weaker for adolescents who report a better parent–child relationship. For adolescents who have quality relationships with their parents, social connectedness with trusted others is likely fulfilled, and thus social media may serve other purposes during their development.

Method

Participants

Participants were a national sample of 12- to 17- year-olds and their parent/caregiver recruited via Qualtrics panels. Qualtrics panelists were recruited from the web, and background checks were performed. We recruited a sample to align with race and ethnicity data from the U.S. census (Heen et al., 2014) in order to assist in the generalizability of findings. Recruitment procedures were modeled-based Qualtrics surveys in youth (Len-Ríos et al., 2016; Moreno et al., 2020). Recruitment and data collection occurred between February and March 2019.

English-speaking adults who identified as having an English-speaking adolescent between ages 12–17 were recruited via Qualtrics survey manager. The parent/caregiver of the adolescent provided informed consent, which was followed by the assent of the minor. Adolescents were instructed to complete the survey by themselves and in a private location. The surveys took an average of 39 min for the adolescent and their caregiver to complete. Surveys assessed social media use, social media rules, demographic variables, and psychosocial factors.

A total of 4592 adolescent-parent dyads completed the survey. The average age of adolescents was 14.62 (SD = 1.68, [12–17]). The majority of adolescent participants were White (66.86%) and non-Hispanic (80.73%), with White (68.55%) and non-Hispanic parent/caregivers (82.71%). Most parents/caregivers completing the survey were female (57.75%), while the majority of the adolescents in our sample were male (52.01%). Most parents/caregivers identified being biological parents of the adolescent (85.67%), followed by step-parents (5.36%). Based on parent self-reported household socioeconomic status, the majority of the sample was above the poverty line (74.09%). Prior studies with this sample have characterized the association between the frequency of social media use, physical activity, and symptoms of depression and anxiety (Rutter et al., 2020).

Measures

Assessment of Social Media Use

Adolescents' Digital Technology Interactions (ADTI; Moreno et al., 2020) The ADTI is an 18-item scale designed to evaluate adolescents' digital technology interactions and their importance. The scale was recently validated and reduced from 71 to 40 to 18 items, which load onto three

distinct factors, according to a validation study conducted by Moreno and colleagues (2020). As a part of the current study, we were most interested in factor 3, "using technology for social connection," as we wanted to explore how social media use for social connectedness relates to empathy, perspective-taking, and parent–child relationships. The other two named factors from the initial validation study included factor 1, "technology to bridge online and offline experiences," and factor 2, "technology to go outside one's identity or offline environment" (Moreno et al., 2020). An example item from factor 1 is "How important, if at all, is it for you to use media platforms for the following purposes? – Follow or look into an event you may attend," rated from "1" (Never) to "5" (Very often). An example item from factor 2 is, "How important, if at all, is it for you to use media platforms for the following purposes? – Steal or copy others' identities," rated on the same Likert scale. Lastly, and most relevant to this study, an example item from factor 3 is, "How important, if at all, is it for you to use social media platforms for the following purposes? – Direct message, converse, chat, or talk back and forth with another person (one on one)." Because the ADTI scale is new and was validated in a sample of 761, we proceeded to reevaluate the psychometric properties of the ADTI in the current study, given our larger sample and the addition of parent forms.

Self-reported frequency of checking and posting In addition to the ADTI-teen and ADTI-parent forms, adolescents reported on how often they check and how often they post on social media. Checking and posting scores ranged from 1 to 9, with "1" being "Almost constantly" and "9" being "Never," which were reverse coded so that for both self-reported checking social media and self-reported posting on social media, as well as their combined scores, higher scores indicated more social media use. A max score of 18 indicated nearly constant checking and posting on social media.

Interpersonal Reactivity Index (IRI; (Davis, 1980, 1983)

The Interpersonal Reactivity Index (IRI) is a 28-item scale assessing dispositional empathy. The IRI features four seven-item subscales, including Perspective-taking (P.T.), Empathic Concern (E.C.), Personal Distress, and Fantasy. We used the P.T. and E.C. subscales to measure perspective-taking and empathy scores in adolescents. Both subscales are comprised of seven items, rated on a 4-point Likert scale, with 2–3 items reverse coded. The maximum score on each scale is 28, and in both subscales, a higher score reflects a higher level of ability. An example item from the P.T. subscale is, "I try to look at everyone's side of a disagreement before I make a decision," rated from "Does not describe me well" to "Describes me very well." An example item from the E.C. scale is "When I see someone is being taken advantage of, I feel kind of protective towards them," rated the same as above. The IRI is one of the most widely used instruments to assess dispositional empathy, and its four-factor structure has been validated in a variety of samples, including American, Dutch, French, Swedish, and Spanish adults (Chrysikou & Thompson, 2016; Cliffordson, 2002; Gilet et al., 2013; Hawk et al., 2012; Pérez-Albéniz et al., 2003) and Dutch, Spanish, Korean, and Swedish adolescents (Cliffordson, 2001; Hawk et al., 2012; Mestre Escrivá et al., 2004; Yang & Kang, 2020) as well as American college students (Pulos & Elison, 2004). In our sample, Cronbach's alpha for E.C. was 0.66 and 0.72 for P.T.

Parent-Adolescent Relationship Scale (PARS; Hair et al., 2006)

We used an 8-item scale to assess the strength and supportiveness of the relationship between the adolescent and parent/caregiver, completed by the adolescent only. Items included questions related to youth identification with the parent/caregiver and support from the parent/caregiver. The PARS has shown acceptable internal consistency in the relationship with resident mother scales and high internal consistency in rating the relationship with a resident father (Hair et al., 2006). Of note, the questionnaire was phrased so that the adolescent would complete the survey based on the parent who was enrolled in the study and completed the survey as well. An example item is "I think highly of him/her.". Items are rated on a 5-point Likert scale (0–4), with three reverse-coded items. A higher score indicates a stronger relationship with the parent. Scores range from 0–32, and based on prior studies, a value of 24 or higher indicates a high-quality relationship with the parent. Cronbach's alpha was 0.80.

Data analyses

Data were analyzed in R (RStudio Team, 2020). First, we examined the factor structure of the ADTI, as it is a relatively novel measure, using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). We used the following cutoff ranges to evaluate model fit: Root Mean Square Error of Approximation (RMSEA) 0.08 is poor, 0.05-0.07is acceptable, <0.05 is excellent; for Tucker Lewis Index (TLI) and Comparative Fit Index (CFI), <0.9 is poor, 0.0-0.94 is acceptable, and >0.95 is excellent; for Standardized Root Mean Squared Residual (SRMR), 0.09 is poor, 0.06-0.09 is acceptable, <0.06 is excellent), in accordance with (Hu & Bentler, 1999; Marsh et al., 2004). Next, we examined bivariate correlations to confirm that relationships were consistent in the expected direction (i.e., more social media use for connectedness associated with interpersonal variables) and varied with age and gender. Next, we tested our specific hypotheses using linear regression. For each major

analysis, we corrected for multiple comparisons (across two interpersonal reactivity categories: E.C. and P.T.) using a conservative Bonferroni adjustment ($p < 0.03$). Results are considered statistically significant if they survived correction for multiple comparisons.

Results

Examining how and why adolescents use social media: factor analysis

As described above, prior analyses of the factor structure of the ADTI have suggested a three-factor structure composed of factors representing (1) technology to bridge online and offline experiences, (2) technology to go outside one's identity or offline environment, and (3) technology for social connection (Moreno et al., 2020). Of note, the original validation study was conducted in a sample of 761 adolescents, with a sample of 261 adolescents to test the final scale of the ADTI. Thus, an updated psychometric analysis is warranted in the current study to confirm that social connectedness represents a factor independent of other reasons for social media use. In our sample of 4592, we had complete ADTI data for 4316 adolescents. The analyses described below are based on the sample of 4316.

First, we ran a confirmatory factor analysis (CFA) based on the three-factor structure of Moreno et al. (2020). This model did not fit the data well based on established fit indices described above, (χ^2 (132) = 5309.10, $p < 0.001$, RMSEA = 0.095 (90% CI = 0.093, 0.098), SRMR = 0.062, CFI = 0.91, TLI = 0.89). Given the lack of fit and poor RMSEA, we conducted an exploratory factor analysis (EFA) in R using the GPArotation package to examine the factor structure and reliability of the ADTI. Parallel analyses suggested that a five-factor model fit the data very well (RMSEA = 0.042 [0.04, 0.05], TLI = 0.98, mean item complexity = 1.6), and a four-factor model also fit the data well (RMSEA = 0.053 [0.05, 0.055], TLI = 0.97, mean item complexity = 1.3).

In the five-factor model, however, one factor was composed of only one item (#13: "How important, if at all, is it for you to use media platforms for the following purposes? – Use a service that allows me to track what I'm doing (For example: using an app to track your run, steps, heart rate, sleep)"?). Considering the interpretability of item loadings, the results of the parallel analysis, and the eigenvalues, we chose the more parsimonious four-factor model (see Table 2). Factor 1 appears to be related to social media use to escape, explore, be creative, and manage mood (i.e., create a profile with a different identity) and was dubbed "Go Outside Identity." Factor 2 captures social media use to connect with others (i.e., direct messaging, conversing, and chatting with another person) and was the primary factor of interest for the current study, "Connectedness." Factor 3 seemed most related to social media for the purposes of planning events and connecting to businesses (i.e., following or looking into an event you may attend) and was dubbed "Bridge Online and Offline." Factor 4 appears to be related to general social media use for sharing status (i.e., updating status with accomplishments, changing status, posting updates), "Updating Status." The four-factor solution showed improved fit over both the three-factor and five-factor solutions (see Table 1).

Descriptive statistics

The mean ADTI score for our primary variable of interest, ADTI-Connectedness, based on previously defined items that load onto this factor was 16.19 ($SD = 5.59$) range [5–25], indicating moderate levels of social media use for connectedness. On our data, the Cronbach alpha for "ADTI-Connectedness," was 0.89 [95% CI 0.88, 0.89]. Notably, we conduct factor analyses and evaluate the psychometric properties of the ADTI in more detail above. Mean empathic concern (EC) and perspective-taking (PT) scores were 18.43 (SD = 4.91) and 15.66 (SD = 5.16), respectively, and highly correlated ($r = 0.45$, $p < 0.001$), consistent with national surveys. In examining the quality of the parent and adolescent relationship, the average PARS score was 24.94 (SD = 5.57), and 62.80% (2829/4505) met the cutoff of having a high-quality relationship. Correlations between variables are presented in Table 2.

Individual and interpersonal characteristics and social media use in adolescents

We conducted a series of ANOVAs and post-hoc Tukey tests to examine gender differences in E.C., P.T., and connectedness among adolescents by six gender categories of female, male, nonbinary, female to male transgender, male to female transgender, and other). While there we no significant differences between nonbinary gender adolescents and female or male adolescents, female adolescents (M = 16.46, SD = 5.47) were more likely than males (M = 15.98, SD = 5.71) to use to use social media for connectedness, F (1, 4507) = 10.38, $p < .01$. Female adolescents (M = 19.12, SD = 4.96) also had significantly higher levels of EC than males (M = 17.87, SD = 4.78) and female to male transgender adolescents (M = 15.64, SD = 4.52), F (1, 4496) = 76.55, $p < .01$. There were no statistically significant gender differences in PT, F (1, 4513) = 2.26, $p = .13$.

Table 1 Exploratory Factor Analysis of the Adolescents' Digital Technology Interactions scale, Three-Factor, Four-Factor, and Five-Factor Solutions ($n = 4316$)

Model	χ^2	df	χ^2 *diff*	TLI	RMSEA	RMSR	BIC
Three-factor	621.13***	102		.95	.07 [.06, .07]	.02	1206.11
Four-factor	312.12***	87	309.01	.97	.05 [.05, .06]	.02	395.01
Five-factor	149.33***	73	162.79	.98	.04 [.04, .05]	.01	23.68
Factor Loadings: Four-factor Model							
ADTI item	Factor 1 "Go Outside Identity"		Factor 2 "Connectedness"		Factor 3 "Bridge Online and Offline"	Factor 4 "Updating Status"	
1						.72	
2						.79	
3					.51		
4					.85		
5					.78		
6						.45	
7	.73						
8			.36			.36	
9			.68				
10			.68				
11			.90				
12			.50				
13	.46						
14	.57						
15	.90						
16	.63						
17	.83						
18	.73						
Proportion of variance explained	12%		12%		9.8%	9.3%	

*** = $p < .001$, * = $p < .05$, df = degrees of freedom, TLI = Tucker Lewis Index, RMSR = root mean square of residuals; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion; ADTI = Adolescents Digital Technology Interactions

Table 2 Association between age, frequency of social media use, types for social media use, empathy, perspective-taking, and parent–child relationship in a nationally representative sample of adolescents

Variable	1	2	3	4	5	6	7
1. Age							
2. Social Media Checking	.12***						
3. Social Media Posting	.06***	.72***					
4. Social Media Total	.10***	.92***	.93***				
5. Connectedness	.05***	.57***	.55***	.60***			
6. Perspective-Taking	.03, *ns*	.05**	.06***	.06***	.09***		
7. Empathetic Concern	.06***	-.07***	-.13***	-.11***	.03, *ns*	.45***	
8. Parent–Child Relationship	.05***	-.15***	-.24***	-.21***	-.11***	.24***	.50***

$N = 4316$

$p < .001$***, $p < .01$**, *ns* = not significant

In order to test the hypothesis that adolescents who report greater empathy and perspective-taking use social media mostly for connectedness, we conducted a series of linear regressions, where E.C. and P.T. served as a predictor of social media use for connectedness controlling for age, gender, and total social media use in two separate models. Here, we observed a pattern of results whereby both EC ($R^2 = 0.37$, $F\,(9, 4312) = 285.7$, $p < 0.001$) and PT ($R^2 = 0.37$, $F\,(9, 4325) = 278.97$, $p < 0.001$) contributed to using social media for connectedness. See Table 3 for estimates.

Table 3 Regression models examining the effect of empathy and perspective-taking on using social media for connectedness in a nationally representative sample of adolescents

	Effect	Estimate	*SE*	95% CI *LL*	95% CI *UL*	*p*
Model 1	Fixed Effects					
	Intercept	11.07	2.30	6.56	15.58	< .001
	EC	.11	.02	.08	.15	< .001
	Age	-.04	.04	-.12	.04	.30
	Social Media Use	.73	.01	.70	.76	< .001
	Female	.75	1.19	-1.57	3.08	.50
	Male	.79	1.18	-1.53	3.12	.50
	Non-Binary	-.71	1.56	-3.76	3.12	.60
	Female to Male	1.23	1.50	-1.71	4.17	.40
	Male to Female	6.45	2.50	1.54	11.36	.01
Model 2						
	Intercept	12.84	2.23	8.47	17.21	< .001
	PT	.06	.01	.03	.09	< .001
	Age	-.03	.04	-.11	.05	.40
	Social Media Use	.71	.01	.69	.74	< .001
	Female	1.67	1.12	-.51	3.86	.13
	Male	1.59	1.11	-.60	3.77	.20
	Non-Binary	.29	1.51	-2.67	3.25	.80
	Female to Male	2.25	1.46	-.62	5.12	.12
	Male to Female	7.38	2.48	2.52	12.25	< .01

$N = 4386$

EC = empathic concern, PT = perspective-taking

For adolescent identified gender the category "other" served as the reference group

Parent–child relationship and social media use

To determine if the way that adolescents use social media is influenced by the strength of the parent–child relationship, we explored the interaction between perspective-taking and empathic concern with parent–child relationship quality. Given that E.C. was significantly associated with age, with older adolescents showing lower E.C. scores (see Table 2), we also controlled for age, gender, and social media use in testing interactions. Controlling for age and gender in our analyses, the moderating variable of parent–child relationship was significant for EC ($\beta = -0.01$, model $R^2 = 0.38$, F (10, 4311) = 259.60, $p < 0.001$) as well as PT ($\beta = -0.01$, model $R^2 = 0.37$, F (10, 4324) = 252.20, $p < 0.001$) in its effect on social media use for connectedness; a better relationship between parent and child was associated with lower social media use for social connectedness.

Examining the simple slopes of E.C. and P.T. across values of parent–child relationship suggests that the associations get significantly weaker as the quality of the parent–child relationship improves. For example, at one standard deviation below the mean levels of parent–child relationship (M = 19.37; -1SD), the effect of EC on social media use for connectedness is 0.19 (SE = 0.02, $p < 0.001$). However, at high levels of parent–child relationship (M = 30.51; + 1 SD above the mean), the effect of EC on social media use for connectedness is only 0.07 (SE = 0.02, $p < 0.001$). Figure 1 plots the simple slopes of empathic concern on the use of social media for connectedness across all levels of parent–child relationship as well as the predicted associations of E.C. on the use of social media for connectedness at the mean ± 1 standard deviation (S.D.) of parent–child relationship.

When parent–child relationship is 1 SD below the mean (M = 19.37), the effect of PT on social media use for connectedness is 0.11 (SE = 0.02, $p < 0.001$). However, when the parent–child relationship is 30.51 (+ 1 S.D. above the mean), the effect of P.T. on social media use for connectedness was only 0.03 (S.E. = 0.02, $p = 0.06$). Figure 2 plots the simple slopes of perspective-taking on the use of social media for connectedness across all levels of parent–child relationship as well as the predicted effects of P.T. on the use of social media for connectedness at the mean ± 1 standard deviation (S.D.) of parent–child relationship.

Discussion

The current study adds to the body of literature examining adolescent social media use and the potential effects of parent–child relationship quality. In particular, the results of the study indicate that increasing social connection is one

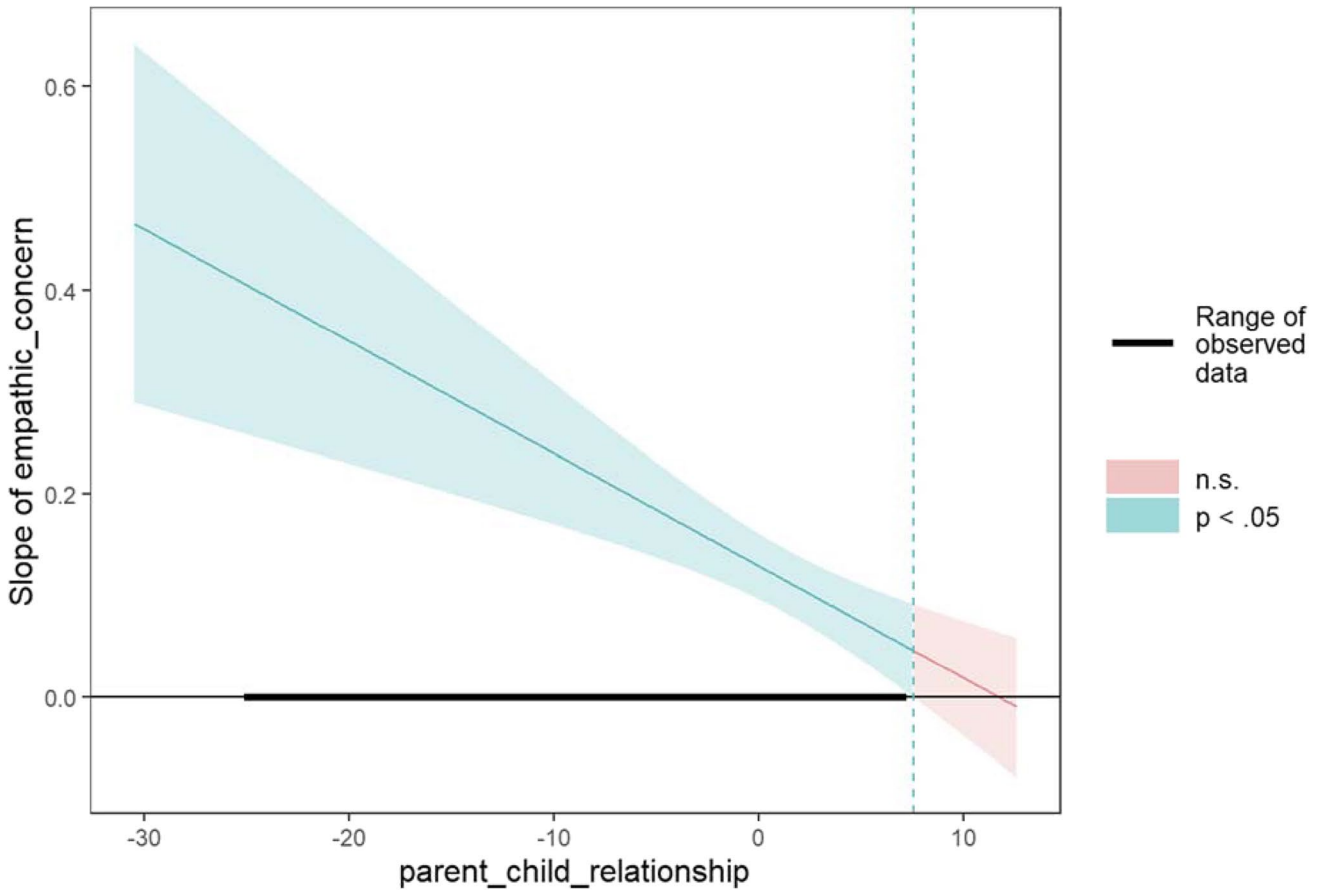

Fig. 1 Simple Slopes of Empathic on Use of Social Media for Connected Across All Levels of Parent–Child Relationship

reason adolescents use social media. Examining how and why adolescents use social media could present a deeper understanding of the potential negative or positive long-term outcomes as a result of the increasing rates of social media use among adolescents (Anderson & Jiang, 2018).

First, we conducted a factor analysis to determine if the measure of adolescent social media use (ADTI) was a good fit for addressing the research questions about social connection. From our analyses, it appears that the ADTI remains a good measure of adolescent social media use for social connection. However, in comparison to the previously conducted CFA of the ADTI (Moreno et al., 2020), which indicated a 3-factor model for adolescent social media use, we found a 4-factor model to fit the current study data better. Our findings suggest that more research is needed to understand the ways that adolescents use social media. In particular, as the age at which adolescents begin to engage in technology use decreases, and we begin to understand more about individual differences, the myriad of ways in which adolescents use social media will certainly change.

Our first hypothesis was supported in that greater adolescent report of empathic concern, and perspective-taking was associated with greater use of social media for social connection when controlling for age, gender, and social media use frequency. As adolescents begin to shift social-cognitive perspectives of others' thoughts and emotions, their preference for engaging these skills in social contexts likely increases. While perspective-taking and empathic concern involve different social-cognitive skills, one that is more proactive (perspective-taking) and the other more reactive (empathic concern) within close social relationships, it is plausible that adolescents who seek to connect using social media do so in ways that are fostered by both their empathic concern for close friends and family and proactive seeking of perspective-taking.

Our second hypothesis was exploratory, given the lack of empirical evidence on social media and associations with face-to-face relationships, including family relationships. However, we considered the research on adolescent face-to-face relationships that remain significant despite social media use. The current study results shed light on whether parent–child relationships influence the associations between adolescent interpersonal characteristics and social media use. Specifically, greater perspective-taking and

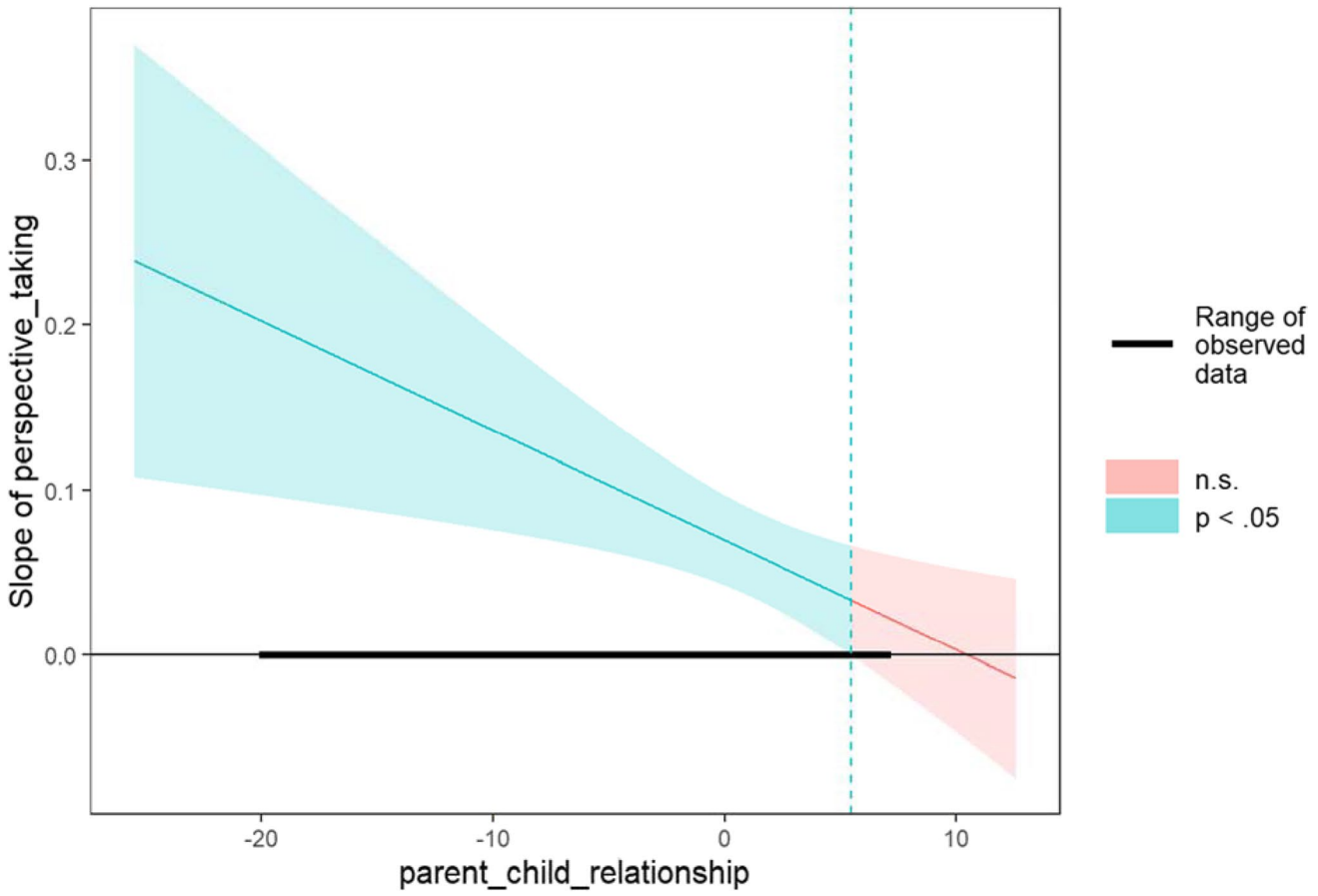

Fig. 2 Simple Slopes of Perspective-Taking on Use of Social Media for Connected Across All Levels of Parent–Child Relationship

empathic concern were associated with using social media for social connectedness but only for those adolescents who reported a less supportive parent–child relationship (i.e., less time spent and less support from their parents or caregivers). We believe our results suggest that, for adolescents, their inclination to connect in some social capacity likely emerges alongside their skills in social cognition, such as perspective-taking and empathic concern. Further, when their face-to-face social relationships lack a supportive environment for engaging in these skills, adolescents might seek social connection through using social media.

Strengths and limitations

Previous research on social media use among adolescents has largely examined the potential negative effects of time spent and duration of social media use. The current study is one of the few that examines the reasons adolescents use social media for connectedness and the potential interpersonal factors that contribute to social media use to connect socially. Examining adolescents' natural desires to connect with others in the context of social media use is important to understanding the changing adolescent social world and its impact on their development within the twenty-first century. Furthermore, as new social media platforms emerge (e.g., Tik Tok), adolescents will undoubtedly continue to engage in social media at increasingly rapid rates and find new ways of connecting with others. Social media can be beneficial and supportive of adolescents and their development if used for the intended purpose (Wu et al., 2016). The current study goes beyond examining the frequency of social media use among adolescents and considers potential interpersonal characteristics that are sensitive to development during this age-stage. More research should consider how and why adolescents use social media, as well as the important developmental skills that can be supported through social media use.

The current study is also one of the few to examine how the face-to-face parent relationship influences adolescent social media use for social connectedness. Much of the extant literature has focused on parent–child conflict as a result of social media use (Mesch, 2006), with little attention to how adolescents and their families maintain bonds that are not influenced by social media or that buffer the effects of social media use. Our results add to the body of literature that suggests

adolescents' face-to-face relationships do not diminish because of social media use but instead might hold value in how adolescents engage socially, as seeking social connectedness was only significant for families with lower adolescent report of a supportive parent–child relationship. Further, the study results emphasize the importance of family as socializing agents with whom youth are able to engage their developing social-cognitive skills of perspective-taking and empathic concern.

While the current study examines characteristics important to adolescent social media use and social connections in novel ways, there are some limitations. First, we examine empathy by utilizing the empathic concern subscale of the interpersonal reactivity index (Davis, 1980, 1983). Researchers suggest that this subscale might indicate sympathy rather than empathy. Future research might consider how related constructs of empathy and sympathy contribute to adolescent social media use for social connection in different or similar ways. Secondly, the current study is limited in its use of adolescent-reported data. Family and parent–child relationships are dynamic processes that involve multiple perspectives. The inclusion of parent-reported data or sibling dynamics within the family might best serve research that seeks to understand how relationships within the family unit influence adolescents' decisions to engage in social media for social connectedness.

Furthermore, adolescents' relationships with peers, teachers, and other significant adults are additional face-to-face interactions that impact empathic concern and perspective-taking (Malin et al., 2014; Wölfer et al., 2012). Our research is limited in its focus on the parent–child relationship. Additional work is needed to understand the full scope of adolescent offline relationships and social media use for connection, empathy, and perspective-taking. Finally, the current study examines social media within the context of Facebook. It will be important for future research to distinguish the use of social media for social connectedness across other social media platforms (e.g., Instagram, Twitter, Snapchat) among adolescents. It is plausible that various social media platforms hold different intentions for making and maintaining social connections.

Conclusion

The current study contributes to our knowledge of adolescent social media use within a developmental framework. There is much to learn about how adolescents engage with new social contexts, such as social media, and whether their developing skills associated with social relationships remain important. Consideration of the ways that adolescents merge their real and virtual worlds and the underlying developmental characteristics that support these efforts is significant to understanding their positive development.

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Data availability The data that support the findings of this study are available from [blinded for review], but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are, however, available from the authors upon reasonable request and with permission of [blinded for review].

Declarations

Ethical approval The current study was approved by the University's Institutional Review Board and performed in accordance with the ethical standards in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Conflicts of interest The authors have no conflicts of interest or disclosures related to this work.

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