



## Full length article

## Do social media foster or curtail adolescents' empathy? A longitudinal study

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## ABSTRACT

Recently, concerns have been raised that adolescents' prolific social media use may cause them to become less empathic. However, direct empirical evidence is missing and research suggests that social media use can also be beneficial for adolescents' psychosocial development. The present study aims to investigate whether and how social media use influences empathy. We surveyed 942 Dutch adolescents (10–14 years) twice, with a one-year interval. The results showed that social media use is related to an increase in cognitive and affective empathy over time. Specifically, adolescents' social media use improved both their ability to understand (cognitive empathy) and share the feelings of their peers (affective empathy).

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## 1. Introduction

In recent years, there has been a burgeoning interest in research on the influence of social media use on adolescents' psychosocial development. These studies generally show that social media use can have a positive influence on different aspects of psychosocial development, such as self-esteem, friendship closeness, and social competence (e.g., [Apaolaza, Hartmann, & Medina, 2013](#); [Koutamanis, Vossen, Peter, & Valkenburg, 2013](#); [Valkenburg & Peter, 2011](#)). Whereas some studies have reported negative effects of social media on some aspects of psychosocial development (e.g., on self-esteem or mood), these studies have typically focused on problematic or excessive internet or social media use (e.g., [Blomfield Neira & Barber, 2014](#); [Van der Aa et al., 2009](#)).

An important aspect of psychosocial development that has received surprisingly little attention in social media research is empathy. Empathy is defined as the ability to experience and understand the feelings of others ([Preston & de Waal, 2002](#)). Empathy enables us to relate to other people. Especially in adolescence, where forming close and meaningful relations with peers is one of the main developmental goals, empathy is an imperative ability to

learn. There have been concerns that young people are becoming less empathic (e.g., [Konrath, 2012](#); [Twenge, 2014](#)). These concerns have received initial support in a cross-temporal meta-analysis showing a decline in empathy scores among American college students over a timeframe of 10 years ([Konrath, O'Brien, & Hsing, 2011](#)). The authors of this meta-analysis argue that an important potential cause for this decline in empathy is the concurrent rise of the internet, and more specifically social media (i.e., social network sites and instant messaging applications). Indeed, with young people, and especially adolescents, spending several hours a day using social media ([Sonck & de Haan, 2015](#)), the question whether this prolific use potentially curtails the development of empathy has become ever more opportune.

In the aforementioned meta-analysis ([Konrath et al., 2011](#)) and in a book chapter by the same first author, entitled "The Empathy Paradox" ([Konrath, 2012](#)), several arguments are put forward as to why social media might negatively influence empathy. First, although social media might facilitate making new friends and connecting with others online, this might not necessarily translate into better social skills offline. Even more so, spending time online displaces time spent with people offline, which could make social skills such as empathy become "rusty" ([Konrath, 2012, p. 14](#)). Second, the reduced nonverbal cues in online interactions may hinder empathy because it is more difficult to tell how a friend is really feeling without seeing their facial expressions or body posture.

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Third, the visual anonymity in social media may loosen people's ideas of what is appropriate social behavior and lead to *deindividuation* (i.e. a state of decreased self-evaluation causing anti-normative and disinhibited behavior; Diener, 1980). According to Konrath (2012), deindividuation in combination with the greater interpersonal and physical distance of social media, may cause people to ignore the feelings of others and become less empathic.

Despite these rationales for why social media use might decrease empathy, direct empirical evidence for a relation between social media use and empathy is largely missing and even suggests otherwise. To our knowledge, there are only two studies investigating the relation between social media use and empathy (Alloway, Runac, Qureshi, & Kemp, 2014; Carrier, Spradlin, Bunce, & Rosen, 2015). Both studies employ a cross-sectional design among young adults. Carrier et al. (2015) overall report no significant relation between online activity and empathy. However, their online activity measure also included activities such as online gaming and browsing the internet. Alloway et al. (2014) found a positive rather than a negative relation between Facebook use and empathy. This finding is in line with research showing that adolescents often seem to use social media to practice social skills such as self-presentation and self-disclosure (Valkenburg, Sumter, & Peter, 2011), and that these skills are transferable to offline interactions (e.g., Koutamanis et al., 2013; Valkenburg & Peter, 2008). Moreover, while social media may be characterized by fewer nonverbal cues, a review by Derks, Fisher, and Bos (2008) revealed that there are no differences in the intensity of expressing emotions between online and face-to-face communications. Finally, contemporary social media are no longer as anonymous as proposed by Konrath (2012). There is often a large overlap between the online and offline world (Valkenburg & Peter, 2011). Most adolescents mainly use the internet and social media to maintain relationships with their offline friends (Bryant, Sanders-Jackson, & Smallwood, 2006; Valkenburg & Peter, 2007).

Given the scarcity in research investigating the relationship between the use of social media and empathy, the first aim of the present study is to investigate the relation between social media use and empathy in a longitudinal design. A second aim of our study is to investigate the specificity of the relation between social media and empathy. Empathy is a multidimensional construct consisting of an affective and a cognitive component, which have been shown to be differentially related to behavioral outcomes (e.g., Lovett & Sheffield, 2007). It is still unknown whether social media is related to both components of empathy or only to one particular component.

Knowledge about the relationship between social media use and empathy is of vital importance. Research has consistently shown that a high level of empathy is positively related to prosocial behavior (Carlo et al., 2012; Knafo, Zahn-waxler, & Robinson, 2008), and negatively to aggressive behavior (Jolliffe & Farrington, 2004; Lovett & Sheffield, 2007). Therefore, to assess the potential influence of social media use on adolescents' empathic skills may provide vital insights into how new communication technology help shape adolescents' psychosocial development. These insights are not only important to assess whether potential concerns of parents, teachers, or practitioners are grounded but also to help them effectively cope with adolescents' avid social media use.

### 1.1. Social media and empathy: theoretical propositions

Empathy plays a crucial role in the social functioning of adolescents, and is often considered the "social glue" in peer interactions (Baron-Cohen & Wheelwright, 2004). In childhood, empathy largely develops through experiences with social interactions. According to the Perception Action Model (PAM) of

empathy, social interactions help shape and fine-tune mental representations of emotions, which are needed to recognize and share emotions of others (Preston & de Waal, 2002). For example, if we see another person throwing a ball, brain regions related to the representation of throwing a ball are activated in our brain. This same mechanism applies to emotions; the perception of an emotion in someone else activates one's own representations of that emotion which enables "state-matching" (Preston, 2007). Through social interactions we create more representations of emotions and they become more easily available to us, which increases our natural tendency to empathize. This natural tendency is named trait empathy, which is the focus of the current study. Given that social interactions increasingly take place online, an important question is whether online communication provides the same opportunity for forming representations and thus influencing trait empathy as face-to-face communication does.

A potential negative influence of social media on empathy has been attributed to the notion that communicating via social media is qualitatively different from communicating face-to-face. In particular the "lack" of nonverbal cues in online communication is being held responsible for potential changes in interpersonal dynamics (Konrath, 2012). This rationale resembles those that characterized the first generation theories of Computer Mediated Communication (CMC), which originated in the 1970s and have retrospectively been named *cues-filtered out theories* (Walther, 2011). These theories tried to explain why communication via "lean", text-based applications (e.g., email) is less socio-emotional in nature and leads to more shallow representations than the "richer", face-to-face communication.

The pessimistic view of the cues-filtered out theories received little empirical support, and, when the Internet became widely available in the 1990's, they were substituted for theories with a more positive view of CMC. One of such theories is Walther's (1996) *hyperpersonal communication theory*. According to this theory, CMC encourages people to present themselves in optimal ways, and they can more carefully shape their self-presentation than they can in face-to-face communication. Due to the relative absence of audio-visual cues, the recipients of these self-presentations, can, in turn, fill in the blanks in their impressions of their partners, which may lead them to idealize these partners. By doing so, CMC can become "hyperpersonal," which means that users experience a greater level of intimacy and share more information (i.e. self-disclosure) than in face-to-face communication.

Empirical support for the hyperpersonal communication theory comes from studies among adolescents showing that online communication indeed promotes self-disclosure (e.g., Trepte & Reinecke, 2013; Valkenburg & Peter, 2009) and leads to more closeness to friends (Valkenburg & Peter, 2007), social connectedness (Grieve, Indian, Witteveen, Anne Tolan, & Marrington, 2013) and higher quality of relationships among adolescents (Antheunis, Schouten, & Kraemer, 2014; Valkenburg & Peter, 2009).

Based on the development in CMC theory and the empirical findings described above, there seems to be more reason to expect that social media use offers adolescents the opportunity to practice understanding and sharing the emotions of others, which could enhance their empathic skills. Therefore, the first aim of this study is to verify this expected positive relation between social media and empathy.

### 1.2. The specificity of the relation between social media and empathy

As discussed earlier, empathy is a multidimensional construct, consisting of an affective and a cognitive component. Its affective component refers to the sharing or resonating of someone else's

emotions (Mehabrian & Epstein, 1972). Its cognitive component pertains to the understanding and recognizing of other people's emotions (Preston & Hofelich, 2012). Although the affective and cognitive component are strongly related, they are distinct and do not always co-occur. In fact different brain networks are involved in affective and cognitive empathy (Nummenmaa, Hirvonen, Parkkola, & Hietanen, 2008). Furthermore, previous studies have shown that affective and cognitive empathy are differently related to specific social behaviors (e.g., Yeo, Ang, Loh, Fu, & Karre, 2011). This stresses the need to treat empathy not as a unidimensional construct but recognize the affective and cognitive component.

If social media use may influence empathy, it is important to assess which aspect of empathy is affected. Social interactions could benefit both the sharing and understanding of other people's emotions and as such one would expect a positive effect on both components of empathy. However, The Perception Action Model of empathy postulates that imagining emotions of others taps more into cognitive empathy while direct observation of emotions more often elicits affective empathy (Preston, 2007). In CMC, the other person is not physically present and certain nonverbal cues are not available so that direct observation is less likely. This implies that social media may especially offer opportunities to practice cognitive empathy skills. In the present study, we hypothesize that social media will have a positive effect on affective empathy (H1a) as well as on cognitive empathy (H1b). However, we expect the effect to be stronger for cognitive empathy compared to affective empathy (H2).

Finally, in previous studies empathy has often been equated with sympathy. Sympathy is a construct that is related to empathy but conceptually different. Sympathy refers to feelings of sorrow and concern about another person's misfortune (Clark, 2010). Affective empathy and sympathy are both emotional responses to perceived emotions of others, however, affective empathy refers to 'feeling with' (emotion congruency) another person whereas sympathy refers to 'feeling for' (Eisenberg & Fabes, 1990; Wispé, 1986). Because there are very few measures that distinguish between empathy and sympathy, empirical research that purports to study empathy, has actually often measured sympathy. One of the most widely employed scales is the Interpersonal Reactivity Index (IRI, Davis, 1980). The "Empathic Concern" (EC) subscale of the IRI is often used to measure affective empathy, while the "Perspective Taking" (PT) subscale is used to measure cognitive empathy. However, the EC scale measures "the tendency of the respondent to experience feelings of warmth, compassion, and concern for others undergoing negative experiences" (Davis, 1980, p. 6), which in fact reflects sympathy and not empathy.

Considering that Konrath et al. (2011) employed the EC and PT scales of the IRI in their cross-temporal meta-analysis, the decrease in empathy they found may actually reflect a decrease in sympathy rather than in affective empathy. If so, this raises the question whether the same argumentation for why social media would affect empathy also applies to sympathy. While there is limited knowledge about differences in etiology between empathy and sympathy, scholars have suggested that sympathy, unlike empathy, is an automatic response that particularly relates to suffering or distress of others (Padilla-Walker & Fraser, 2014; Wispé, 1986). As such, sympathy might be less of a skill that can be practiced through social media. It may be no surprise, therefore, that Alloway et al. (2014), who also employed the IRI, found that Facebook use was positively related to the perspective taking subscale but not to the empathic concern subscale (sympathy). However, because the empirical evidence is too scant to rule out a relationship between social media use and sympathy, we investigate the hypothesis that social media has a positive influence on sympathy over time (H3).

## 2. Method

### 2.1. Participants and procedure

After receiving approval from the sponsoring institution's Institutional Review Board, a large, private research institute in the Netherlands collected the data. A total of 516 families with at least 2 children between the ages of 10–14 years participated in this study. Families were recruited via an existing online panel of approximately 60,000 households that is representative of the Netherlands. Data collection consisted of two waves, and took place in the adolescents' homes where they filled out a questionnaire on a laptop. Before completing the questionnaire, written informed consent was obtained from the participating adolescent and one of their parents. The first wave of data collection was conducted between September and December 2012; the second wave was conducted between September and December 2013. Data collection procedures were identical for both waves. To compensate adolescents for their time, families received points to redeem for a variety of prizes provided by the research company.

As this study was part of a larger study in which a sibling design was needed, two children from each recruited family participated in the study. In total, 1032 adolescents (50% female;  $M_{\text{age}} = 12.93$ ,  $SD = 1.39$ ) participated in wave 1, and 1011 adolescents participated in wave 2 (51% female;  $M_{\text{age}} = 13.38$ ,  $SD = 1.37$ ; 98% recontact rate). The final sample consisted of 942 Dutch adolescents who had complete data on all study variables. Missing data was random (i.e., not associated with household characteristics, social media use, or empathy). The final sample consisted of 99.7% sibling pairs; 50.4% were girls.

### 2.2. Measures

#### 2.2.1. Social media use

Social media use was operationalized using direct estimates of the frequency of usage of social network sites (e.g., Facebook and Twitter) and instant messaging applications (e.g., WhatsApp and Skype). These direct estimates are regularly used in social media research (e.g., Valkenburg & Peter, 2007, 2008) and consisted of two questions each (four in total): (1) How many days of the week do you use social network sites [instant messaging applications]? and (2) On the days that use social network sites [instant messaging applications], how much time do you spend on this per day? Response categories for the first item ranged from 0 (never) to 7 (7 days per week). The second item was an open-ended question, answered by filling in hours and minutes. The two items for each medium were multiplied to calculate direct estimates of the number of minutes per week spent on social network sites or instant messaging applications. Finally, the direct estimates for social network sites and instant messaging applications were added to create a measure of social media use per week. Descriptive statistics are presented in Table 1.

#### 2.2.2. Empathy and sympathy

The Adolescent Measure of Empathy and Sympathy (AMES) was used at both time points (Vossen, Piotrowski, & Valkenburg, 2015). This measure consists of 12 statements that measure affective empathy (4 items), cognitive empathy (4 items), and sympathy (4 items). For each statement, respondents indicated how often the behavior occurred on a five-point scale: (1) never, (2) almost never, (3) sometimes, (4) often, and (5) always. Example items are "When a friend is scared, I feel afraid" (affective empathy), "I can tell when someone acts happy, when they actually are not" (cognitive empathy) and "I feel sorry for someone who is treated unfairly" (Sympathy). Mean scores were calculated for the affective empathy

**Table 1**  
Means, standard deviations and bivariate correlations between model variables.

	Means (SD)		Correlations				
	Time 1	Time 2	1	2	3	4	5
1. Social media	11.05 (18.91)	17.13 (24.50)	<b>0.46**</b>	0.19**	0.17**	0.06	0.11**
2. AE	2.30 (0.78)	2.47 (0.77)	0.15**	<b>0.53**</b>	0.42**	0.56**	0.38**
3. CE	3.28 (0.77)	3.25 (0.80)	0.12**	0.48**	<b>0.57**</b>	0.41**	0.13**
4. S	3.22 (0.75)	3.57 (0.75)	0.06	0.48**	0.55**	<b>0.55**</b>	0.28**
5. Sex	1.50 (0.50)	1.50 (0.50)	0.13**	0.25**	0.20**	0.27**	<b>1</b>

Note. Social media reflects hours of exposure per week. The AMES subscales ranged from 1 (never) to 5 (always); correlations for T1 are presented above the diagonal; correlations for T2 below the diagonal; correlations in bold are stability coefficients. \* $p < 0.05$ , \*\* $p < 0.01$ . AE = Affective Empathy, CE = Cognitive Empathy, S = Sympathy.

subscale ( $\alpha = 0.76/.77$  at time1/time2), the cognitive empathy subscale ( $\alpha = 0.80/.82$  at time1/time2), and the sympathy subscale ( $\alpha = 0.69/.74$  at time1/time2). See Table 1 for descriptive statistics.

### 2.3. Analytic approach

First, model variables were examined for normality and univariate outliers. The social media use measure was calculated, in part, based on an open-ended question. Therefore there were some extreme values. Extreme values were defined as values exceeding the mean  $\pm 3$  times the standard deviation and were recoded to the value of the observation closest to the threshold of mean  $\pm 3$  times SD. A total of 18 cases were considered outliers at T1 and 19 cases at T2.<sup>1</sup> The subscales of the AMES were normally distributed and consisted of no outliers.

Bivariate correlations were calculated between all variables at both data waves. Consecutively, cross-lagged panel analyses were performed in Mplus 7.0 to examine the longitudinal relation between social media use and empathy and sympathy. Cross-lagged panel analysis allows for investigating reciprocal relationships between social media use and empathy and sympathy (Selig & Little, 2012). Therefore, the effect of social media on empathy and sympathy can be tested, while taking into account a possible effect of empathy and sympathy on social media use. Furthermore, to adjust for the clustering within our data (i.e., two adolescents per household) as well as the non-normality of the social media use measure, robust clustered standardized errors were estimated by using Robust Maximum Likelihood estimation (MLR) (Múthen & Satorra, 1995). We correlated the error terms of like items over time because it is reasonable to assume that each item has stable idiosyncratic variance which is not explained by the latent factor (Geiser, 2010). To investigate the unique effect of affective empathy, cognitive empathy and sympathy, all AMES subscales were included simultaneously in one model. Further, because of well-known gender differences in empathy (Lennon, Eisenberg, & Strayer, 1987; Mestre Escriva, Samper Garcia, Frias Navarro, & Tur Porcar, 2009), gender and was included as a control variable in all models (see Fig. 1). Age was initially included as a control variable, but was not significantly related to any of the outcomes and as such not included for reasons of parsimony. The fit of the different models were evaluated using three goodness-of-fit-indices were used: the root mean square error of approximation (RMSEA), the Bentler Comparative Fit Index (CFI) and the Standardized Root Mean square Residual (SRMR). Generally, CFI values larger than 0.95, RMSEA values smaller than 0.05 and SRMR values smaller than 0.08 indicate good model fit (Kline, 2005).

Finally, because we are using the AMES subscales as latent constructs at two time points, we tested whether factor loadings on

the AMES subscales were equal over time (i.e. metric measurement invariance). We compared a model in which all factor loadings were allowed to vary over time (i.e. configural model) with a model where factor loadings are constrained to be equal over time (i.e. metric model). Because we use Robust Maximum Likelihood (MLR) estimation to address the clustered nature of the data, we calculated the Satorra-Bentler (SB) Scaled Chi-Square difference between the configural and metric model (Satorra & Bentler, 2001). If the SB Chi-Square difference is not statistically significant, full metric invariance is established. Full metric invariance means that all factor loadings are equal over time. However, full metric invariance is often considered overly stringent and, as such, the comparison of path coefficients over time is admissible even when some indicators are not invariant (Byrne, Shavelson, & Múthen, 1989; Steenkamp & Baumgartner, 1998). We could establish full metric measurement invariance for sympathy (SB  $\Delta\chi^2 = 7.71$ ,  $p = 0.053$ ). For affective empathy and cognitive empathy we could not establish full metric invariance. However, we did find partial metric invariance. For both constructs, when 3 out of four factor loadings were constrained there was no difference between the configural and metric model (affective empathy: SB  $\Delta\chi^2 = 2.17$ ,  $p = 0.525$ ); cognitive empathy: (SB  $\Delta\chi^2 = 5.72$ ,  $p = 0.065$ ). The results presented in the results section are based on the (partial) metric invariant cross-lagged model.

## 3. Results

### 3.1. Descriptive statistics

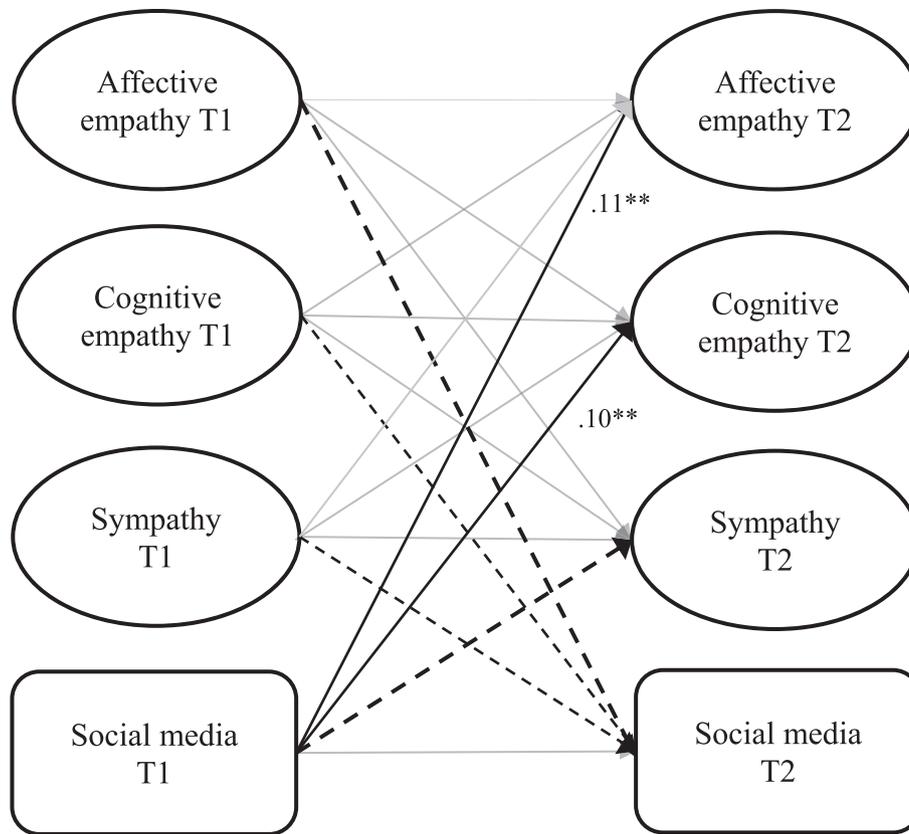
Overall, all variables in the model proved to be stable over time. There was an overall increase of 6.08 h ( $SD = 22.11$ ) of social media use per week from T1 to T2. This increase was significant ( $t_{(941)} = 8.44$ ,  $p < 0.001$ ). Both affective empathy and sympathy increased from T1 to T2 (AE:  $t_{(941)} = 6.85$ ,  $p < 0.001$ , S:  $t_{(941)} = 15.07$ ,  $p < 0.001$ ), whereas cognitive empathy did not change over time ( $t_{(941)} = -1.31$ ,  $p = 0.191$ ).

As expected, at both time points social media use was positively correlated to affective empathy and cognitive empathy, but not to sympathy. Furthermore, girls used more social media and scored higher on affective empathy, cognitive empathy and sympathy both at T1 and T2.

### 3.2. Longitudinal relationship between social media use and empathy

A cross-lagged model including all three subscales of the AMES and a measure for online communication was used to test the causal paths between empathy and sympathy on one hand and social media on the other hand (see Fig. 1). The model had an adequate fit (RMSEA = 0.05, CFI = 0.92, SRMR = 0.06). When looking at the cross-lagged pathways concerning affective empathy, the results show a significant path from social media use

<sup>1</sup> Analyses conducted with and without recoding the outliers yielded similar results.



**Fig. 1.** Standardized estimates of the longitudinal pathways between social media use and empathy/sympathy. Gender was included as a control variable at both time waves. Correlations of exogenous variables and correlations of error terms of the endogenous variables were included in the model but are not depicted in this figure. Dashed lines represent non-significant causal pathways, bold lines represent significant causal pathways. The grey lines represent modelled pathways that are not directly related to the hypotheses. \*\* $p < 0.01$ .

at T1 to affective empathy at T2 ( $b^* = 0.11$ , 95%CI [0.04, 0.19],  $p = 0.003$ ). Individuals using more social media at T1 reported increased levels of affective empathy at T2, which provides support for H1a. The reversed path from affective empathy at T1 to social media use at T2 was not significant ( $b^* = 0.01$ , 95%CI [-0.10, 0.13],  $p = 0.817$ ).

As for cognitive empathy, the results revealed a significant positive effect of social media use at T1 on cognitive empathy at T2 ( $b^* = 0.10$ , 95%CI [0.04, 0.15],  $p = 0.001$ ), whereas cognitive empathy at T1 did not influence social media use at T2 ( $b^* = 0.02$ , 95%CI [-0.06, 0.10],  $p = 0.686$ ). Individuals reporting more social media use at T1 increased in their cognitive empathy scores one year later. These results support Hypothesis 1b.

Finally, the cross-lagged pathways between social media use and sympathy were both not significant (social media T1 to sympathy T2,  $b^* = -0.01$ , 95%CI [-0.08, 0.07],  $p = 0.846$ ) (sympathy T1 to social media T2,  $b^* = -0.06$ , 95%CI [-0.18, 0.07],  $p = 0.386$ ). Therefore, hypothesis 3 was rejected.<sup>2</sup>

<sup>2</sup> Analyses were also conducted with a measure of SNS activity. Because this measure comprised of five questions, which asked respondents how often they engaged in the several SNS activities (e.g. "posting messages on your own profile page", "reacting to messages that other people have posted on your profile", and "posting messages on profile pages of others"). Response options were: 1 (almost never), 2 (less than 1 time a week), 3 (2–3 times a week), 4 (every day), 5 (multiple times a day), and 6 (all the time). Results with this measure were highly similar to the results of the social media measure, in that SNS activity predicted an increase in affective and cognitive empathy, but was unrelated to sympathy.

### 3.3. Difference between cognitive empathy and affective empathy

In order to test whether social media had a stronger effect on cognitive empathy in comparison to affective empathy we compared the unstandardized estimates retrieved from the cross-lagged model. Using a technique by Paternoster, Brame, Mazerolle, and Piquero (1998) we found that the unstandardized coefficient from cognitive empathy ( $b = 0.004$ , SE = 0.001) and from affective empathy ( $b = 0.004$ , SE = 0.001) were not statistically different ( $z = 0$ ,  $p = 1.00$ ). Therefore, Hypothesis 2 is rejected.

## 4. Discussion

In previous publications, concerns have been expressed about a possible negative influence of social media use on empathy. With the lack of empirical evidence in the existing literature, the main aim of the present study was to investigate the influence of social media use on empathy in adolescents. In addition, because empathy is a multidimensional construct and often erroneously equated with sympathy, differences in effects were investigated between cognitive empathy, affective empathy, and sympathy. Overall, the findings of this study suggest that, in contrast to concerns that have been raised, social media use can actually have a beneficial influence on empathy.

### 4.1. Longitudinal effect of social media on empathy

Based on theories of the development of empathy and online communication, we hypothesized that social media use would have

a positive influence on both affective and cognitive empathy (H1a and H1b). The findings of the present study support these expectations by demonstrating that adolescents who more frequently use social media, improved their ability to share and understand the feeling of others over time. These results are in line with a cross-sectional study on Facebook use and empathy (Alloway et al., 2014). While not measuring affective empathy, Alloway et al., (2014) demonstrated a positive association between Facebook use and cognitive empathy (as measured with the perspective taking scale of the IRI). The current study extends these previously found cross-sectional relations between social media use and empathy and suggest that social media use might be a way for adolescents to practice social skills.

In addition, as empathy is a multidimensional construct and often equated with sympathy, we investigated whether affective empathy, cognitive empathy, and sympathy are differently related to social media use. First, because there is no face-to-face interaction in online communication and, as a result, individuals have to imagine the emotional state of others, we hypothesized that social media would influence cognitive empathy more strongly than affective empathy (H2). Our findings did not provide support for this hypothesis. This seems to suggest that distinguishing between the affective and cognitive component of empathy is less important when it comes to social media use. It could also suggest that development in one component of empathy, benefits the other as component as well.

Furthermore, our findings showed no significant path from social media to sympathy (H3). This suggests that the frequency of social media use is not related to changes in concern about someone's distress. This result is similar to the cross-sectional results from Alloway et al. (2014) who also did not find a relation between Facebook use and the Empathic Concern subscale from the IRI, which reflects sympathy. Our findings seem to imply that it is relevant to distinguish between empathy and sympathy as they are differentially related to the frequency of social media use. Many empirical studies asserting to investigate empathy use questionnaires that actually measure sympathy (e.g. the empathic concern scale from the IRI). Sympathy is considered a moral emotion (Carlo, Mestre, & Samper, 2010) that is specifically related to suffering and distress of others. As such, sympathy might not be influenced by social media use in general but to specific negative content in social media (e.g. cyberbullying).

#### 4.2. Implications and suggestions for future research

The present study is the first to provide longitudinal empirical information on the relationship between social media use and empathy and sympathy. In general these results indicate that, in contrast to previous concerns, social media may not be detrimental but perhaps even beneficial for the development of empathic skills in adolescents. This seems promising considering that understanding and sharing the emotions of others are crucial skills to develop in adolescence as they greatly influence social interaction (Eisenberg & Miller, 1987; Knafo et al., 2008). Empathy might also function as a possible mediator of the effect of social media on social behavior. For instance, the effect of social media use on friendship quality might be explained by changes in empathic abilities.

In addition, our findings suggest that the decrease in empathic concern (reflecting sympathy) found in the cross-temporal meta-analysis by Konrath et al., (2011) may not be caused by social media use. Using a scale that distinguishes between empathy and sympathy, we demonstrate that while social media influences empathy it does not influence sympathy. However, it is possible that a negative influence of social media on empathy or sympathy is not

visible in our younger adolescent sample, but exist only in older adolescents or emerging adults. Future research including a broader age range could provide evidence on possible age differences in the relation between social media and empathy.

As this is the first longitudinal study, we understand the importance of replication of our results and we provide two suggestions for future research. In the current study we only measure the amount of time spent on social media use. Research measuring other aspects of social media use is needed to investigate whether these media effects particularly pertain to the general frequency of social media use or to other measures such as frequency of specific activities, contact with close vs. distant friends or feedback from peers? Perhaps it is not just about how much time you spend online, but also about what you specifically do and with whom you are in contact with. Is looking at what others post or responding to it that helps practice empathic skills? It is conceivable that, as stated before, specific online activities or ways of using social media platforms are differentially related to empathy and sympathy. Therefore we call on future research to use comprehensive and detailed measures of social media use.

Related to this we need more information on why social media use influences empathy. What are the underlying mechanisms that drive this effect? For example, it has been shown that social media use can increase attachment to peers (Valkenburg & Peter, 2007) which, in turn, is positively related to empathy (e.g., Carlo & McGinley, 2012). In the same respect, social media has previously been found to influence social competence (Koutamanis et al., 2013), where social competence has been suggested to positively relate to empathy (e.g., McDonald & Messinger, 2011). Future research should investigate possible mediators of the effect of social media on empathy.

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