



Friendship quality in adolescence: the role of social media features, online social support and e-motions

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Abstract

The last decade has seen a growing interest in understanding what role social media play in adolescent experiences, including friendship relationships. However, little is known about the associations of specific characteristics of social media and individual factors with friendship quality. This study was designed in line with the tenets of the so-called *Transformation Framework* (Nesi et al., 2018) with the aim of testing whether and how social media features, online social support, and online expressions of emotions play a role in adolescents' friendship quality. Participants were 744 Italian adolescents (64.5% females) with an average age of 15.9 years ($SD=1.31$). First, a path analysis was conducted to test the hypothesized model on the whole sample of adolescents. Finally, two multi-group analyses (MGA) were conducted to analyze differences across gender groups (female vs. male) and group of social media users (problematic vs. non-problematic). Path analysis yielded a complex pattern of associations, in which different perceived social media features were significantly associated with different dimensions of friendship quality, both directly and indirectly via perceived online social support and the tendency to express e-motions on social media. Moreover, MGAs confirmed significant differences among both genders and social media users. The findings provide support for the importance of considering social media as a social context with its own characteristics for the study of adolescents' peer experiences, by taking into consideration that the hypothesized role of social media in supporting friendship relations during adolescence may depend on individual factors.

Keywords Social media features · Peer relations · Online social support · Friendship quality

Introduction

Over the last decade, research on adolescence has been characterized by a growing interest in understanding the role of social media in youth experiences (e.g., Uhls et al., 2017), including friendship relationships (e.g., Pouwels et al., 2021). Most adolescents engage in frequent online activities, daily interacting and communicating with peers via social media platforms¹ (Odgers & Jensen, 2020). Since

engaging in relationships with peers is one of the most important developmental tasks in adolescence, not surprisingly the interactive nature of social media attracts young people by offering an online tool to get in touch with peers and feel they belong to the group (Moreno & Uhls, 2019). Along with this, social media serve several other developmental tasks, such as self-presentation and feedback-seeking from peer (Prinstein et al., 2020), to the extent that being constantly online is today considered a normative behavior among adolescents born in a digital world (Griffiths & Kuss, 2017). Considering social media a new, important context for adolescents relationships with peers, this study was designed in line with the tenets of the so-called *Transformation Framework* (Nesi et al., 2018a, b) with the aim to investigate the possible associations between specific characteristics of social media, as perceived by users (e.g., publicness, quantifiability, and visualness), and the quality of friendship relations, taking into consideration the role of individual (i.e., gender and level of problematic social

¹ The term "social media" indicates any digital tool and platform, including both social networking sites and instant messaging applications (e.g., WhatsApp, Instagram, Facebook, TikTok, YouTube) that allow users to share content and to interact with others online (Carr & Hayes, 2015).

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media use), social (i.e., perceived online social support), and emotional factors (i.e., online expression of emotions).

Friendship relationships in social media context

Friendship is defined as a dyadic, reciprocal, and affectionate relation between peers (Bukowski et al., 2009). Adolescents' relationship with a close friend, in particular, is characterized by spending time together and having fun, providing each other social and emotional support, and sharing intimate information. Traditional research on friendship during adolescence has often focused on the quality of friendship relationships (see Yau & Reich, 2018), and has identified the key components that contribute to defining friendship quality and to distinguishing friendship from other peer relationships (e.g., acquaintances). For example, Parker and Asher (1993) proposed six core characteristics of friendships, including self-disclosure, or intimacy, (i.e., communicating personal information and feelings to another), validation (i.e., taking care of and making a friend feel special by demonstrating interest and support), companionship (i.e., desiring to spend time with a friend, having fun and relax together), instrumental support (i.e., being helpful and protective with a friend), conflict (i.e., having an argument or annoying a friend), and conflict resolution (i.e., being able to solve disagreements with a friend).

Since digital tools and online spaces represent an important means of social connection with friends for today's youth (Anderson & Jiang, 2018), social media use may support adolescents' friendship formation and maintenance (Amichai-Hamburger et al., 2013; Nesi et al., 2018a, b; Uhls et al., 2017). During middle adolescence, in particular, when time spent with friends increases and relationships with peers become more supportive and psychologically relevant (Batoool et al., 2022), social media may fulfill youth's need to stay constantly in touch and offer the chance to share their feelings and thoughts and to receive prompt emotional support or positive feedback from friends (Pouwels et al., 2021; Yau & Reich, 2018). Although researchers seem to agree that social media use can benefit friends' closeness, questions arise as to whether adolescents' friendships, when occurring through social media, still maintain the same core characteristics of face-to-face interactions (Pouwels et al., 2021). In this regard, a review of research on friendship in digital spaces clearly reported that the core components (such as validation, intimacy, or conflict resolution) contributing to perceived friendship quality identified for the offline context (Parker & Asher, 1993) may be significant also when friends interact on social media (Yau & Reich, 2018). This suggests that there is a substantial overlap in

terms of perceived friendship quality between offline and online interactions in adolescence. Considering that adolescents frequently use social media as an additional tool to interact with friends from their offline network (Décieux et al., 2019), it is important that psychological research starts to investigate also the specific role of social media in adolescents' friendship experiences. Along with many concerns about whether social media isolate and disconnect adolescents (Nesi, 2020; Prinstein & Giletta, 2020), recent studies have started to wonder whether youth still show affection towards their friends, simply in new ways. For example, Yau and Reich (2019), in their study on how adolescents communicate on social media, showed that there are many similarities between online and offline interactions with friends. Just like in person, adolescents show affection to close friends online, compared to classmates, by trying to make each other laugh, they get more intimate by sharing secrets or photos they would not share with anyone else, or they make each other feel special and validated for special occasions, such as their birthdays. However, to date, there is scant research that analyzes how adolescents' social media use to connect and communicate with friends is associated with their friendship experiences. Even less is known about whether the specific features (e.g., publicness, quantifiability, and visualness) that characterize social media as a socialization context are differentially associated with particular dimensions of friendship quality. That is, little is known about how the way social media are built and work may be specifically associated with the different components of friendship quality. Testing for these possible associations is the first aim of the current study.

Social media features and dimensions of friendship quality

The Transformation Framework represents an integrative model for understanding peer relationships in the context of social media by proposing that social media, due to their specific features, play a role in shaping adolescents' experiences and behaviors, such as friendship, social status, peer influence, and peer victimization (Nesi et al., 2018a). Briefly, according to the Transformation Framework, adolescents' engagement in social media would not merely mirror the constructs studied for decades with regards to peer relationships in the offline context. Conversely, social media can be considered a new, 'real' social context, partially different from the traditional (face-to-face) one, characterized by seven specific features (see ESM1 in the electronic supplementary material for a definition of each feature) that may *transform* the way adolescents socially interact with peers, creating unique interactions and expectations that

were unthinkable few years ago (Prinstein & Giletta, 2020). More in details, offline behaviors and relationships, when experienced on social media, may be transformed in five different ways: (i) peer interactions can increase in terms of frequency and immediacy (e.g., more frequent and fast connections with friends); (ii) the online context may amplify certain experiences and requests, increasing the intensity of traditional processes (e.g., stronger peer influence); (iii) the nature of interactions may qualitatively change (e.g., wider communication and better social support); finally, (iv) social media allow for compensatory behaviors more easily implemented online (e.g., more possibilities for marginalized teens to connect with peers) and (v) offer the opportunity to create new behaviors, not possible in the offline world (e.g., using strategies to increase online status).

Specifically, Nesi and colleagues (2018a) proposed the Transformation Framework for understanding adolescents' dyadic peer experiences, such as friendship relationships, arguing that multiple social media features contribute together to the transformation of dyadic friendship processes. For example, *asynchronicity* of social media, together with *cue absence*, may transform the quality of relationships with peers altering communication processes (such as conflict, conflict resolution, or social support) both positively and negatively. Indeed, relying on fewer audiovisual cues (such as facial expressions and tone of voice) when interpreting a message may increase the risk of misunderstanding or misinterpretation, leading to potential conflicts between friends and less effective conflict resolution. Conversely, during a conflict-related online conversation, asynchronicity allows one to take time and calm down before replying, particularly in emotional situations, improving conversation and leading to more effective conflict resolution. Regarding social support, adolescents may also have unique opportunities to ask for help and to be comforted by friends thanks to social media *availability* (unprecedented access to their friends anytime and from anywhere) and *permanence* (e.g., personal distress expressed through a post on social media can be viewed, and responded to, for a long time). From another point of view, this could lead adolescents to feel intense pressure to be constantly accessible to friends who need support, potentially creating tension in their relationship. Cue absence, instead, could make adolescents feel more comfortable engaging in self-disclosure, enhancing greater perceived breadth and depth of communication and increasing intimacy in the relationship with friends. In addition, online spaces facilitate greater companionship between offline friends, offering constant contact and possibility to communicate. On the other hand, *publicness* of social media features offers the opportunity to communicate and receive support also by new friends never met in-person, contributing to the development of "only online" friendships. This

kind of friendship may also increase adolescents' sense of companionship particularly for socially isolated youth, partially compensating for difficulties with peers offline.

Finally, a novel experience in friendship relationships has been introduced by the possibility to quantify social media metrics (i.e., number of friends, likes, views, posts, comments) and to visually communicate through photos and videos. Along with this, publicness and permanence of social media content provide adolescents the opportunity to affirm and demonstrate their friendship to others, presenting the experiences they live offline with their friends, by posting online photographs and videos (e.g., Instagram stories) that, for example, depict the person together with their friends and manifest their affiliation. Similarly, studies on romantic relationships suggest that uploading photos depicting partners is an example of relational assurances on social media and it is associated with a happier and healthier relation with the partner (Taylor et al., 2021). In addition, reciprocating supportive language and recognition through likes and comments on shared content can be broadly viewed by members of the peer network and represent a new way to provide instrumental support and permanently validate the relationship with a friend. At the same time, this novel behavior may also increase requests for public displays of affection within friendship and create potential for jealousy in a similar way to the causes of friendship conflicts offline (Yau & Reich, 2018). In sum, the Transformation Framework applied to friendship relationships may provide an important lens for understanding how adolescents' peer experiences, such as friendship relationships, may function on social media (Nesi et al., 2018a). However, research is needed that empirically tests the associations between social media features, as conceptualized by this theoretical model, and different components of adolescents' friendship quality.

The role of perceived online support and expression of e-motions

While specific social media features are likely directly associated with friendship quality, other online processes may play a role in such association. Specifically, in the current study we focused on two possible constructs—online social support and expression of e-motions—that may help in explaining how social media features relate to specific dimensions of adolescents' friendship quality.

First, social support is defined as an exchange of resources or aid within interpersonal relationships (Cohen et al., 1985). Specifically, appraisal support refers to the tendency to communicate relevant information to satisfy the need for self-affirmation and evaluation, through others' words or actions (Oh et al., 2014). Traditional research

on peer relationships has consistently found a clear positive role of perceived social support (in face-to-face contexts) in the maintenance of intimate and close friendship relationships (Rousseau et al., 2019). Recently, social media use has been found to be associated with a greater perception of social support in adolescence, as the possibility of receiving social support online is one of the most important benefits perceived by social media users (Best et al., 2014). Online interactions create opportunities for intimate disclosure and display of affection, which are critical to provide and receive support among adolescents (Yau & Reich, 2018). Therefore, it is likely that, above and beyond peer support received offline, supportive interactions with friends on social media may benefit adolescents' friendship quality, mostly enhancing feelings of closeness (Pouwels et al., 2021; Uhls et al., 2017).

Moreover, according to the Transformation Framework (Nesi et al., 2018a), different social media features may also be associated with perceived online support. For example, availability, publicness, and permanence of social media content may increase the frequency and likelihood of receiving social support, both from close friends and from a large network. In addition, while cue absence and asynchronicity may, in some circumstances, make online communication and social support processes less rich, they may also make them easier and more comfortable, for example by encouraging adolescents in distress to share their experiences online as a means of receiving social support. Therefore, beyond the direct association between social media features and friendship quality, in this study we are interested in examining the possible indirect effect of social media features on friendship quality via perceived online social support. We may hypothesize that specific social media features could be positively associated with higher perceived online social support that, in turn, is positively associated with better friendship quality. To disentangle the specific role of online social support, the well-known positive effect of offline support on friendship quality was also controlled for in the analyses.

Second, regarding the role of emotions, social media offer adolescents new opportunities to express their emotional states and their affection toward friends. Emotional expression in online spaces may rely for example on using emoji, gifs, or songs to communicate one's own feelings or emotional distress to others (Prinstein & Giletta, 2020). This kind of affordances could hinder or promote users' emotional expression and, more broadly, relationships with friends (Moreno & Uhls, 2019). Indeed, on one hand, the constant exposure to others' emotional content may lead adolescents to develop new skills to understand and process positive and negative emotions. On the other hand, given the delicate developmental stage, they may experience

difficulties in emotion regulation strategies or engage in dysfunctional social comparison processes. To this respect, Zych and colleagues (2017) have proposed the new concept of "e-motions" (i.e., online emotions) showing how emotions could be specifically perceived, expressed, used, understood, and managed on social media. While there is comparatively less research on the role of e-motions in peer relationships, recent research has started to adopt this construct in the context of problematic social media use, showing that it may be a promising explanatory process of adolescents' online experiences (Marino et al., 2020). In this study, we adopted this concept by specifically focusing on the expression of e-motions, as it explicitly reflects behaviors related to online emotions regulation that may be crucial in contributing to the links between perceived social media features and friendship quality. We expect to find indirect links between social media features and friendship quality via higher expression of e-motions. That is, some features of social media may favor adolescents' expression of e-motions that, in turn, would be associated with friendship quality.

Gender differences in friendship relationships

To our knowledge, research on gender differences in adolescents' social media use as connected to friendship relationships is still very limited. Nonetheless, we might anticipate that the links between social media features and friendship quality do differ, to some extent, across gender groups, because females and males may partially differ in their use of social media. Indeed, studies have found that females tend to use social media in a more visually oriented way; for example, they tend to be more active than males on social media by posting selfies and communicating through photos and videos (Prinstein et al., 2020). In regard with friendship quality, validation is likely to be more common among females (Parker & Asher, 1993), who also usually show higher expectations for companionship compared to males, especially in stressful situations; moreover, differently from males who tend, on average, to prefer shared activities to support companionship, females are more likely to develop more intimate relationships through self-disclosure with friends (Yau & Reich, 2018). However, the question of whether different features of social media are differently associated to friendship quality across genders remains unanswered. Similarly, gender differences in the potential role of online support and expression of e-motions have not been explored yet. To fill this gap in knowledge, a further aim of this study is to study gender differences in friendship experiences through social media. However, in light

of the paucity of previous research we did not formulate specific a-priori hypotheses and this analysis was deemed exploratory.

Problematic social media use and friendship relationship

Another individual characteristic that may be important to consider in this context is the quality of social media use (Marino, 2018), that is, the level of adolescents' problematic use. Social media use may become "problematic" when it leads to unregulated online behaviors and negative health outcomes, including depressive symptoms and social isolation (e.g., Marino, Gini et al., 2018) and decreased subjective well-being (Marino, 2018; Marino et al., 2020). However, little is known about the impact of problematic social media use on friendship quality, especially during adolescence and no studies have specifically tested whether the links between social media features and adolescents' perceived quality of their friendships could be moderated by the extent to which they (mis)use social media. Another novelty of this study, therefore, is to explore possible differences in the associations under study by comparing problematic social media users and users whose use of social media may be considered non-problematic.

The current study

In sum, based on the above-mentioned theories and previous research (e.g., Nesi et al., 2018a, 2018b; Pouwels et al., 2021; Yau & Reich, 2018), the present study aims to examine the relative contribution of different social media features (i.e., asynchronicity, permanence, publicness, availability, cue absence, quantifiability, and visualness) in explaining the six dimensions of friendship quality (i.e., validation, intimacy, instrumental support, companionship, conflict, and conflict resolution) among adolescents. Specifically, we formulated the following three research questions: (a) First, which social media features are directly associated with different dimensions of friendship quality in adolescence? (b) Second, are there any indirect associations in the relationships between social media features and friendship quality via (i) perceived online social support and (ii) expression of e-motions? (c) Third, is the pattern of associations different across (i) gender groups, and across (ii) groups of social media users (problematic vs. non-problematic)? With regards to this last research question, we might expect stronger associations between social media features and the dimensions of friendship quality in the female group compared to males, and that adolescents' problematic social

media use may interfere with the hypothesized role of social media in supporting friendship relations. Finally, since, to our knowledge, a validated measure of the perceived presence of the seven social media features is not available yet, a first preliminary step is to test the factorial validity of the new Perceived Social Media Features Scale (PSMF).

Method

Sample

Participants were adolescents attending public secondary schools in Italy. The sample included a total of 744 adolescents (64.5% females) with an average age of 15.9 years ($SD=1.31$; age range = 14–20 years). All participants reported that they regularly use at least one social media. Consistent with recent statistics about adolescent social media usage (van Driel et al., 2019), the most popular social media used by youth in this sample were WhatsApp (98.5%), Instagram (91.4%), and Youtube (80.5%), followed by TikTok (61.8%), Snapchat (20.2%), and Facebook (8.7%). Most participants (92%) reported to use 3 or more social media. Moreover, the majority of participants (63.3%) reported using social media especially to comment or "like" others' posts (status updates, photos, or other content). At the end of the questionnaire participants were asked to report the social media they had thought of during the compilation. The majority of participants (63.2%) reported having thought about social media in general, while among those who had thought about a specific social media the most frequently indicated social media were Instagram (28.1%) and WhatsApp (7.9%).

The study protocol and procedure were approved by the local Ethics Committee for Psychological Research (protocol n° 4170). After obtaining permission from the school principals, and after parents - or participants who were 18-year-old or older - signed active consent, participants completed a series of anonymous self-report questionnaires. Data were collected between March and May 2021, during a regular school-day in school computer rooms or online during a Zoom session when restrictions due to Covid-19 pandemic required it. During data collection, a teacher and a research assistant were present. Before completing the questionnaires, participants were assured confidentiality and they were told that they could withdraw from the study at any time with no consequences. Then, they were thanked for their participation and researchers answered any questions.

Instruments

Perceived social media features. Adolescents' perception of the presence of the seven features of social media conceptualized in the Transformation Framework (Nesi et al., 2018a) was assessed with the *Perceived Social Media Features Scale (PSMF)*, a new scale developed ad-hoc for the present study because no measures were available. Starting from the conceptual definition of each feature, 14 items were developed by the first and third authors, and then revised by the second author who has long expertise in the study of social media use. Two items for each of the seven social media features were developed (see ESM 1 for the full list of items), and participants rated their level of agreement with each item on a 5-point scale (from 1 = not at all, to 5 = completely true). To test for the factorial validity of this new scale, a CFA was performed, which yielded a 6-factor solution as the best solution. For each of the six factors, a mean score was computed to represent the perceived presence of social media features for adolescents. The full results of the CFA are reported in the [Results](#) section and in the electronic supplementary material (ESM 1).

Perceived friendship quality. The six dimensions of friendship quality described in the Introduction were assessed using subscales from two existing measures on friendship quality. Adolescents' perceived validation (e.g., "My friend makes me feel good about my ideas;" Cronbach's $\alpha = 0.70$ [95% CI 0.66–0.73]), sense of intimacy (e.g., "My friend and I always tell each other our problems;" $\alpha = 0.78$ [95% CI 0.75–0.80]), conflict (e.g., "My friend and I argue a lot"; $\alpha = 0.74$ [95% CI 0.71–0.77]), and conflict resolution (e.g., "My friend and I make up easily when we have a fight"; $\alpha = 0.62$ [95% CI 0.57–0.66]) were derived from the Friendship Quality Questionnaire–Revised (Nangle et al., 2003; Parker & Asher, 1993). Perceived instrumental support (e.g., "If other people were bothering me or my friend, we would help each other"; $\alpha = 0.89$ [95% CI 0.87–0.90]) and companionship (e.g., "My friend and I spend all our free time together"; $\alpha = 0.62$ [95% CI 0.57–0.67]) were assessed with the Friendship quality scale (Bukowski et al., 1994; Markiewicz et al., 2001). These scales have been used in previous studies with adolescents and have demonstrated good psychometric qualities (e.g., Nangle et al., 2003; Markiewicz et al., 2001).

Participants were asked to think about their closest friendship relationship and to rate items on a 5-point scale (from 1 = not at all to 5 = completely true). Answers to each item were then averaged for each dimension. Higher scores in the subscales related to positive friendship qualities (validation, intimacy, companionship, instrumental support and conflict resolution) indicate higher perceived quality in the

relationship with the best friend, whereas higher scores on the conflict subscale indicate lower perceived friendship quality.

Perceived social support on social media. To measure adolescents perceived online social support, the *Appraisal Support* subscale from the Perceived Online Support Scale was used. The three items (e.g., "There is at least one person I know on social media whose advice I really trust") were taken from Eastin and LaRose (2005), who adapted the original Interpersonal Support Evaluation List (Cohen et al., 1985) to specifically assess online social support. This scale has been already used in other studies showing good psychometric qualities (e.g., Oh et al., 2014). Items were rated on a 5-point scale (from 1 = not at all to 5 = completely true). The Cronbach's α for the scale's scores was 0.80 (95% CI 0.78–0.83). Higher scores in this scale indicate a higher level of adolescent's perceived online social support.

Expression of e-motions. Participants' tendency to express their emotions on social media was assessed using the subscale *E-motional expression* (e.g., "I express my emotions on social media," "I let my contacts on social media know if I am happy or sad") from the Italian version (Marino et al., 2020) of the E-motions questionnaire (Zych et al., 2017). The original scale includes a total of 21 items, rated on a 5-point scale (from 1 = completely disagree to 5 = completely agree), which cover other 3 dimensions: e-motional perception, facilitating use of e-motions and understanding and management of e-motions. For the purpose of the current study only e-motional expression was used (4 items; Cronbach's $\alpha = 0.66$ [95% CI 0.62–0.70]). This scale has been already used in other studies showing good psychometric qualities (e.g., Marino et al., 2020). The score measures adolescents' tendency to express their emotions through social media.

Problematic social media use. To assess problematic social media use the Italian validation of the Social Media Disorder Scale (Boer et al., 2022; van den Eijnden et al., 2016) was used. The scale includes 9 items, developed around the criteria for problematic social media use (e.g., preoccupation: "During the last year have you found that you can't think of anything else but the moment that you will be able to use social media again?"). In order to perform multi-group analysis, participants answering "yes" to at least six of the nine items were identified as "problematic social media users" (10.8%), whereas those reporting five or less symptoms were defined as "non-problematic social media users". Of note is that the percentage of problematic social media users found in this sample is consistent with what has been found in large scale epidemiological studies (Boer et al., 2022). The Cronbach's α for the scale in this sample was 0.71 (95% CI 0.77–0.82). The scale has been validated in several languages, including Italian, and

Table 1 Descriptive statistics of the study variables in the whole sample

	M (SD)	Skewness (SE)	Kurtosis (SE)
1. Validation	3.71 (0.30)	-0.046 (0.90)	-0.02 (0.18)
2. Intimacy	3.73 (0.035)	-0.51 (0.90)	-0.37 (0.18)
3. Instrumental support	4.40(0.29)	-1.68 (0.90)	3.15 (0.18)
4. Companionship	3.81(0.28)	-0.93 (0.90)	1.02 (0.18)
5. Conflict resolution	3.73(0.30)	-0.47 (0.90)	0.06 (0.18)
6. Conflict	2.05(0.31)	0.69 (0.90)	0.15 (0.18)
7. Asynchronicity	3.52(0.30)	-0.13 (0.90)	-0.19 (0.18)
8. Permanence	3.70(0.032)	-0.46 (0.90)	0.04 (0.18)
9. Publicness/Availability	4.11(0.03)	-0.98 (0.90)	0.89 (0.18)
10. Cue absence	3.97(0.37)	-0.74 (0.90)	-0.27 (0.18)
11. Quantifiability	3.38(0.37)	-0.26 (0.90)	-0.59 (0.18)
12. Visualness	2.94(0.32)	0.14 (0.90)	-0.18 (0.18)
13. Online perceived support	2.85(0.43)	0.13 (0.90)	-0.97 (0.18)
14. E-motions expression	2.71(0.30)	0.11 (0.90)	-0.23 (0.18)
15. Peer support	3.45(0.27)	-1.44 (0.90)	1.53 (0.18)
16. Problematic social media use			

Notes. $N = 744$

has demonstrated good psychometric qualities (Boer et al., 2022).

Perceived offline peer support. Perceived social support from peers offline was used as a control variable in our model and was assessed with a 3-item subscale of the Italian version (Marino, Hirst et al., 2018) of the Social and Emotional Health Survey (Furlong et al., 2013). This subscale is included in the domain labeled *Belief-in-others*; an example of item is “I have a friend who really cares about me.” Participants were asked to rate the content of each item on a 4-point scale (from 1 = not at all true to 4 = very much true). This scale has been already used in other studies showing good psychometric qualities (e.g., Marino, Hirst et al., 2018). The Cronbach’s alpha for the scores in this sample was 0.90 (95% CI 0.88–0.91). The higher the score, the more support is received from peers.

Data analysis

Before running the analyses, we identified missing values for all variables. A total of 58 participants were excluded due to missing data (more than 50% of missing data in the whole questionnaire or in each single scale). Then, correlations among all the study variables were computed (Table 1). After that, to answer our research questions a path analysis using Mplus 8.3 (Muthén & Muthén, 2017) was conducted (Fig. 1). The model was analyzed with a Robust Maximum Likelihood method (MLR) estimator and bias-corrected bootstrap confidence intervals with 1,000 bootstrapped iterations were used for calculating indirect effects, which were considered significant when their 95% confidence interval did not include zero. In the tested model, the six dimensions of friendship quality were the dependent variables, perceived social media features were the independent variables, and perceived online social support and expression of emotion on social media were the mediators. To disentangle the specific role of online social support, we included perceived offline peer support as a control variable on friendship quality. To evaluate the goodness of fit of the model we considered the R^2 of each endogenous variable.

The model was first tested on the whole sample of adolescents; then, two multi-group analyses were conducted to test the model independently for both genders (males vs. females) and the two groups of social media users (problematic vs. non-problematic). After this, the null hypothesis of equality of the path coefficients across groups was tested with a series of Wald chi-square tests of parameter equalities in Mplus (Muthén & Muthén, 1998–2015; Wang & Wang 2012, pp. 276–278), which allows for specific hypothesis testing. In other words, unstandardized coefficients were compared between groups (with the “Model test” command) to test for gender differences and differences between social media users in the associations between the study constructs (Loehlin, 1998).

Results

Preliminary confirmatory factor analysis for the perceived social media features scale

A first confirmatory factor analysis (CFA) was performed in Mplus 8.3 with the MLR estimator to test the fit of the hypothesized 7-factor structure of the scale. However, an error in fitting the model occurred, likely due to a very high correlation between two latent variables. Inspection of the estimated standardized parameters indicated that latent publicness and availability had a correlation of 1.03. There may indeed be conceptual overlap between the two concepts that

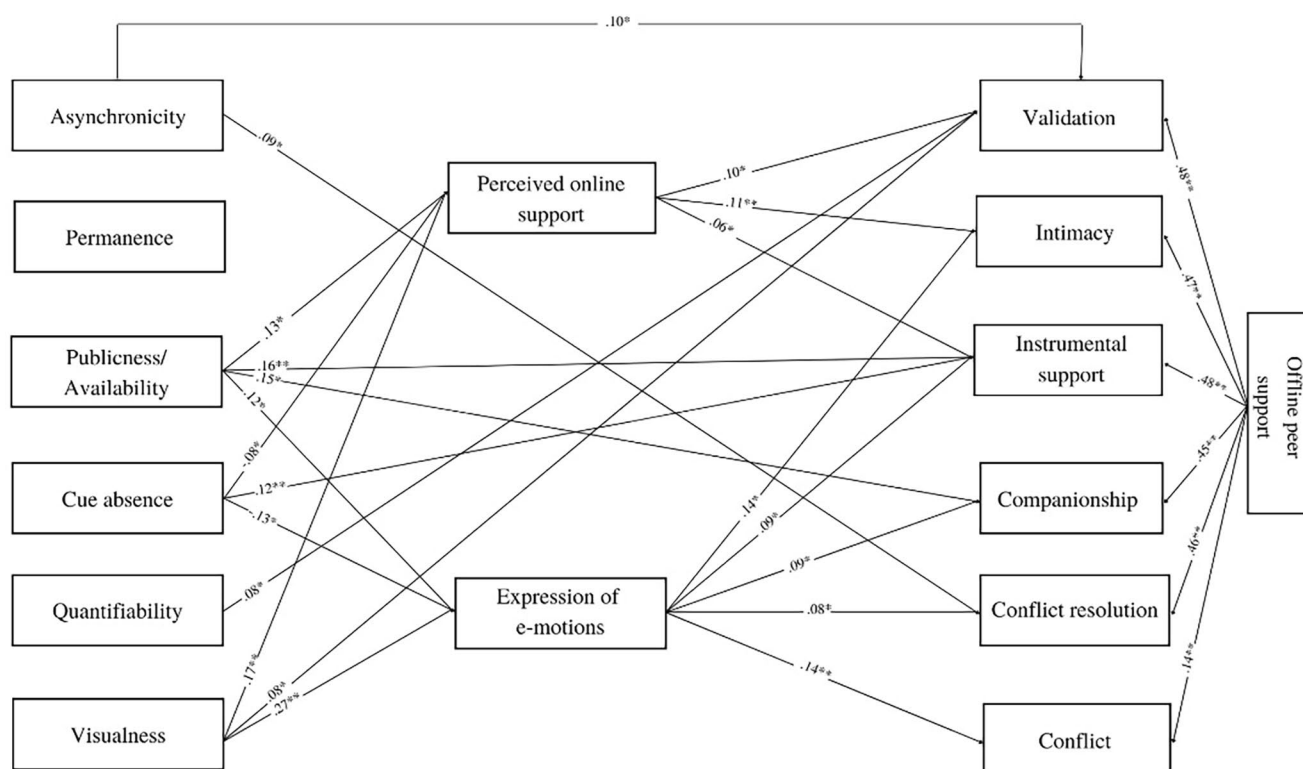


Fig. 1 Model of the relationships between the study variables in the whole sample. Notes: $N = 744$; * $p < .05$, ** $p < .001$. For sake of clarity, non-significant relations are omitted, but are available upon request to the first author

makes it difficult to measure them as two separate constructs. Therefore, a second CFA was run, in which the two items from publicness and the two items from availability loaded on a single factor, which was labeled “publicness/availability”. The results of this second analysis confirmed an adequate fit between the model and the data: $\chi^2(62) = 114.93$, $p < .001$; CFI = 0.97; SRMR = 0.027; RMSEA = 0.035, 90% CI [0.025–0.045]. The standardized loadings ranged from 0.493 to 0.855 and were significant at the $p < .001$ level. The complete results of the CFA are presented in the electronic supplementary material (ESM 1). In light of this result, we computed the average score for six features of social media to be used in the subsequent analyses.

Descriptive statistics and correlations

Descriptive statistics of the study variables are reported in Table 1. Correlations are reported in Table 2. As expected, significant associations between friendship quality dimensions and most of the social media features were found.

Path analysis on the whole sample

Path analysis results are reported in Fig. 1. Regarding the direct associations between social media features and the dimensions of friendship quality, asynchronicity was

positively associated with validation ($\beta = 0.10$, $p = .05$) and conflict resolution ($\beta = 0.09$, $p = .017$); publicness/availability was associated with instrumental support ($\beta = 0.16$, $p < .001$) and companionship ($\beta = 0.15$, $p = .002$); quantifiability and visualness were positively associated only with validation ($\beta = 0.08$, $p = .015$; $\beta = 0.08$, $p = .013$, respectively), and cue absence was significantly associated only with instrumental support ($\beta = 0.12$, $p < .001$). Finally, as expected the control variable perceived offline peer support was positively associated with validation ($\beta = 0.48$, $p < .001$), intimacy ($\beta = 0.47$, $p < .001$), instrumental support ($\beta = 0.48$, $p < .001$), companionship ($\beta = 0.45$, $p < .001$), conflict resolution ($\beta = 0.46$, $p < .001$) and it was negatively associated with conflict between friends ($\beta = -0.14$, $p = .001$).

Along with the direct paths, many significant indirect effects emerged (Table 3). Publicness/availability was associated with validation and intimacy via perceived online social support, while the expression of e-motions mediated its association with intimacy, instrumental support, companionship, and conflict. Visualness was indirectly associated with validation and intimacy via online perceived support, and with intimacy, instrumental support, companionship, conflict, and conflict resolution via expression of e-motions. Finally, negative indirect effects were found in the relation between cue absence and intimacy, both via online social support and e-motions, and between cue absence

Table 2 Correlations between the study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Validation																
2. Intimacy	0.63**															
3. Instrumental support	0.61**	0.57**														
4. Companionship	0.55**	0.51**	0.69**													
5. Conflict resolution	0.61**	0.62**	0.56**	0.54**												
6. Conflict	-0.16**	-0.010	-0.16**	-0.14**	-0.15**											
7. Asynchronicity	0.24**	0.21**	0.22**	0.17**	0.23**	-0.04										
8. Permanence	0.17**	0.20**	0.16**	0.09*	0.20**	-0.004	0.35**									
9. Publicness/Availability	0.27**	0.32**	0.33**	0.24**	0.28**	-0.05	0.44**	0.51**								
10. Cue absence	0.12**	0.15**	0.23**	0.10**	0.16**	-0.05	0.30**	0.20**	0.35**							
11. Quantifiability	0.20**	0.17**	0.13**	0.06	0.15**	-0.03	0.26**	0.24**	0.43**	0.17**						
12. Visualness	0.19**	0.18**	0.08*	0.07*	0.12**	0.02	0.23**	0.18**	0.29**	0.02	0.22**					
13. Online perceived support	0.24**	0.27**	0.19**	0.15**	0.14**	0.05	0.13**	0.11**	0.17**	-0.01	0.07*	0.22**				
14. E-motions expression	0.20**	0.29**	0.19**	0.18**	0.18**	0.12**	0.11**	0.12**	0.20**	-0.06	0.14**	0.32**	0.32**			
15. Peer support	0.54**	0.54**	0.55**	0.50**	0.51**	-0.12**	0.15**	0.12**	0.25**	0.11**	0.11**	0.05	0.18**	0.15**		
16. Problematic social media use	0.09*	0.16**	0.08*	-0.005	0.04	0.07*	0.13**	0.02	0.11**	0.03	0.11**	0.19**	0.20**	0.29**	-0.002	

Notes. N = 744; *p < .05, **p < .001

Table 3 Standardized indirect effects of social media features on friendship quality via online perceived support and e-motions

Independent variable	Mediator	Validation	Intimacy			Instrumental Support			Companionship			Conflict Resolution			Conflict				
			ES	CI 95%	ES	CI 95%	ES	CI 95%	ES	CI 95%	ES	CI 95%	ES	CI 95%	ES	CI 95%			
Asynchronicity	Support	0.006	-0.002	0.018	0.006	-0.003	0.017	0.004	-0.002	0.012	0.002	-0.002	0.009	0.000	-0.005	0.006	0.002	-0.003	0.009
	E-motion	0.001	-0.003	0.006	0.002	-0.010	0.015	0.001	-0.006	0.010	0.001	-0.007	0.010	0.001	-0.006	0.010	0.002	-0.010	0.014
Permanence	Support	0.001	-0.007	0.011	0.001	-0.008	0.012	0.001	-0.005	0.007	0.000	-0.004	0.005	0.000	-0.004	0.003	0.000	-0.005	0.006
	E-motion	0.001	-0.003	0.007	0.004	-0.008	0.017	0.002	-0.006	0.011	0.002	-0.005	0.011	0.002	-0.004	0.012	0.004	-0.008	0.017
Publicness/Availability	Support	0.013	0.002	0.027	0.015	0.003	0.031	0.008	0.000	0.021	0.004	-0.005	0.016	0.000	-0.010	0.009	0.004	-0.006	0.017
	E-motion	0.005	-0.003	0.016	0.017	0.004	0.034	0.011	0.001	0.023	0.011	0.001	0.025	0.010	0.000	0.024	0.017	0.003	0.035
Visualness	Support	0.018	0.005	0.034	0.020	0.007	0.035	0.011	0.000	0.024	0.005	-0.006	0.018	0.000	-0.012	0.012	0.006	-0.007	0.021
	E-motion	0.011	-0.006	0.029	0.037	0.018	0.058	0.024	0.006	0.044	0.025	0.005	0.047	0.021	0.001	0.043	0.037	0.014	0.065
Cue absence	Support	-0.008	-0.021	0.000	-0.009	-0.021	-0.001	-0.005	-0.015	0.000	-0.002	-0.011	0.003	0.000	-0.007	0.006	-0.003	-0.012	0.004
	E-motion	-0.005	-0.017	0.003	-0.018	-0.034	-0.005	-0.011	-0.023	-0.002	-0.012	-0.025	-0.002	-0.010	-0.023	0.000	-0.017	-0.033	-0.004
Quantifiability	Support	-0.003	-0.013	0.006	-0.003	-0.013	0.006	-0.002	-0.009	0.003	-0.001	-0.006	0.003	0.000	-0.003	0.004	-0.001	-0.008	0.003
	E-motion	0.001	-0.002	0.007	0.004	-0.006	0.015	0.003	-0.004	0.011	0.003	-0.004	0.012	0.003	-0.004	0.011	0.004	-0.006	0.015

Notes. ES = estimate; 95% CI = bias-corrected bootstrapped confidence interval; Support = Perceived online support; E-motion = E-motional expression

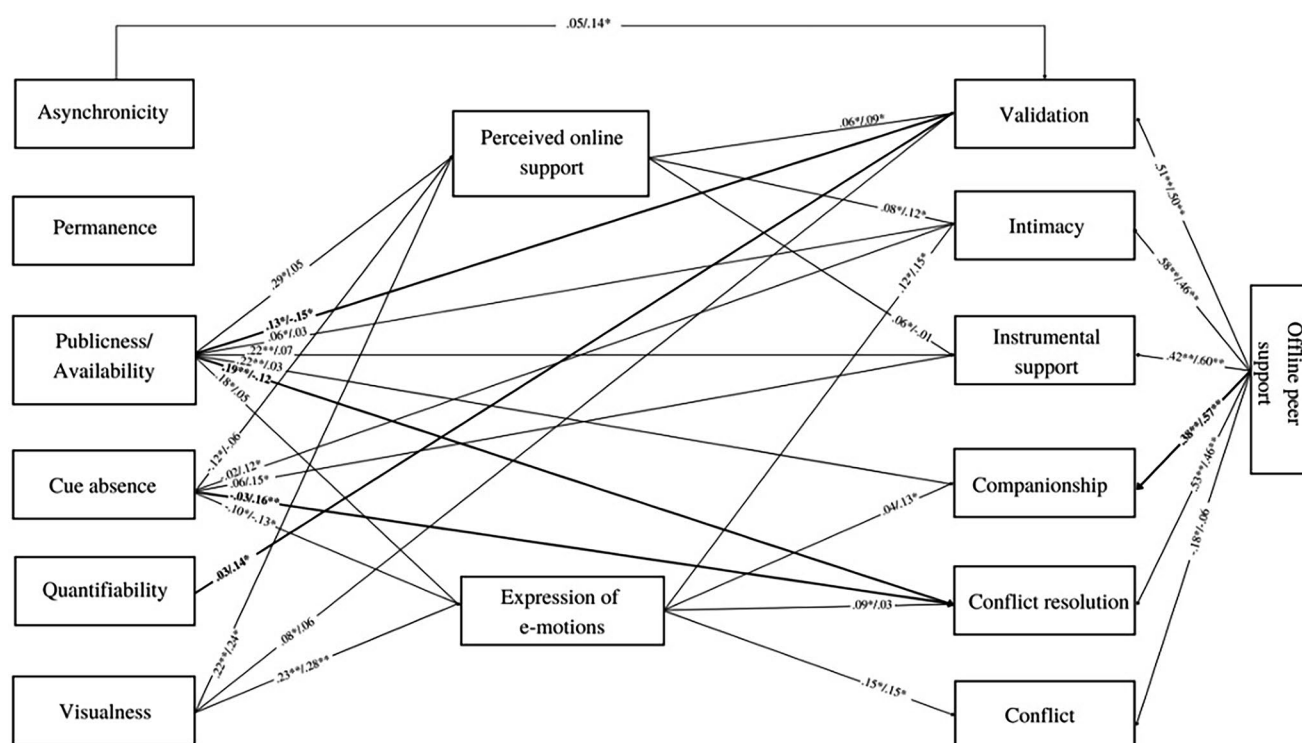


Fig. 2 Tested model through multi-group analysis in gender groups (girls vs. boys). *Notes.* $N=735$ (girls=475; boys=270); standardized estimates: girls/boys; * $p < .05$, ** $p < .001$. For sake of clarity, only relations between variables which were significant in at least one group are reported, but all associations are available upon request. Significantly different associations between the two groups are highlighted in bold

and instrumental support, companionship, and conflict via expression of e-motions only.

Overall, the model explained 35% of the variance for validation, 36% for intimacy and for instrumental support, 27% for companionship, 30% for conflict resolution, and a smaller, though significant percentage (4%) of the variance for conflict. Explained variance for the mediators was 7% for perceived online social support, and 12% for expression of e-motions.

Multi-group analyses

Results from the first multi-group analysis showed significant differences between gender groups. The overall Wald test of parameter constraints was statistically significant (Wald $\chi^2_{(67)} = 129.249$, $p < .001$), indicating that not all paths were equal between males and females (see Fig. 2). Specifically, the link between publicness/availability and validation of friendship was positive for girls and negative for boys ($b = 0.13$, $SE = 0.06$, $p = .026$, vs. $b = -0.15$, $SE = 0.08$, $p = .042$, $\chi^2_{(1)} = 8.829$, $p = .003$). Moreover, the relations between quantifiability and validation ($b = 0.03$, $SE = 0.03$, $p = .39$, vs. $b = 0.14$, $SE = 0.04$, $p < .001$, $\chi^2_{(1)} = 4.541$, $p = .033$) and the one between cue absence and conflict resolution ($b = -0.03$, $SE = 0.04$, $p = .480$ vs. $b = 0.16$, $SE = 0.04$, $p < .001$, $\chi^2_{(1)} = 10.868$, $p = .001$) were found to be positive

and significant only for males. Conversely, the link between publicness/availability and conflict resolution was statistically significant only in the female group ($b = 0.19$, $SE = 0.06$, $p < .001$, vs. $b = -0.12$, $SE = 0.07$, $p = .101$, $\chi^2_{(1)} = 11.005$, $p < .001$). Finally, males showed a stronger association between perceived offline peer support and companionship ($b = 0.38$, $SE = 0.07$, $p < .001$ vs. $b = 0.57$, $SE = 0.06$, $p < .001$, $\chi^2_{(1)} = 4.453$, $p = .035$).

In the second analysis comparing problematic and non-problematic social media users (see Fig. 3), six paths were found to be different across groups (Wald $\chi^2_{(67)} = 196.005$, $p < .001$). The following three links were statistically significant only for problematic social media users compared to the non-problematic group: cue absence with validation ($b = 0.03$, $SE = 0.03$, $p = .257$, vs. $b = -0.16$, $SE = 0.07$, $p = .025$, $\chi^2_{(1)} = 6.322$, $p = .012$), publicness/availability with conflict ($b = -0.02$, $SE = 0.06$, $p = .673$, vs. $b = -0.47$, $SE = 0.16$, $p = .003$, $\chi^2_{(1)} = 7.053$, $p = .008$) and visualness with conflict ($b = -0.03$, $SE = 0.04$, $p = .432$, vs. $b = 0.25$, $SE = 0.12$, $p = .037$, $\chi^2_{(1)} = 4.959$, $p = .026$). Conversely, the association between visualness and validation ($b = 0.10$, $SE = 0.03$, $p = .002$, vs. $b = -0.13$, $SE = 0.09$, $p = .135$, $\chi^2_{(1)} = 6.301$, $p = .012$), and the effect of perceived offline peer support on companionship ($b = 0.51$, $SE = 0.05$, $p < .001$, vs. $b = 0.19$, $SE = 0.11$, $p = .075$, $\chi^2_{(1)} = 7.151$, $p = .007$) were significant only for non-problematic social media users.

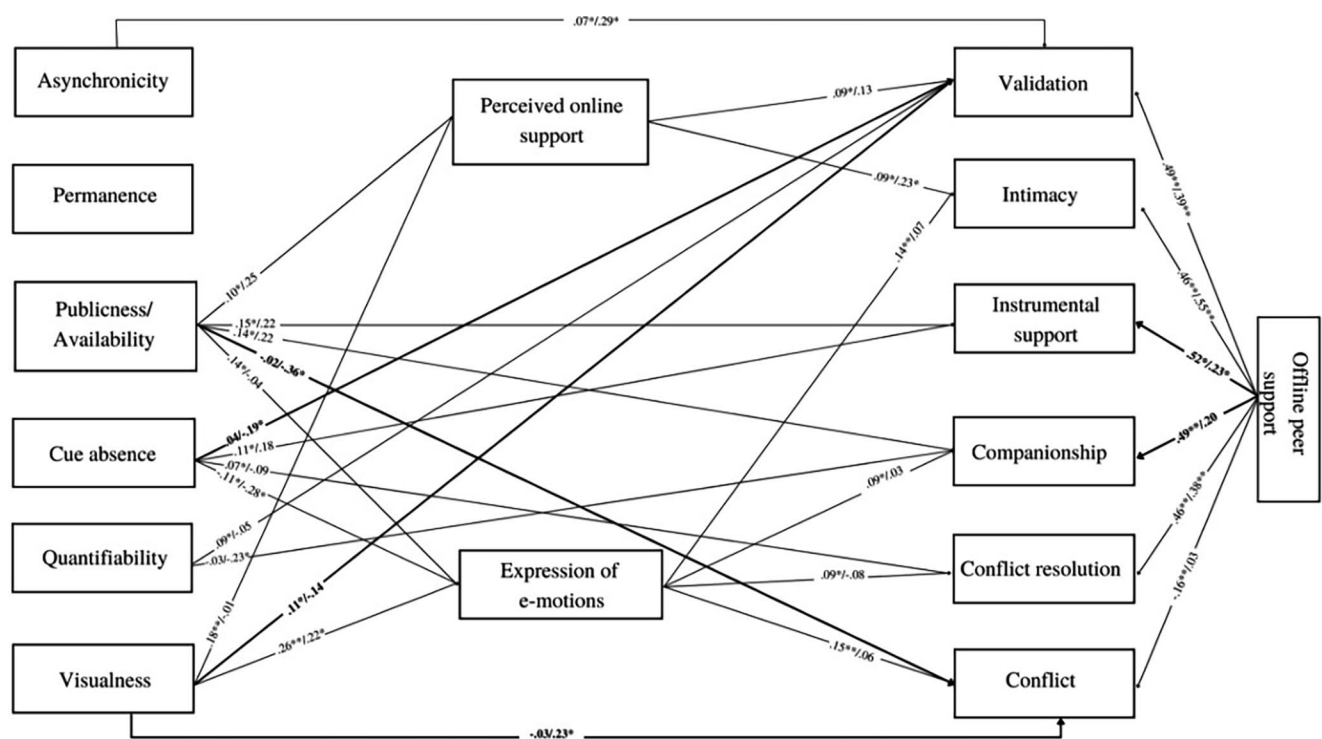


Fig. 3 Tested model through multi-group analysis in social media users groups (non-problematic vs. problematic). *Notes.* N = 739 (non-problematic = 659; problematic = 80); standardized estimates: non-problematic/problematic; * $p < .05$, ** $p < .001$. For sake of clarity, only relations between variables which were significant in at least one group are reported, but all associations are available upon request. Significantly different associations between the two groups are highlighted in bold

Finally, the relation between perceived offline peer support and instrumental support was stronger in the non-problematic sample ($b = 0.58, SE = 0.051, p < .001$, vs. $b = 0.18, SE = 0.08, p = .016, \chi^2_{(1)} = 19.168, p < .001$).

Discussion

The current study was designed based on the tenet of the Transformation Framework (Nesi et al., 2018a, b) and is the first attempt to examine the associations between different social media features and the dimensions of friendship quality among adolescents. Both direct effects, and indirect paths via online social support and expression of e-motions, were tested. Moreover, differences in the studied associations between gender groups and groups of problematic and non-problematic social media users were explored. Overall, results confirmed that several social media features are directly and indirectly associated with at least one component of friendship quality; in other words, the perception of multiple social media features, together, may transform some social and emotional individual processes and, in turn, play a role in adolescents’ dyadic friendship experiences.

Direct Associations of Social Media features with Friendship Quality

Regarding our first research question, results of the path analysis showed that two social media features seem to be more relevant for adolescents’ friendship quality, at least in our sample. First, the feature “publicness/availability” is directly associated with both instrumental support and companionship. That is, the more adolescents perceive social media as a context that allows them to frequently and quickly get in touch with a large number of people, especially peers, the more they report to be satisfied with the level of instrumental support they receive by friends and the greater the level of companionship they experience. A possible explanation is that rapid and wide online interactions make social support requests readily available and highly visible, increasing opportunities to offer and receive support from friends. Moreover, publicness and availability may facilitate both communication with geographically distant friends and creation of online exclusive friendships, enhancing the perception of companionship among friends (Nesi et al., 2018a).

Secondly, asynchronicity plays a significant role in explaining two other components of friendship quality, namely conflict resolution and validation. In particular,

asynchronicity may help adolescents to better handle conflicts with peers because it allows different communication strategies compared to face-to-face conflictual interactions. As already described by Nesi and colleagues (2018a), indeed, the possibility to manage the time during a mediated conversation on social media may alter communication processes among friends, for example by improving the way they react to others' messages (e.g., calming down before replying, or thinking better about how to not let the message be misunderstood) and leading to more effective perceived ability to solve conflicts. In regard with validation, a possible explanation of the role of asynchronicity is that online spaces, thanks to the possibility to interact in different moments, may offer new opportunities to show affection to friends, for example by using the time interval to write a special private message, or to comment and "like" a friend's post on social media even after some time it has been shared (Yau & Reich, 2019). In sum, the more adolescents perceive social media as a context that allows them to communicate asynchronously, the more they feel they are able to solve potential arguments with friends and they experience more occasions for reciprocate validation within the relations.

With respect to other associations between social media features and friendship quality, we also found a significant direct effect of cue absence on perceived instrumental support. The lack of important social cues of mediated communication might increase adolescents' self-disclosure, especially for socially anxious ones (Nesi et al., 2018a). It follows that adolescents may expose themselves and their feelings more easily online than in person and, as a consequence, may experience greater supportive responses from friends. Moreover, we found that both visualness and quantifiability directly contribute to explaining validation. Indeed, the possibility to communicate through photos and videos and to use quantifiable social indicators such as "likes" or comments for today's adolescents may serve to validate friends, to make them feel special and to demonstrate the importance given to the relation with them (Nesi & Prinstein, 2019). Thus, these associations suggest that social media, as they are built and work, are perceived as relevant means to support the quality of friendship during adolescence.

Regarding the perceived characteristic of permanence of contents on social media, no significant associations with the dimensions of friendship quality were found in our sample. Although the bivariate correlations suggested that perceived permanence on social media is associated with many dimensions of friendship quality, the lack of significant paths between these variables in the overall model suggests that other characteristics of social media (e.g., publicness/availability and asynchronicity) are more relevant than permanence for the relational and communicative processes underlying friendship quality. In other terms, it might be

that the quality of friendship is more clearly related to adolescents' daily online behaviors (e.g., chatting, posting content, "liking" or commenting on friends' posts), which are specifically allowed by determinate social media features, than by the possibility to retrieve content shared in the past. Further insights are needed to better explore this possible explanation.

The role of online perceived support and expression of e-motions

Another aim of the current study was to test for any indirect associations in the relationships between social media features and friendship quality via (i) perceived online social support and (ii) expression of e-motions. First, it is important to mention that, in considering the mediating role of online social support, we controlled for offline peer support on friendship quality. As expected, we found a negative association between offline peer support and conflict and positive direct associations, stronger than those with online social support, with all the other friendship quality dimensions. This control allows to disentangle the specific role of offline and online social support on friendship quality and the findings confirm the literature about the complementary role of social media in adolescents' relationships with friends (e.g., Nesi et al., 2018a, 2018b; Uhls et al., 2017; Valkenburg & Peter, 2011; Yau & Reich, 2018). In other words, it could be the case that online friendship interactions are mostly based on peer networks belonging to the offline context, which remains fundamental for social support processes. Moreover, teens' engagement in social media to interact with peers, also to receive social support, would predominantly serve to complement existing relationships rather than substitute them (van Driel et al., 2019).

After controlling for offline peer support, indirect significant associations via online perceived support were found between publicness/availability, visualness, and cue absence with two friendship dimensions, namely validation and intimacy. Specifically, both publicness/availability and visualness were positively associated with validation and intimacy via online perceived support, while we found a negative indirect effect of cue absence on intimacy. Consistent with the evidence that social and emotional support from peers is one of the most important determinants of friendship closeness (Rousseau et al., 2019) and that social media use play a role in this association (Pouwels et al., 2021), these indirect paths suggest that adolescents perceiving more the potential public online and the ease accessibility to it, together with the opportunity to use multimedia communication, are more likely to perceive greater social support on social media and, in turn, to experience higher levels of intimacy and validation in their relations with friends. Conversely, perceiving

fewer audiovisual cues decreases the perception of social support on social media, leading to lower perceived experience of help and protection among friends, and to feel the relations as less intimate.

Concerning the mediating role of expression of e-motions, we found a positive indirect association between publicness/availability and all the dimensions of friendship quality, except for validation and conflict resolution; in contrast, a negative indirect association, via online expression of emotions, between cue absence and the same characteristics emerged. This second pattern of indirect associations shows that experiencing the presence of visual communication and easier access to a greater number of people on social media increase adolescents' tendency to express their emotions online and, in turn, to perceive higher satisfaction in the relationships with friends. On the other hand, the perceived lack of social cues within online interactions with friends makes e-motional expression less frequent, which, in turn, is associated with poorer perceived relational quality.

Differences between gender groups

A further aim of the present study was to explore differences across gender groups and groups of social media users (problematic vs. non-problematic). Results showed significant group differences in both cases. Regarding gender, we found an opposite direction in the association between publicness/availability and validation, which was positive for girls and negative for boys. Thus, the more female adolescents perceive the possibility to easily and constantly access to their friends online, the more they tend to experience validation within the relations (e.g., frequent online interactions with friends, together with public demonstration of affect, may be synonymous with validation among friends); conversely, males reported to perceive less validation within friendship relations when they experience higher accessibility to friends online. This negative link, together with the stronger association between perceived offline peer support and companionship in the male group compared to females, could be interpreted as result of the well-known higher level of engagement in social media by girls (Nesi & Prinstein, 2019) that, in terms of perceived quality of friendship, may indicate a potential preference for online interactions with friends, compared to boys. Further, some links were found to be significant only in one gender group. Specifically, only in the male group, quantifiability and cue absence were significantly associated with validation and conflict resolution respectively, while publicness/availability was significantly linked to conflict resolution only in the female group. In other words, males tend to use quantifiable indicators (e.g., "likes") in order to demonstrate the importance of relationships with friends online. Differently, within the female

group there are probably other mechanisms that contribute to experience validation among friends, such as sharing of emotions, sentiment of posts, and stories on social media. Moreover, the lack of social cues seems to help male adolescents to better communicate to solve an argument during conflicting interactions with friends. On the other hand, publicness/availability seems to facilitate conflict resolutions among female adolescents: It could be the case that females perceive the easy access to friends online (e.g., getting in touch with friends anytime and from anywhere) as an important tool to make things better and be reconciled, for example taking advantage of the possibility to send messages, express emotions, and negotiate solutions. As a purely speculative interpretation of these results, we can reflect on what the literature suggests about gender differences in the expression of emotions, and about the preference for online interactions for more shy or anxious individuals. Indeed, it is well-known that females tend to express their emotions more easily than males (e.g., Chaplin, 2015) and that people with difficulties in expressing themselves in face-to-face contexts may feel more comfortable in communicating with others on social media due to the absence of many social cues (Nesi et al., 2018a). Accordingly, we suggest that male adolescents could compensate for their difficulties by preferring online interactions as a favorable context to resolve conflicts with friends. Future studies focusing more explicitly on gender differences should try to verify this hypothesis. Moreover, it would be interesting to control for friends' gender to whom the group of males and females have referred in order to better understand these different associations.

Differences between types of social media users

The second multi-group analysis highlighted differences in the two groups of social media users related to the dimensions of conflict and validation. Specifically, conflict was found to be negatively associated with publicness/availability and positively associated with visualness in the problematic users group. Validation was found to be negatively associated with cue absence in the problematic group, and positively associated with visualness among non-problematic users. These results suggest that the constant access to broad networks of friends is related to fewer experiences of conflictual interactions for problematic social media users, while, conversely, visual sharing of their friends' lives via photos and videos might increase them. In this regard, literature on problematic social media use (van den Eijnden et al., 2016) has clearly described the "addiction-like" symptoms (i.e., compulsion, salience, tolerance, withdrawal), the typical preference for online social interaction and users' desire to constantly be connected to others through social

media. For this reason, publicness/availability, by allowing users to easily see everything happening online, may give to problematic users a higher sense of control over their own and their peers' experiences, making them feel more comfortable and, thus, decreasing the likelihood of conflict with friends. On the other hand, the more they perceive the possibility to visually access friends' everyday contents on social media, the more they are at risk to have conflicts, for example as a consequence of more frequent occasions for social comparison, or feelings of jealousy after seeing a picture of a friend having fun with other people. In sum, publicness/availability and visualness could be considered as protective and risk factors, respectively, for conflictual interactions with friends for problematic social media users.

With regard to validation, the more problematic social media users perceive the lack of social cues during online interactions with friends, the less they experience validation within the relations with friends; on the other hand, posting or sharing photos and videos lead to higher perceived validation for non-problematic users. According to the compensatory model of Internet use (Kardefelt-Winther, 2014), problematic users tend to engage in frequent online activities to compensate for psychosocial issues (e.g., difficulty in emotion regulation processes and lack of social competences), and they are motivated to frequently access social media by the desire for mood modification and social facilitation. Further, this kind of user is very committed to getting recognition from others and they also get easily worried about what happens on social media. In this sense, the absence of some aspects of communication during online interactions with friends might increase their worries and make them feel less approved and validated within the friendship relations (e.g., due to cue absence, they may misunderstand the validating meaning of a written message from a friend and worry about it). It is therefore possible that, as a vicious circle, the more they use social media to compensate for offline difficulties, the less they feel satisfied with what they get (due to some specific social media features), and the more they engage in compulsive online activities. Conversely, results for non-problematic social media users suggest that visual communication may serve as an important tool to validate friends and to support the quality of friendship. These results appear in line with studies showing that social media use for companionship and social motives is associated with lower levels of problematic use, that is, non-problematic users are able to take advantage of social media tools for functional reasons (e.g., Marino, Mazziere et al., 2018).

In sum, as for gender, some aspects of friendship quality could be differently transformed by perceived social media features depending on the individual level of problematic social media use. With regard to the problematic group,

compared to non-problematic users, some features (i.e., publicness/availability) seem to help them in compensating for offline difficulties, while others (i.e., visualness and cue absence) are likely to exacerbate their symptoms. These findings are merely exploratory, and further studies are certainly needed to deepen the possible differences between different types of social media users. Nonetheless, they suggest the importance of not considering social media users as a one, homogeneous group, and to analyze how peer relationships function on social media taking into account individual differences.

Limitations

Among the limitations of the current study, one refers to the cross-sectional design, which does not allow us to make definitive conclusions about the directionality of the effects of social media features on friendship quality dimensions. While the paths tested in our model were theoretically derived from the Transformation Framework (Nesi et al., 2018a), future studies should try to replicate the current findings with a longitudinal design. Using multiple data collections, starting from early adolescence, would also allow us to test when the interplay of social media features and the dimensions of friendship quality emerges in adolescence and how it develops over time. This is a venue of our future research efforts. Moreover, most of the participants were about 15-year-old, with limited variation around the mean age, and this hampered the possibility of considering the role of participants' age in our model. A second limitation might be related to the novelty of the measurement for the perceived social media features. Because no published scales existed at the moment of our data collection, we needed to develop a new instrument to assess adolescents' perception of social media features. We showed preliminary evidence of its factorial structure. However, in the present sample two features of social media were collapsed into one factor due to a high correlation between the two latent variables. Moreover, to obtain a short scale that could be used within longer study protocols, we only used two items for each feature. While the scale in its current form looks promising, further analyses are needed to validate the scale, for example by testing its factorial structure, its test-retest reliability, and its concurrent and predictive validity. Moreover, future studies should also add objective measures or more specific items (e.g., by asking participants to rate the number of times they note the presence of a certain feature and to describe what they perceived as representative of it). Finally, while we tested the indirect paths via two important dimensions (i.e., online social support and expression of e-motions), there are certainly other personal characteristics (e.g., importance of online status indicators) and contextual

factors (e.g., group norms about social media use) that may be important to investigate.

Implications

These limitations notwithstanding, the current findings have implications for prevention and intervention programs with adolescents. First, they suggest the need for specific activities about social media use, for example group discussions about how social media may be used to seek social support or to communicate with peers and positively express emotions online. Moreover, activities focused on sharing expectations within the peer group about online behavior based on social media features (e.g., visualness and lack of social cues) could be useful to facilitate positive interactions with friends—both online and offline—and to prevent problematic social media use. Also, activities aimed at increasing youth's awareness of online spaces as a real social context may be useful to make them mindful of the potential role of social media in their relationships with others, especially friendship relationships. For this kind of educational programs, schools are crucial places to reach audience of youth and alliance with educators is needed to support adolescents toward healthy and useful use of social media.

Conclusions

In conclusion, this study adds to the growing literature by allowing for a first analysis of the role of social media features in adolescents' friendships, and by showing the relative contribution of both social and emotion-related processes in adolescents' social media use. Specifically, with regard to our first and second research questions, we found that all social media features, except for permanence, are directly associated with different dimensions of friendship quality in adolescence and that many of these associations are also mediated by perceived online social support and expression of e-motions. Since previous studies about adolescents' social media use and their experiences with peers have largely focused on negative consequences (Odgers & Jensen, 2020), the fact that the way social media are built and work may have a specific role in friendship processes has been overlooked. It is therefore noteworthy that today's youth online interactions with friends are characterized by novel behaviors (e.g., liking, sending photos), which largely serve the same psychological and relational purposes as the offline behaviors. Moreover, the presence of social media features, as perceived by adolescents, may lead to differential effects and other online processes may play a significant role in this link. Concerning our last research question, different patterns of associations between social media features

and the dimensions of friendship quality were found across gender groups and groups of social media users, confirming that the hypothesized role of social media in supporting friendship relations may depend on individual factors that need to be taken into consideration. In conclusion, moving beyond the dichotomy of social media being good or bad for individual and relational well-being among adolescents, our findings support the importance of embracing both perspectives to fully understand the function of social media use within contemporary peer relationships.

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Authors' contribution All authors contributed to the study conception and design. Federica Angelini prepared material and performed data collection. Federica Angelini and Gianluca Gini performed statistical analysis. Federica Angelini wrote the first draft of the manuscript. Gianluca Gini and Claudia Marino performed study supervision. All authors read and approved the final manuscript.

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Data availability and materials Available upon request.

Declarations

Competing interests The authors have no relevant financial or non-financial interests to disclose.

Ethics approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee for Psychological Research of the University of Padua (protocol n° 4170).

Consent to participate Written and signed informed consents were collected from all participants' parents/caregivers or participants who were 18-year-old or older.

Consent to publish Not applicable.

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