

RESEARCH ARTICLE

Differences in perceived online communication and disclosing e-motions among adolescents and young adults: The role of specific social media features and social anxiety

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Abstract

Introduction: Social media are widely used by adolescents and young adults as a mean to maintain interpersonal relationships. Recent studies have found that young individuals with high levels of social anxiety feel more confident in communicating online. However, little is known about the role of perceived social media characteristics that could minimize the distress they experienced in face-to-face interactions. In this study, we rely on the tenets of the Transformation Framework, according to which social media, with its own features, may transform social relationships, including disclosing emotions and communicating with others online, in ways that may differ across individuals with or without specific vulnerability (e.g., social anxiety). Therefore, this cross-sectional study aims at examining the contribution of three specific social media features (i.e., asynchronicity, cue absence, and visualness) in explaining perceived breadth and depth of online communication, both directly and via e-motional processes (i.e., expression and facilitating use of e-motions), across groups of individuals with high versus low levels of social anxiety.

Methods: Participants were 1046 Italian adolescents and young adults (61.4% females; $M_{age} = 17.9$, $SD = 3.23$) who completed an anonymous self-report questionnaire between 2021 and 2022. Participants with very high scores on social anxiety (above the 90th percentile; *socially anxious*), were distinguished from all others (*socially nonanxious*) and a multigroup analysis (MGA) was run to compare the pattern of associations across the two different groups.

Results and Conclusion: Results from the MGA showed significant differences between the two groups, partially confirming our hypotheses. Specifically, among socially anxious individuals, perceived cue absence was found to benefit perceived breadth and depth of online communication, and asynchronicity to enhance online emotional processes; conversely, these associations were negative in the group of socially nonanxious. Thus, these findings underly the contribution of social media in explaining youngsters' online experiences and support the potential beneficial role of some social media features for those more socially vulnerable.

KEYWORDS

e-motional processes, online communication, social anxiety, social media features

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1 | INTRODUCTION

Social media allow to maintain interpersonal relationships, particularly among adolescents and young adults, who engage in daily social media use to communicate with peers, especially friends (Moreno & Uhls, 2019; Notley, 2009). To date, research on online communication has mainly focused on its potential effects on psychosocial well-being, to understand whether digital interactions hinder or enrich youngsters' social relationships. However, little attention has been devoted to the fact that some may benefit from online interactions more than others because of individual and contextual characteristics (Nesi et al., 2022). For example, while communication on social media is attractive to everyone because it provides a more comfortable environment that may encourage self-presentation and self-disclosure (Valkenburg & Peter, 2011), this could be particularly true for those experiencing social anxiety, who can compensate online for communication difficulties encountered offline (Scott et al., 2021). In this regard, no research has specifically focused on the potential role of social media, with its own characteristics, to investigate the processes underlying online communication patterns among groups of individuals with high versus low levels of social anxiety; indeed, what might hinder, or being less relevant for perceived communication quality in young people without social anxiety, it might instead benefit socially anxious' experiences.

Previous studies dealing with communication in the traditional (offline) environment have shown that emotional processes (e.g., expression of emotions) may be significantly inhibited in young people with higher social anxiety. However, when interactions are perceived as less risky, the communication styles of the socially anxious do not seem to differ from those of other people (Alden & Bieling, 1998). In this regard, no studies have investigated whether social media may be perceived as a less risky context and, if so, what might be the contribution of the characteristics of social media in association with online emotional processes during social interactions. Therefore, this study was designed to contribute filling this gap by considering the role of social media in explaining different online emotional and communicative processes in young people with high versus low social anxiety. Specifically, we tested how perceiving some key characteristics of social media (namely, asynchronicity, cue absence, and visualness) can be associated with different online communication experiences (in terms of perceived breadth and depth), both directly and via two online emotional processes (i.e., expression and facilitating use of online emotions), depending on high versus low levels of social anxiety. As such, the novelties of the current study are twofold: (i) for the first time, social media characteristics (Nesi et al., 2018a), as perceived by adolescents and young adults, are explicitly applied to the study of their emotional and communicative processes on social media, and (ii) social anxiety is considered a potential moderator of these associations.

1.1 | Social anxiety and online communication

Social anxiety is characterized by an intense fear of being criticized or negatively evaluated, to the extent of avoiding social situations, thus impacting daily social functioning (American Psychiatric Association, 2013). Epidemiological studies on the prevalence of social anxiety (Martin, 2022) show that, in the general population, from 2% to 16% of individuals suffer from social anxiety, with percentages in the lower range (2%–7%) in Western countries (Faravelli et al., 2000; Mayo-Wilson et al., 2014) and with younger individuals and women showing the highest rates (Fehm et al., 2008). In addition, lifetime prevalence range in late adolescence and early adulthood is estimated to be 6%–9%, as reported in studies conducted in Europe (Merikangas et al., 2002; Wittchen et al., 1999).

Individuals with social anxiety show difficulties in communicating and self-disclosing with others, so that their social relationships with peers may be inhibited and less satisfactory. However, interactions on social media may be perceived as less risky, thus minimizing the distress and the potential threats usually experienced offline (Prizant-Passal et al., 2016).

Research on online communication has usually focused on two dimensions: (i) perceived breadth (i.e., the ease to talk about a wide variety of topics online), and (ii) perceived depth (the feeling of less inhibition in disclosing intimate information) (Peter & Valkenburg, 2006). Previous studies on perceived online communication in association with social anxiety (High & Caplan, 2009; Kamalou et al., 2019; Valkenburg & Peter, 2009) showed that the online context, compared with the face-to-face one, tends to be preferred by socially anxious individuals because it allows for more controllability and enhances the sense of security during interpersonal interactions. In this regard, the preference for online interactions for socially anxious individuals would result in greater perceived breadth and depth of online communication (Peter & Valkenburg, 2006; Schouten et al., 2007).

Although the reason behind the preference for online interactions, regardless of individual characteristics, seem to be related to the inherent characteristics of social media (Nesi et al., 2018a; Valkenburg & Peter, 2011), further research is needed to understand whether specific social media features can be differently associated with the way online communication is perceived among socially anxious and nonanxious young individuals.

1.2 | Inherent characteristics of social media

The definition of social media as an important social context, partially different from the face-to-face one, has been recently proposed within the Transformation Framework (TF) (Nesi et al., 2018a, 2018b, 2021). In this line of research, the TF

represents an important theoretical model to investigate potential differences in the way young users perceive social media features according to their individual factors. According to the TF, indeed, social media are characterized by specific features (i.e., asynchronicity, permanence, publicness, availability, cue absence, quantifiability, visualness, and algorithm) that may *transform* the way young people socially interact with each other. For example, social media may allow for compensatory experiences more easily implemented online (e.g., more possibilities for shy individuals to communicate with peers) or alter the quality of communication processes both positively and negatively (e.g., interactions on social media may increase misunderstandings, or create more intimate relationships with friends; see, Angelini et al., 2022). However, since the perceptions of these features may impact users' online behaviors differently (Peter & Valkenburg, 2006), more attention should be devoted to potential individual factors (e.g., levels of social anxiety) in how the perceived presence of the social media features may be associated with different communication outcomes.

In this study, we focused on specific characteristics of social media that, in previous studies on online communication, were considered in explaining why people, regardless of individual differences, may prefer to communicate online over face-to-face interactions (Schouten et al., 2007; Valkenburg & Peter, 2011). Specifically, reduced nonverbal cues (i.e., audiovisual anonymity) and the perceived controllability allowed by asynchronous conversations seem to play an important role in encouraging online self-disclosure and feelings of disinhibition, thus facilitating interpersonal communication processes. Such attributes of the online context, indeed, may stimulate a greater sense of security and provide the chance to overcome the potential social challenges faced when communicating in person.

Similar concepts were then taken up within the TF: in particular, in this study, we referred to (i) asynchronicity (i.e., time lapse between aspects of communication) and (ii) cue absence (i.e., degree to which physical cues absent). In addition, we also focused on a third social media feature described within the TF, which has not been considered in prior studies on online communication: (iii) visualness (i.e., the extent to which photographs and videos are emphasized on social media). As described by Nesi and colleagues (2018a, 2018b), the features of cue absence and asynchronicity together can potentially change relational outcomes, transforming communication processes like interpreting information, solving conflicts, or providing social support. With regard to cue absence, the degree of audiovisual anonymity may vary from platforms providing most of interpersonal cues (like video chatting services), to completely anonymous platforms; the lack or reduction of social cues may enhance comfort and disclosure during online interactions, but it can also diminish the perceived richness of social support or create misunderstandings (Angelini et al., 2022). Although online communication may be easier to some extent, the majority of people who do not show difficulties during social interactions may perceive cue absence to hinder the quality of mediated communication compared with the in-person one (Nesi et al., 2018a). Thus, we expected the lack, or the reduction, of nonverbal cues in online communication (i.e., cue absence) to be negatively associated with perceived breadth and depth of online communication for individuals with lower level of socially anxiety (H1a). Conversely, social media environment may become beneficial for socially anxious young individuals, which struggle with relational difficulties during face-to-face interactions; engaging in online communication through social media platforms, indeed, allows them to easily manage the richness of social cues they want to convey, thus reducing their exposure to what usually triggers their anxiety and providing them with a greater sense of control over social interactions (Joinson, 2001; Nesi et al., 2018a; Valkenburg & Peter, 2011). Therefore, we expected the associations between perceived cue absence and perceived breadth and depth of online communication to be positive among socially anxious youth (H1b).

Regarding asynchronicity, instead, this feature enables all adolescents and young adults to engage in multiple and selective conversations with peers, and allows for more thoughtful responses, especially during emotional conversations (Angelini et al., 2022); in this sense, asynchronicity may benefit perceived online communication quality for young people who feel easily shy and embarrassed in face-to-face interactions (e.g., when they are asked to disclose about personal information), but it could be even more beneficial, and satisfy the need to have control on communication, for those experiencing intense fear of social situations and who tend to avoid them in the offline context (Chan, 2011). On the other side, asynchronicity can also foster relational uncertainty and increase reassurance and feedback seeking processes which is characteristic of socially anxious individuals, thus potentially hindering their perceived quality of online communication (Nesi et al., 2018a). For these reasons, we expect perceived asynchronicity on social media to be positively associated with higher perceived breadth and depth of online communication in socially nonanxious individuals (H2); however, the variety of possible associations between asynchronicity and the perception of online communication among the socially anxious did not allow us to define specific hypotheses in this regard.

Finally, regarding the feature of visualness, most of currently used social media platforms (e.g., WhatsApp and Instagram) allow users for a greater emphasis on visual content to experience new forms of communication not possible offline; photographs and video, but also gifs or emojis, may support the conversations with peers and help to better transmit and understand the message (Nesi et al., 2018a). In this sense, the feature of visualness may help overcome the limits of reduced nonverbal cues on social media, by offering the opportunity to convey emotions in an alternative way during online interactions. Although many adolescents and young adults may enjoy visualness of social media as a new, additional form of communication, this could be particularly true for socially anxious individuals, who may rely more on the possibility to visually communicate on social media to easily express their thoughts and emotions and feel less intimidated, compared with traditional offline interactions. In this regard, we may expect visualness to be positively associated with perceived online communication among both socially anxious and

nonanxious individuals; however, in light of the paucity of previous research on the role of visualness in online communication, we did not formulate specific a-priori hypotheses and this analysis was deemed more exploratory.

1.3 | The role of e-motions

Previous research on communication in the offline setting has highlighted the significant role of emotions in explaining difficulties during face-to-face social interactions for those suffering from social anxiety. Socially anxious individuals, indeed, may worry excessively about showing their emotions, due to the fear of rejection or negative evaluation from others; as a result, when they do not avoid social situations, they may struggle to both express their emotions (e.g., they tend to avoid eye contact or speak in a hesitant manner) and to interpret and understand others' emotions accurately, thus reducing the perceived quality of interpersonal communication (Cuming & Rapee, 2010). However, little is known about whether such emotional processes, characterizing socially anxious individuals, are present also when they interact on social media, and whether they play a role in explaining their perceived communication experiences. Moreover, although specific social media features are hypothesized to be directly associated with perceived online communication, online emotional processes may contribute to these associations, and be different across groups of individuals with high versus low levels of social anxiety.

In the current study, we relied on the concept of "e-motions" (i.e., online emotions), which refers to the processes of perceiving, expressing, understanding, and managing emotions on social media (Zych et al., 2017). Specifically, we focused on two e-motional processes, (i) expression of e-motions and (ii) facilitating use of e-motions (i.e., the use of emotions on social media to facilitate interpersonal relationships and thought), as possible mediators of the associations between social media features and perceived online communication.

As mentioned above, interactions occurring online offer new and alternative ways to convey emotional states, thus creating opportunities for intimate disclosure and to enhance feelings of closeness, which are important during adolescence and emerging adulthood (e.g., Litt et al., 2020; Pouwels et al., 2021). In a previous study involving a sample of adolescents from the general population (Angelini et al., 2022), it was found that perceiving the presence of visualness on social media increased adolescents' tendency to express emotions online and, in turn, their satisfaction within the relationship with friends. Moreover, the perceived lack of social cues during online interactions was associated with less e-motional expression and, in turn, with poorer perceived friendship quality. Finally, with regard to asynchronicity, we found that, when engaged in conflicts with their friends, adolescents seemed to benefit from asynchronous conversation thanks to a reduced emotional involvement, which turned out in a more effective communication.

At the same time, other studies (e.g., Schouten et al., 2007; Weidman et al., 2012) have found that greater social anxiety is associated with more frequent emotional disclosure online; in particular, reduced social cues and controllability of the conversation allow for a perceived greater control over the construction of the message, thus diminishing the fear of being negatively evaluated by others and increasing the opportunity of emotional expression. These findings are consistent with the tenets of the TF and emphasize the potential role of social media functioning in supporting compensatory strategies to manage emotional states and improve communication experiences for socially anxious individuals (Nesi et al., 2018a).

Based on the above, we expected cue absence to be associated with decreased frequency of expression and facilitating use of e-motions among nonanxious individuals (H3a), whereas we expected the lack of social cues to benefit e-motional processes in the socially anxious group (H3b). Moreover, we expected asynchronicity to inhibit the two e-motional processes in low socially anxious individuals (H4a), although these negative associations may turn out to be positive for communication, and we hypothesized a positive association between asynchronicity and both expression and facilitating use of e-motions among socially anxious individuals (H4b). Finally, we expected a positive association of visualness with e-motions among socially nonanxious (H5); further, although we could expect such positive associations also among individuals with higher levels of social anxiety, who, due to their well-known difficulties in disclosing emotions, may rely even more on visual content as an alternative way to express themselves, we did not have enough evidence to support this a-priori hypothesis.

1.4 | The current study

In sum, the main aim of this study was to investigate differences in disclosing e-motions and perceived communication on social media in groups of young people with higher versus lower levels of social anxiety. In this regard, we believe that the TF represents an ideal theoretical context to investigate potential differences in the way young users perceive social media features depending on their individual characteristics, to understand their experiences related to online communication with peers. Specifically, in line with the TF, we examined the relative contribution of the social media context, as perceived by participants and represented by specific social media features (i.e., asynchronicity, cue absence, and visualness), in explaining e-motional processes (i.e., expression and facilitating use of e-motions) and, in turn, perceived online communication (in terms of breadth and depth). In doing so, we expected that experiencing high social anxiety might differentiate the role of the

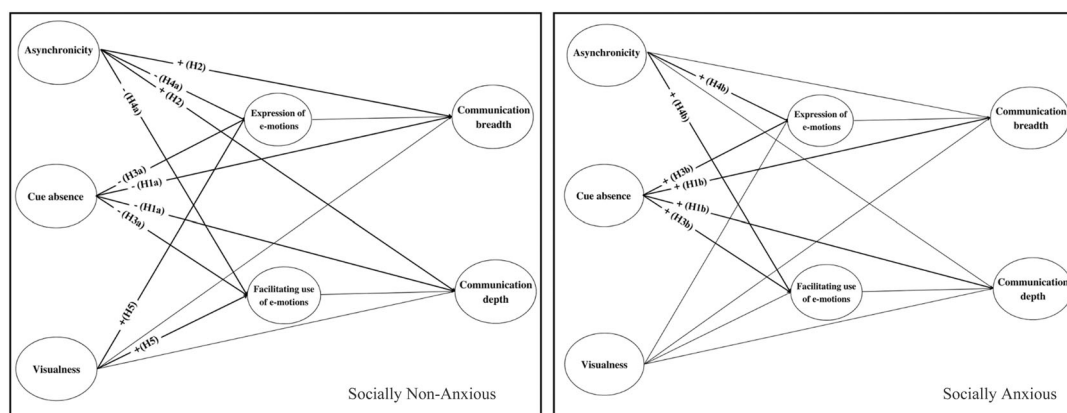


FIGURE 1 Hypothesized associations across groups (on the left: Socially nonanxious; on the right: Socially anxious).

social media features in explaining both emotional and communicative online processes; in other words, social media may provide a means of connecting and communicating with others without the stress and pressure that usually arise in face-to-face interactions; however, this might not be true for socially nonanxious individuals.

For the sake of clarity, the main hypothesized associations in both groups are summarized in Figure 1. Furthermore, we tested the hypothesized model by controlling for participants' gender and age. Gender and age differences have been found in expressions of e-motions and perceived online communication, showing that females, for example, are more likely to express emotions and feelings online and to create more intimate interactions than males, thus perceiving online communication as more supportive; in addition, compared with young adults, adolescents are more likely to self-disclose online and to use emojis to express their feelings easily, also with negative emotions such as anger or sadness. Thus, communicating online might appeal females and younger users more strongly (Peter & Valkenburg, 2006). However, testing age and gender differences was beyond the focus of this study, and we did not formulate specific hypotheses.

2 | METHOD

2.1 | Sample and procedure

The total sample comprised 1046 Italian participants (61.4% females), including 711 adolescents ($M_{\text{age}} = 16.04$, $SD = 1.34$) attending public secondary schools, and 335 young adults ($M_{\text{age}} = 22.1$, $SD = 1.97$) who were recruited through social media platforms. The majority of young adults (more than 80%) were university students, and only 15% of them have a job. Further, 65% of them reported to live with parents, and 31% with university flatmates, while only a small percentage lived alone or with a partner.

Data were collected between November 2021 and September 2022, during a regular school day for adolescents reached in schools, or at any other time for young adults. Parents or participants aged 18 years or older were asked to sign an active consent form. Then, participants completed a series of anonymous self-report questionnaires. Confidentiality was assured and participants were informed they could withdraw from the study at any time with no consequences. The protocol and procedure of the present study were approved by the local Ethics Committee for Psychological Research (protocol n. 4170).

2.2 | Measures

The full list of items, factor loadings, and McDonald's Omega are reported in Table 1.

2.2.1 | Perceived social media features

For the purpose of the current study, we measured asynchronicity, cue absence, and visualness with the Perceived Social Media Features Scale (Angelini et al., 2022). The full scale was developed in Italian starting from the conceptual definition of each feature (Nesi et al., 2018a, 2021) and includes a total of 16 items, two for each feature. The scale has been already used with Italian adolescents and has shown good factorial validity (Angelini et al., 2022). Participants were asked to rate their level of agreement with each item on a 5-point scale (from 1 = *not at all*, to 5 = *completely true*). Then, for each feature, a latent variable was computed with the two respective items (see Table 1).

2.2.2 | Perceived online communication quality

To measure participants' perception of online communication, we used eight items from Peter and Valkenburg (2006) that cover breadth and depth of online communication with four items each. For the purpose of this study, one item that was referred to disclosing about sex was excluded. Participants were asked to rate their level of agreement with each item on a 5-point scale (from 1 = *completely disagree*, to 5 = *completely agree*). Then, for each dimension, a latent variable was computed with the respective four items (see Table 1).

2.2.3 | E-motions

Participants' tendency to express their emotions on social media and to use them to facilitate thoughts and interpersonal relationships were assessed using the respective subscales 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 two dimensions: e-motional perception and understanding and management of e-motions. For the purpose of this study, only e-motional expression and facilitating use of e-motions were used. This scale showed good psychometric qualities in other studies (e.g., Marino et al., 2020) and good reliabilities were also confirmed in this sample (see Table 1). For each dimension, a latent variable was computed with the respective items.

TABLE 1 Standardized factor loadings of the latent variables and reliability for each scale.

Latent variable	Items	Loadings	SE	Ω
Asynchronicity	1. I think that during interactions with others on social media it is possible to take time before answering.	0.59	0.04	0.68
	2. I think that during interactions with others on social media it may be some time before receiving an answer.	0.83	0.05	
Cue absence	1. I think that during social media interactions some aspects of communication (such as voice tone, gestures and facial expressions) may be absent.	0.82	0.04	0.80
	2. I think that social media interactions may lack some communicative signals such as voice tone, gestures and facial expressions	0.81	0.04	
Visualness	1. I think that on social media, photos and videos allow you to express yourself.	0.61	0.04	0.52
	2. I think that on social media communication through photos and videos is very important.	0.58	0.05	
Expression of e-motions	1. I express my emotions through social media.	0.73	0.02	0.76
	2. I let my contacts on social media know if I am happy or sad.	0.76	0.02	
	3. I usually use emoticons or GIF on social media.	0.47	0.03	
	4. My profile on social media reflects what I feel in different situations.	0.68	0.02	
Facilitating use of e-motions	1. Perceiving the emotions of my contacts on social media helps me to think.	0.64	0.02	0.90
	2. If I have to do something important, expressing what I feel on social media helps me.	0.80	0.01	
	3. I express my emotions on social media to improve the relationship with my contacts.	0.79	0.02	
	4. I express my emotions on social media to overcome my difficulties.	0.83	0.02	
	5. If I change the emotion expressed through social media, I see new possibilities.	0.75	0.02	
	6. Knowing the emotions expressed through social media helps me to make decision.	0.78	0.02	
Communication breadth	1. On social media, I talk more easily about different topics than during face-to-face encounters.	0.77	0.02	0.78
	2. On social media, I can more easily change topics than during face-to-face encounters.	0.68	0.02	
	3. On social media, I hear more new information than in face-to-face encounters.	0.65	0.03	
	4. On social media I learn more about different topics than in face-to-face encounters.	0.64	0.03	
Communication depth	1. On social media, I talk more easily about secrets than in a face-to-face encounter.	0.86	0.01	0.91
	2. On social media, I talk more easily about my feelings than in a face-to-face encounter.	0.91	0.01	
	3. On social media, I talk more easily about my concerns than in a face-to-face encounter.	0.89	0.01	
	4. On social media, I talk more easily about being in love than in a face-to-face encounter.	0.73	0.02	

2.2.4 | Social anxiety

To assess participants experiences of social anxiety we used the Italian version of the Social Phobia Inventory (I-SPIN; Gori et al., 2013). The original scale includes a total of 17 items, rated on a 5-point scale (from 1 = *completely disagree* to 5 = *completely agree*), which cover three dimensions (i.e., Fear, Avoidance, and Authority problems). The first dimension is related to the fear of criticism or embarrassment in talking to others (nine items, “I am bothered by blushing in presence of others,” “I am afraid to do things when people may be looking at me”), while the second one refers to the avoidance of those situations which could enhance anxiety symptoms (five items, “The fear of feeling embarrassed leads me to avoid doing many things and talking to people,” “I avoid being the center of attention”). In the current study, we did not consider the third factor, which is specifically related to the fear, and thus avoidance, of talking to people in authority. The I-SPIN showed acceptable psychometric properties and a good capability to assess the presence of social anxiety both in the clinical and nonclinical population (Gori et al., 2013). The Cronbach α in this sample was very good 0.91 (confidence interval [CI] 0.90–0.92). Therefore, answers to each item were averaged to create a unique score of social anxiety.

2.3 | Data analysis

Data analysis was conducted using Mplus 8.3 (Muthén & Muthén, 2017). Before merging the two age-groups in one sample, we compared them to exclude any difference, especially in terms of social anxiety levels. Results from the *t* test analyses reported in Supporting Information (Table A1) evidenced that adolescents and young adults reported very similar mean levels of social anxiety, whereas the group of young adults differed from adolescents only in terms of gender (young adults included a slightly higher percentage of females) and of mean levels of perceived cue absence and visualness (which were slightly higher for young adults). Overall, these differences were considered minimal for the purposes of the current study, and we decided to use a larger group of adolescents and young adults together.

After that, structural equation modeling was performed with the maximum likelihood estimator, with perceived breadth and depth of online communication as dependent variables. The three social media features were the independent variables, while participants' expression and facilitating use of e-motions were included as mediators. In addition, we controlled for participants' gender and age. To evaluate the goodness of the model we considered the fit indices (CFI, RMSEA, SRMR) and the R^2 of each endogenous variable. To calculate indirect effects, bias-corrected bootstrap CIs, with 10,000 bootstrapped iterations, were considered significant when their 95% CI did not include zero.

The model was first tested on the whole sample; then, we compared the pattern of direct and indirect associations across groups of individuals with different levels of social anxiety. Before this analysis, we identified two groups based on their scores on social anxiety. Because a definite cut-off score for social anxiety is not available for the employed scale, we selected individuals with very high score on social anxiety (above the 90th percentile). Specifically, after identifying the participants' score on social anxiety corresponding to the 90th percentile ($M = 3.78$), a dichotomous variable was created so that participants with a score on social anxiety below 3.78 were identified with 0 (nonsocially anxious), while participants with a score on social anxiety equal to or above 3.78 were identified with 1 (socially anxious). This cut-off has been already used in several studies to identify individuals with extreme values on a certain variable (e.g., Chavira et al., 2002), including social anxiety (e.g., Erath et al., 2007; Giannini et al., 2016; Miers et al., 2008).

After that, multigroup invariance test was conducted to examine measurement equivalence across different groups, as a prerequisite to conducting meaningful between-group comparisons (van de Schoot et al., 2012). To assess whether the assumption of invariance was acceptable, negligible changes in value of fit indices (i.e., Δ CFI, Δ RMSEA, Δ SRMR) were considered, that is, a Δ CFI smaller than 0.01 and a change smaller than 0.015 in RMSEA and SRMR (e.g., Chen, 2007). Lastly, a multigroup analysis was conducted to test the model independently for each group and the null hypothesis of equality of the path coefficients across groups was tested with a Wald χ^2 test of parameter equalities (Wang & Wang, 2012, pp. 276–278; see also Gini et al., 2018; Pan et al., 2016; Strohmeier et al., 2012) which allows for specific hypothesis testing. In other words, unstandardized coefficients were compared between groups with different levels of social anxiety to test for differences in the associations between the study constructs (Loehlin, 1998).

3 | RESULTS

3.1 | Analysis on the whole sample

Descriptive statistics and correlations in the whole sample are shown in Table 2.

Results from the SEM model conducted on the entire sample showed a good fit between the model and the data: $\chi^2_{(271)} = 954.09$, $p < .001$; CFI = 0.942; RMSEA = 0.050, 90% CI [0.046, 0.053], SRMR = 0.042. Standardized results are shown in Figure 2. Regarding the significant direct associations, perceived asynchronicity was found to be negatively associated with

TABLE 2 Descriptive statistics and correlations between the study variables in the whole sample.

Variables	M (SD)	1	2	3	4	5	6	7	8	9
1. Gender (% female)	61.4%	—								
2. Age	17.98 (3.24)	−0.06	—							
3. Social anxiety	2.64 (0.87)	−0.21***	0.02	—						
4. Communication breadth	2.79 (0.88)	−0.10**	−0.07*	0.34***	—					
5. Communication depth	2.62 (1.13)	−0.14***	−0.07*	0.35***	0.66***	—				
6. Asynchronicity	3.64 (0.85)	−0.10**	0.16***	0.14***	0.08**	0.07*	—			
7. Cue absence	3.94 (1.01)	−0.13***	0.19***	0.05	−0.05	−0.08**	0.31***	—		
8. Visualness	2.90 (0.83)	−0.11***	0.05	0.07*	0.16***	0.15***	0.20***	0.05	—	
9. Expression of e-motions	2.45 (0.88)	−0.16***	0.13***	0.18***	0.35***	0.36***	0.06	−0.01	0.30***	—
10. Facilitating use of e-motions	2.21 (0.87)	−0.05	−0.01	0.22***	0.42***	0.46***	0.01	−0.09**	0.29***	0.72***

Note: $N = 1046$; gender: females = 0, males = 1.

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

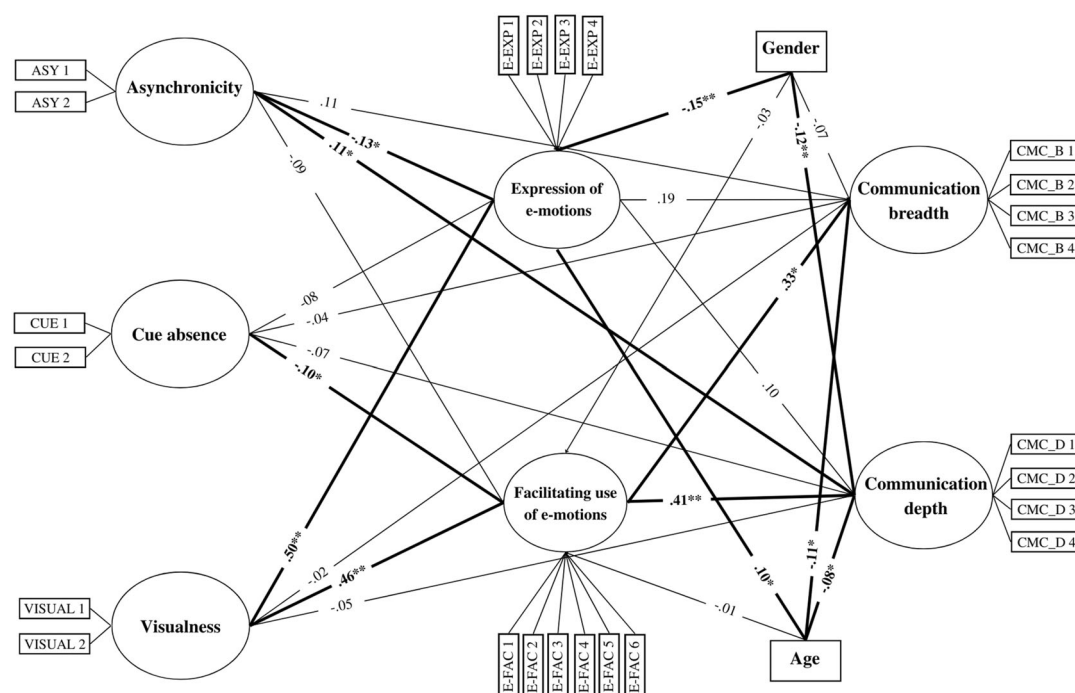


FIGURE 2 Standardized results of the SEM model conducted on the whole sample. $N = 1046$; standardized estimates * $p < .05$, ** $p < .001$. Significantly associations are highlighted in bold.

expression of e-motions, while cue absence was negatively associated with facilitating use of e-motions; conversely, visualness was positively linked to both e-motional factors. Participants' tendency to use e-motions in facilitating thought were positively associated with both perceived breadth and depth of online communication. Finally, participants' age was found to be negatively associated with both perceived breadth and depth of online communication, and positively with expression of e-motions; gender showed significant, negative associations only with perceived communication depth and expression of e-motions.

Overall, the model explained 28% and 27% of the variance for perceived breadth and depth of online communication, respectively, while the explained variance for the mediators was 27.4% for expression of e-motions, and 21% for facilitating use of e-motions.

Along with the direct paths, several significant indirect effects emerged. Specifically, participants' use of e-motions to facilitate interpersonal relationships mediated the associations between cue absence and both perceived breadth ($ES = -0.03$

[CI −0.08; −0.01]) and depth of online communication (ES = −0.04 [CI −0.09; −0.01]); similarly, visualness was indirectly associated with perceived breadth (ES = 0.15 [CI 0.04; 0.27]) and depth of online communication (ES = 0.19 [CI 0.09; 0.30]), via facilitating use of e-motions. Supporting Information (see Table A2) shows results for all tested indirect paths.

3.2 | Invariance test

Configural invariance was tested through an unconstrained model, that is, all parameters were freely estimated in the two groups, and it showed an acceptable fit. Then, two subsequent analyses in which parameters were progressively constrained to be equal across groups confirmed metric and scalar invariance. Full results are reported in Table 3.

3.3 | Multigroup analysis

Once measurement invariance was confirmed, we compared unstandardized path estimates between the two groups (*socially anxious* vs. *socially nonanxious*) to test for significant differences in the associations between the study constructs (descriptive statistics and correlations per group are displayed in Table 4). Results from the multigroup analysis showed a good fit between the model and the data: $\chi^2_{(576)} = 1209.86$, $p < .001$; CFI = 0.938; RMSEA = 0.046, 90% CI [0.043, 0.050], SRMR = 0.048, and standardized results across the two groups are reported in Figure 3. Multigroup analysis was conducted in two steps: (i) first we constrained each path to be equal to test the hypothesis that all (corresponding) paths' estimates did not differ in the two groups; (ii) then, we relied on the overall Wald χ^2 significance to test whether the null hypothesis of equality of the path coefficients across groups was confirmed. Results suggested to refuse the null hypothesis

TABLE 3 Fit indices for invariance tests (Socially nonanxious vs. Socially anxious).

	χ^2	df	CFI	Δ CFI	RMSEA	Δ RMSEA	SRMR	Δ SRMR
Configural invariance	1384.4	560	0.931	–	0.053	–	0.051	–
Metric invariance	1404.4	577	0.930	−0.001	0.052	−0.001	0.052	−0.001
Scalar invariance	1421.8	594	0.930	0	0.052	0	0.052	0

Note: $N = 1046$.

TABLE 4 Descriptive statistics and correlations between the study variables in the two groups (Socially nonanxious: below the diagonal; Socially anxious: above the diagonal).

Variables	Socially nonanxious M (SD)	Socially anxious M (SD)	1	2	3	4	5	6	7	8	9	10
1. Gender (% female)	58.9%	84.7%	–	0.07	−0.09	−0.01	−0.08	0.04	0.12	−0.10	−0.02	0.01
2. Age	17.92 (3.21)	18.5 (3.37)	−0.06	–	−0.20*	−0.01	0.03	−0.01	−0.13	0.04	0.28**	0.11
3. Social anxiety	2.48 (0.73)	4.22 (0.32)	−0.15***	−0.01	–	0.19	0.13	−0.04	−0.04	0.01	−0.05	−0.04
4. Communication breadth	2.73 (0.8)	3.31 (0.84)	−0.07*	−0.09**	0.29***	–	0.60***	0.16	0.13	0.18	0.27**	0.42***
5. Communication depth	2.55 (1.10)	3.32 (1.16)	−0.11***	−0.09**	0.30***	0.65***	–	0.16	0.10	0.08	0.31**	0.39***
6. Asynchronicity	3.61 (0.85)	3.96 (0.83)	−0.09**	0.17***	0.09**	0.05	0.03	–	0.07	0.18	0.11	0.29***
7. Cue absence	3.92 (1.02)	4.04 (0.95)	−0.14***	0.22***	0.04	−0.07*	−0.11***	0.34***	–	−0.11	−0.09	−0.03
8. Visualness	2.88 (0.84)	3.07 (0.81)	−0.11***	0.05	0.04	0.14***	0.14***	0.19***	0.07*	–	0.25*	0.28**
9. Expression of e-motions	2.43 (0.87)	2.65 (0.96)	−0.16***	0.11***	0.19***	0.35***	0.35***	0.04	−0.01	0.31***	–	0.71***
10. Facilitating use of e-motions	2.18 (0.85)	2.44 (1.02)	−0.04	−0.03	0.23***	0.41***	0.46***	−0.03	−0.10**	0.29***	0.72***	–

Note: N (Socially nonanxious) = 946; N (Socially anxious) = 100; gender: *females* = 0, *males* = 1.

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

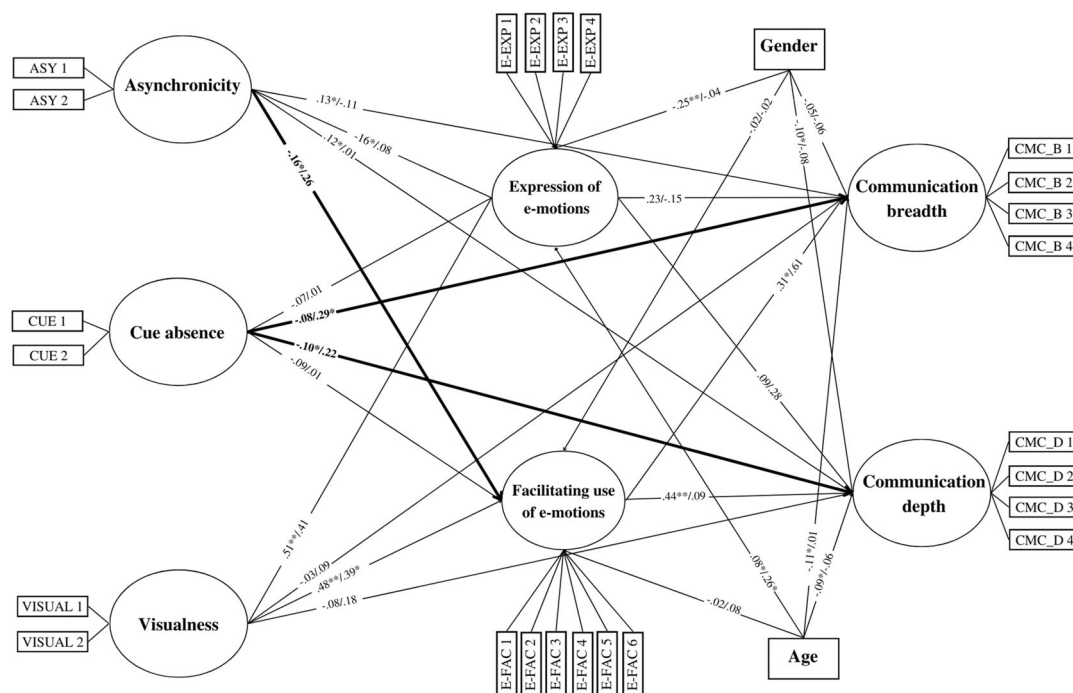


FIGURE 3 Tested model through multigroup analysis in Socially nonanxious versus Socially anxious group. $N = 1046$ (Socially nonanxious = 946; Socially anxious = 100); standardized estimates: Socially nonanxious/Socially anxious; * $p < .05$, ** $p < .001$. Significantly different associations between the two groups are highlighted in bold.

(Wald $\chi^2(24) = 40.48$, $p = .019$), thus indicating that some of the path coefficients differed across the two groups. Then, we repeated the same two steps by constraining one path at a time, to test which were different in the two groups. The Wald test of parameter constraints were statistically significant for the direct associations between cue absence and both perceived breadth (Wald $\chi^2(1) = 6.41$, $p = .011$) and depth of online communication (Wald $\chi^2(1) = 5.79$, $p = .016$), and for the association between asynchronicity and facilitating use of e-motions (Wald $\chi^2(1) = 7.82$, $p = .005$), indicating that these paths were not equal between the two groups. Specifically, cue absence was positively associated with perceived communication breadth in the socially anxious group ($b = 0.30$, $SE = 0.14$, $p < .05$) and negatively, but not significantly, in the socially nonanxious group, ($b = -0.08$, $SE = 0.06$, $p = .17$); the association between cue absence and perceived communication depth, instead, was positive but not significant in the socially anxious group ($b = 0.30$, $SE = 0.16$, $p = .07$), and significantly negative in the socially nonanxious group, ($b = -0.12$, $SE = 0.06$, $p < .05$). Furthermore, the association between asynchronicity and facilitating use of e-motions was significantly negative for socially nonanxious individuals ($b = -0.18$, $SE = 0.06$, $p < .05$), and positive for the socially anxious ones ($b = 0.35$, $SE = 0.18$, $p = .05$). With regard to the indirect paths, we did not find any significant difference across the two groups.

Finally, because the group of young adults was much smaller than the group of adolescents, a sensitivity analysis was conducted by performing multigroup analysis only on the sample of adolescents. The results are reported in the Supplementary materials (Supporting Information: Figure A1) and confirmed the same pattern of findings emerged for the whole sample.

4 | DISCUSSION

Overall, the results of the current study shed light on the relationship between social anxiety and online communication and suggest that specific perceived social media features are—both directly and indirectly—associated with perceived breadth and depth of online communication and that these associations may be to some extent moderated by levels of youth's social anxiety. In this regard, we found evidence both confirming and contradicting our hypotheses. Specifically, the hypothesized different role of cue absence in explaining the two dimensions of online communication across groups (H1a, H1b) was conformed, as well as the positive links between asynchronicity and both breadth and depth of online communication among the socially nonanxious individuals (H2). Similarly, regarding the two e-emotional processes, the hypothesized positive associations with visualness were confirmed in the same group (H5). Conversely, our findings did not allow us to confirm the hypothesized different associations between cue absence and the two-emotional processes across the two groups (H3a, H3b),

while we found only partial confirmation of our hypothesis about the role of asynchronicity in explaining the two e-motional processes (H4a, H4b). Results for each hypothesized association are discussed in depth below.

4.1 | Group differences

Comparing socially anxious and socially nonanxious young individuals, a few differences did emerge. Specifically, we found that the two groups significantly differ in the way perceived cue absence was linked with both dimensions of online communication, thus confirming our first hypothesis (H1a, H1b). The perceived lack of nonverbal cues on social media, indeed, was negatively associated with perceived breadth and depth of online communication for individuals with lower level of socially anxiety, and positively for those with higher social anxiety. That is, the more socially nonanxious youth perceive that social cues could be somewhat absent on social media, the less they report to be satisfied with online communication, compared with face-to-face interactions. For these individuals, the lack of tone of voice, eye contact, or other social cues, therefore, is likely to transform the perceived richness of conversation online, thus potentially hindering communication experiences (Nesi et al., 2018a). This result suggests that individuals with lower levels of social anxiety are more reliant on nonverbal cues for effective communication in a way that, when these cues are absent in online interactions, their satisfaction with the communication experience is reduced. Conversely, socially anxious individuals are more likely to experience greater variety of topics and more intimate interactions thank to the lack of social cues. Cue absence, indeed, may be perceived as an opportunity to have more control on interactions for those experiencing higher social anxiety; online, compared with face-to-face, they can more easily choose whether and how to enrich the conversation with social cues, thus increasing their sense of comfort and experience for more intimate and satisfactory interactions. In this sense, when interacting online, socially anxious youngsters might experience from more effective communication as they do not necessarily have to rely on social cues.

About our second hypothesis (H2), as expected, the associations between asynchronicity and the two dimensions of online communications was found to be positive and significant among socially nonanxious individuals. That is, such individuals are likely to engage in asynchronous online communication and perceive it as positive and many reasons may explain this association. For example, the possibility for a better time management on social media, compared with what occurs during offline interactions, may increase the perception of control on the conversations; further, asynchronicity may help reducing social influence (e.g., the pressure to respond quickly to a request) and may promote a more comfortable and relaxed environment for communication. Additionally, asynchronous online communication offers the benefit of saving messages or to refer back to them, which may contribute to the usefulness and relative positive perception of online communication. Thus, asynchronicity has become an important aspect of perceived breadth and depth of online communication for many individuals, regardless of potential social difficulties experienced offline.

In exploring the role of visualness in association with the dimensions of perceived online communication, no statistically significant associations emerged in any of the two groups. However, such associations were found to be positive for the socially anxious individuals and, contrary to what we expected, they were negative among the socially nonanxious ones. Thus, further research is warranted to better investigate the role of visualness in perceived online communication, by considering other potential individual processes in between (e.g., the ability to interpret the visual content), which could help in explaining this association.

Concerning the association between social media features and e-motional processes, no significant differences emerged in the two groups related to the role of cue absence, thus not allowing us to confirm our third hypothesis (H3a, H3b). One possible explanation is that individuals with high levels of social anxiety may already have a heightened sensitivity to social cues, even in the absence of explicit cues on social media. Therefore, the absence of cues on social media may not have a significant impact on their emotional processes. On the other hand, individuals with low levels of social anxiety may rely more on explicit social cues in online interactions, and the absence of these cues on social media could have a greater effect on their emotional experiences. However, further investigation is necessary to confirm this explanation and gain a comprehensive understanding of how reduced social cues on social media may differently affect online emotional factors in individuals with high versus low levels of social anxiety.

Regarding the role of asynchronicity in association with e-motional processes, our fourth hypotheses (H4a, H4b) were partially confirmed. Specifically, as expected, asynchronicity was significantly and negatively linked to both expression and facilitating use of e-motions among socially nonanxious individuals, while the same associations were positive, but not significant, in the group of socially anxious. However, these hypothesized opposite associations were found to be significantly different between the two groups only with regard to the relation between asynchronicity and facilitating use of e-motions. In other words, socially anxious young individuals would benefit from asynchronous conversation while interacting online, because of the facilitated emotional engagement, which is instead reduced among socially nonanxious individuals, specifically regarding the use of online emotions to stimulate interpersonal interactions. These findings support the existing research about socially anxious individuals' preference for online conversations, where the time delay between messages allows for

higher control on their thoughts and emotions (Peter & Valkenburg, 2006; Schouten et al., 2007); online communication may help socially anxious individuals to feel more emotionally connected to others, by enhancing their perceived social interactions, compared with the face-to-face context. On the other hand, socially nonanxious individuals may rely more on offline, real-time conversations, where they can experience a higher level of emotional engagement; as such, the use of online emotions may not be as important to them, as they are comfortable expressing their emotions in person.

Finally, as expected, strong positive associations of visualness with both expression and facilitating use of e-motions emerged in the group of socially nonanxious individuals, thus confirming our fifth hypothesis (H5). Therefore, the higher is the perceived emphasis on visual content on social media, the more adolescents and young adults are likely to engage in emotional processes online; visualness, indeed, may allow users to rely on sharing photos or videos to convey expression, tone, and emotions within conversation, thus also compensating for cue absence. In line with the findings from a previous study (Angelini et al., 2022), the increasing prevalence of visual content on social media platforms seems to play an important role in emotional processes and to create a more immersive and authentic online experience. Similarly, these associations were found to be positive also among socially anxious individuals, although only the link between visualness and facilitating use of emotions was significant; such findings suggest that the integration of visual elements into social media platforms is changing the way youngsters socially interact, and represents an additional tool, not available in the offline world, which can be equally beneficial for everyone, regardless of the level of social anxiety. However, further research is needed for a comprehensive understanding of the mechanisms underlying the potential association between perceived visualness on social media and online emotional factors, and whether and how different levels of social anxiety play a role in these associations.

4.2 | Limitations and implications

Among the limitations of this study, first the cross-sectional design does not allow to draw definitive conclusions about the directionality of the associations, and we could not exclude possible reverse causality. Longitudinal research would help in establishing the temporal relationship between the variables of interest and provide a better understanding of the causal directionality. Moreover, because we are not dealing with clinical samples, a short-term longitudinal study (e.g., few months) could also allow to capture potential fluctuations or patterns in the level of social anxiety and their causal associations with emotional processes and related perceived communication through social media platforms.

Second, the sample strategy used to identify socially anxious individuals resulted in having a group which was inevitably much smaller than the nonanxious one, and it did not allow for adequate statistical power; this could also explain why some group differences did not emerge as significant in the analysis, even though the paths were in opposite directions. Therefore, future research involving participants from the general population should consider using a larger sample size for this kind of comparisons; in addition, it would also be important to conduct similar studies by comparing a sample of clinically anxious young people with individuals without a diagnosis of social anxiety.

Finally, the use of self-report questionnaires with all their inherent shortfalls should be acknowledged; in this regard, although we found preliminary evidence of the factorial structure of the social media features scale (Angelini et al., 2022), in the current study we found low McDonald's omega value, specifically with regard to the measure of "visualness." Further analyses are needed to fully establish the validity and reliability of this new measure.

These limitations notwithstanding, this study offers a preliminary contribution to answer the question of how individuals with social anxiety can be supported in online communication contexts. For example, our findings may guide developmental psychologists in implementing both prevention and intervention activities to maximize the benefits related to youth online communication. Such opportunities may be particularly important for more socially vulnerable individuals, as they may remove barriers to the development and maintenance of close relationships that are pivotal for well-being during adolescence and emerging adulthood. Thus, a more person-centered perspective is necessary for a better understanding of contemporary peer experiences on social media, for example by focusing on unique needs, characteristics, and circumstances of each individual to avoid over-generalizing findings. Apart from social anxiety, indeed, youngsters may have varying levels of vulnerability, or strengths, on other factors (e.g., the quality of social, family, or cultural contexts) and their experiences on social media may vary accordingly. In this sense, it would be advisable to tailor interventions and activities by customizing strategies to meet the specific needs of different individuals.

4.3 | Conclusion

Since social media context provides youth an extension of offline interactions with peers, this study adds to our understanding of online communication experiences and partially supports the potential beneficial role of specific social media features for more socially vulnerable individuals. By moving beyond the dichotomy of social media enhancing or

hindering individual and relational well-being, this study highlights the importance of embracing both perspectives to fully understand adolescents' digital life.

AUTHOR CONTRIBUTIONS

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 performed study supervision. All authors read and approved the final manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

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

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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