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Theory of Mind Predicts Emoji Comprehension in a Sample of Early Adolescents: The Moderating Effect of Social Media Use

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Abstract

Despite the widespread use of social media and communication apps among early adolescents, little is known about which psychological variables affect their comprehension of emojis, i.e., pictograms delivering emotional cues in digital messages. To fill this gap, the present study explores the role of Theory of Mind (ToM) in emoji comprehension at the boundary condition of low vs high Social Media Use (SMU), in a sample of 303 Italian early adolescents (134 females) aged between 10 and 14 years old. Participants completed an SMU scale, two ToM measures, namely the Reading the Mind in the Eyes test and Real/apparent Emotions task, and an emoji comprehension task. Results showed that both ToM measures positively predicted emoji comprehension. Moreover, there was a significant interaction between the Real/apparent Emotions task and SMU, with stronger relationships between ToM and emoji comprehension for low SMU. Separate analyses with easy- and difficult-to-classify emojis as dependent variables showed the same interaction effect only on easy emojis, while we found no significant interaction effect on difficult emojis. Taken together, these results suggest that youngsters less familiar with social media rely on ToM to encode and decode emojis and interpret digital messages. Conversely, the more they use social media, the more automated this task becomes. In this sense, ToM training could be relevant to promote preparatory skills among early adolescents starting to approach digital communication.

Keywords: Theory of Mind; affective ToM; emoji; social media; digital communication; adolescence

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Introduction

While the debate on whether social media benefits or harms (pre)adolescents' development is ongoing (Marciano & Viswanath, 2023), more than five billion people use them worldwide, many of whom are -indeed- youngsters. In 2022, individuals spent about two-and-a-half hours on social media each day (Montag et al., 2024). About half of American teens declare to be "almost constantly" online (Anderson & Jiang, 2018). By 2020, social media had become a routine part of daily life for many children in Europe, with more than half of 9- to 16-year-olds using social networking sites at least weekly in most countries (Smahel et al., 2020). While older children were the most active users, even younger children were actively engaged with social media. For instance, 11% of 9- to 11-year-olds in Germany and as many as 45% in Serbia accessed social networking sites every day, with both boys and girls showing similar engagement rates (Smahel et al., 2020). This trend intensified in the subsequent years, particularly during the COVID-19 pandemic (Hamilton et al., 2022). During this time, social media emerged as the principal platform for adolescents to engage with peers and stay informed about global events. After the pandemic, social media remained a privileged context for youth interaction, thus making digital networks one of the main media for adolescents' communication (Hamilton et al., 2023). According to the European Youth Portal, in 2022, 84% of young Europeans used the internet to participate in social media networks.

Italian youngsters do not differ from the statistics described so far (Bozzola et al., 2022). The 2016 OssCom survey revealed that 86.5% of adolescents have at least one social media profile, with WhatsApp (37.3%), Facebook (36.5%), and Instagram (18.8%) being the most popular media platforms (Mascheroni & Ólafsson, 2018) to share information, interact with peers, and ultimately aid identity development (Uhls et al., 2017). Hence, critical and mindful engagement with social media is essential in building positive social relationships, especially for (pre)adolescents, whose development is marked by significant cognitive, emotional, and social growth (Meeus, 2016).

In social media, a form of communication often employed by (pre)adolescents entails emojis (Kralj Novak et al., 2015), which, mimicking real-word facial expressions, allow users to express and recognize emotions and communicative intentions. Accurately interpreting emojis can, therefore, be considered essential for engaging in successful online communication. In this sense, one psychological skill that could be relevant to facilitate *even* online communication is Theory of Mind (ToM), which is the ability to attribute mental states, such as beliefs and emotions, to oneself and others (Baron-Cohen, 1995). ToM supports the ability to reason about the conversational partners' beliefs, intentions and desires to make sense of their (often ambiguous) language and behaviour (Baron-Cohen et al., 2000). The role of ToM has been widely investigated in traditional communication processes (Hughes & Leekam, 2004; Peterson et al., 2012). For instance, De Rosnay et al. (2014) found that children's performance on ToM tasks significantly predicted their competence in everyday conversational interactions, even when controlling for differences in language ability, shyness, emotion understanding, and age. However, little is known about what psychological and environmental prerequisites affect young people's comprehension of digital messages (Cherbonnier & Michinov, 2021) and whether ToM plays a role in this context, especially for the interpretation of emojis. Importantly, these pictograms became so widespread in digital communication to such an extent that, in 2015, Oxford Dictionaries conferred the title of "Word of the Year" to the "Face with Tears of Joy" emoji (😂; Seargeant, 2019).

Emojis: Definition and Previous Research

In face-to-face communication, verbal cues convey content, while non-verbal signals, such as facial expressions, elicit affective, inferential, and social responses (Erle et al., 2022). As communication increasingly shifts from in-person to digital environments, emojis serve a similar function to non-verbal signals (Boutet et al., 2021). Emojis are graphic symbols that represent a wide variety of concepts, including facial expressions, abstract concepts, and feelings, as well as animals, plants, activities, gestures/body parts, and objects (Rodrigues et al., 2018). They are useful in filling in emotional and pragmatic cues that are otherwise missing from typed conversation (Seargeant, 2019). By mimicking real-world facial expressions, emojis impact the interpretation of the sender's emotions and communicative intentions (Boutet et al., 2021; Hand et al., 2022). Researchers have proposed that emojis not only convey emotional content in computer-mediated communication (Bai et al., 2019), but also perform pragmatic functions, such as signaling the illocutionary force of the utterance (Dresner & Herring, 2010), reducing ambiguity (Kralj Novak et al., 2015), facilitating the recognition of the indirect meanings of sentences (Holtgraves & Robinson, 2020), or amplifying the emotional perceptions of messages (Boutet et al., 2021; Erle et al., 2022). They may be used to soften threatening formulations (Sampietro, 2020), suggest an ironic tone (Du, 2024), or act as politeness markers (Skovholt et al., 2014). In other words, emojis might be considered substitutes for facial expressions in digitally mediated communication (Bai et al., 2019).

A growing body of research has emerged in recent years examining the use of emojis (see review by Bai et al., 2019). However, research investigating emoji comprehension or use by children and adolescents remains scarce. Within this limited body of research, Hougaard and Rathje (2018) conducted a study on a sample of young Danes (ages 10–19), revealing that 86% of respondents reported using emojis at least once a day to convey their mood or for entertainment purposes. Furthermore, it has been observed that even children who do not have social media experience can interpret basic emotions conveyed by emojis, such as happiness and sadness (da Quinta et al., 2023; Oleszkiewicz et al., 2017). To the best of our knowledge, however, no studies have investigated the youth's understanding of more complex emotional nuances, which we argue are particularly relevant for (pre)adolescents.

Indeed, adolescence is characterized by significant emotional and social milestones: Specifically, the age range of between 10 and 14 years old, corresponding to the so-called "early adolescence" (Sawyer et al., 2012), is marked, among other milestones, by the prominent role of peer interactions, which are especially relevant to social media use (Hamilton et al., 2023). According to a recent qualitative study (Winstone et al., 2023), most early adolescents perceive social media as beneficial for social connectedness. However, social media, through their specific features, has also introduced additional complexities to the interactions of today's adolescents (Winstone et al., 2023), among which is the absence of facial cues useful to interpret each other's communicative intention, which emojis are meant to make up for.

Given the central role of emojis in digital communication and the premises outlined above, it is imperative that adolescents can accurately interpret their meaning to engage in effective online interactions. However, the question of which psychological skills facilitate such interpretation remains unanswered. In the present work, we aim to explore the role of ToM, in interaction with an environmental one, social media use (henceforth SMU) frequency, in determining early adolescents' emoji comprehension.

Theory of Mind

ToM is the process of understanding others' emotions and mental states and is crucial for effective social interactions (Ramezani et al., 2020). ToM involves attributing mental states such as beliefs, desires, intentions, and emotions to oneself and others, and using these attributions to predict and explain behaviours (Baron-Cohen, 1995). It includes affective ToM, which relates to understanding emotions, and cognitive ToM, which encompasses inferring knowledge, intentions, and beliefs (Gabriel et al., 2021).

As effective communication depends on interpreting mental states, ToM is crucial for understanding both nonverbal and verbal behaviours (Sullivan et al., 1994). It enables individuals to comprehend beliefs, intentions, and the variability of internal states across people (Chandler & Lalonde, 1996; Sullivan et al., 1994). ToM is also essential for interpreting non-literal language such as irony, jokes, and metaphors (Mayes et al., 1994). Children with limited ToM struggle with irony (Happé, 1993) and distinguishing lies from sarcasm (Winner & Leekam, 1991), indicating deficits in pragmatic competence, i.e., the ability to understand contextually appropriate discourse (Levinson, 1983). Additionally, ToM enhances communication by making speakers aware of the listener's internal states, thus improving their ability to gauge comprehension and interest (Fernández, 2013). While ToM is known to predict effective face-to-face communication (Baron-Cohen et al., 2001), its role in online communication remains underexplored. Social media has become a significant environment for young people's social development, partially replacing offline friendships (Chambers, 2013). Therefore, studying ToM in digital interactions is crucial. Preliminary evidence from marketing research suggests that social network use might enhance teenagers' ToM, in turn helping them resist false and deceptive commercial content (Gentina et al., 2021). Similarly, ToM emerged as a key predictor of children's and adolescents' understanding of the implicit selling intent in influencers' videos (Castonguay, 2022). Not only: a recent study (Li et al., 2024, Study 4) documents preliminary evidence of ToM's involvement in the cognitive processing of emojis by reporting a correlation between ToM and working memory (WM) capacity when the stimuli to be processed are emojis. Overall, these studies suggest that ToM's role in decoding digital communication is multifaceted, including facilitating pragmatic language use.

With more and more young people communicating online (Smahel et al., 2020) and considering their extensive use of emojis, understanding whether and how ToM influences emojis interpretation becomes crucial. Such analysis must however also consider early adolescents' familiarity with emojis, thus incorporating the frequency of SMU into the equation.

Social Media Use

Social media (SM) refers to online activities that expand the ways people interact (Aichner et al., 2021), including the use of communication platforms (e.g., WhatsApp, Telegram) and social networks (SN: e.g., Facebook, Twitter, Instagram), that is web-based services that allow individuals to design a (semi)public profile within a bounded system and connect with other users (Boyd & Ellison, 2007). SMU is spreading exponentially among children and adolescents worldwide (Dingli & Seychell, 2015), especially that of SN (Radesky et al., 2015). The age of initial use of SN is progressively decreasing: A recent scoping review (Jungselius, 2024) reports that, in 2023, nearly all children between ages 3 and 17 worldwide have been somehow online. Remarkably, 50% of them used at least one social media app regularly and, by age 11, nine out of ten owned a mobile phone connected to social networks (Ofcom, 2024). In Italy, 84% of children aged 9 to 17 accessed the internet daily via their smartphones, making it their primary gateway to the online world (Smahel et al., 2020). An ISTAT analysis reported that 85.8% of Italian (pre)adolescents aged 11 to 17 years old regularly use smartphones, and over 72% use them to access the internet (Istituto Nazionale di Statistica, 2019). According to Tremolada et al. (2022), Italian adolescents spend more than three hours per day on WhatsApp and more than two hours per day on Instagram, while the use of Facebook is, on average, 35 minutes. Recent national data from the 2024–25 ASAP Project further emphasize this trend. The study found that 89% of middle school students own a smartphone, with 42% receiving it at age 11, 26% at age 10, and 21% even earlier. Social media usage is heavily concentrated around a few key platforms, with WhatsApp (89%) being the most used, followed by SNs such as TikTok (55%), and Instagram (54%; Social Media Kids, 2025). Motivations for using SN refer to identified group belonging, collective self-esteem, communication with peers, and entertainment (Barker, 2009). Overall, SM is currently the most popular tool for connecting and communicating within this age group (Zilka, 2021). SMU plays a crucial role in adolescents' familiarity with emojis, which might enhance their ability to understand and interpret these symbols. Thus, social media use may influence the relationship between ToM and emoji comprehension.

The Present Research

Moving from its role in decoding emotions during face-to-face interaction, this study explores how affective ToM, traditionally involved in interpreting emotions face-to-face, predicts emoji comprehension among early adolescents, namely middle school students (Mascia et al., 2023). Specifically, it examines the "Reading the Mind in the Eyes" and "Real/Apparent Emotions" tasks and their association with emoji comprehension. Additionally, the study tests whether SMU moderates this association and investigates potential differences in SMU's moderation effect based on perceived emoji difficulty. Based on existing literature, we formulated the following hypotheses.

H1: Both ToM tasks are positively associated with emoji comprehension.

H2: The relationship between ToM tasks and emoji comprehension is moderated by SMU. Moving from the assumption that exposure to social media might enhance familiarity with emojis, thus boosting their comprehension and reducing the use of ToM resources, stronger associations are expected for participants with lower SMU scores.

H3: For the same reasons, when distinguishing between "easy-to-classify" and "difficult-to-classify" emojis as dependent variables, we hypothesize that SMU will exert a more pronounced moderating influence on the comprehension of the former. Simpler emojis tend to have widely recognized meanings; as a result, frequent SMU users may be more accustomed to interpreting them effortlessly. This may diminish the role of ToM. Conversely, emojis that are challenging to categorize may necessitate more sophisticated inferencing processes, where ToM abilities remain paramount irrespective of SMU exposure.

Methods

Participants

An a-priori power analysis was run with G*Power (Faul et al., 2007). For a regression analysis with five predictors (i.e., the two ToM tasks, SMU, and the interaction effects between each ToM task and SMU). As we did not have a prior effect size from previous studies to guide our calculations, we opted for a conservative approach by selecting an effect size typical of a small-to-medium value (ρ^2 = 0.06), an alpha level of .05 (two-tailed), a power of .80. Results revealed that a total sample size of at least N = 207 would be required. Overall, 303 early adolescents aged between 10 and 14 years (M_{age} = 12.37, SD_{age} = 1.09; 134 females) attending a public middle school located in Northern Italy were enrolled in the study. Importantly, this regional and socio-demographic context can be considered broadly representative of the area and in general in line with the characteristics of the Central-Northern Italian territory. Data was collected from April to December, 2023.

All students attending the school at the time of data collection were invited to participate in the study. Parents/legal guardians provided informed consent for the participation of their children in the study. Students who did not received consent to participation from both parents/legal guardians were not administered the questionnaire. The study was conducted under the Declaration of Helsinki, and IRB approval was obtained by the Ethics Committee of the University of Modena and Reggio Emilia (protocol number 0282543).

Measures

Each participant completed an anonymous online tool administered collectively during school time. The tool consisted of three sections, comprising both questionnaires and tests.

Socio-Demographic Data and SMU

The first section assessed participants' socio-demographic characteristics and their SMU employing an adaptation of the Experience Sampling Method (ESM) Social Media Use Questionnaire (E-SMUQ: Beyens et al., 2021). Per each media (WhatsApp, Telegram, Facebook, Instagram, and TikTok), we asked participants how frequently (Likert-type scale from 0 = *Never* to 4 = *More than four hours per day*) they used it to (a) *send text messages*; (b) *read text messages*; (c) *post on the platform*; and (d) *scroll to read other people's posts*. Subsequently, an "SMU score" was computed by summing the average frequency reported on each platform. The measure showed excellent internal consistency, with a Cronbach's α of .88.

Affective ToM

The second part of the questionnaire included two measures of affective ToM. The "Reading the Mind in the Eyes" questionnaire (Baron-Cohen et al., 2001), children's version, is a validated ToM measure comprising 28 items (pictures of gazes) and is one of the most used worldwide to test affective ToM. Participants are required to select the correct emotion each gaze expresses out of four alternatives. Each correct answer is awarded 1 point, with overall scores ranging from 0 to 28. To test internal consistency, we calculated the Kuder-Richardson 20 (KR-20) coefficient, which is the alternative to Cronbach's alpha for binary data. Results revealed that the measure had a KR-20 coefficient of .55 (moderate), in line with previous research (e.g., Gooding & Pflum, 2011; Sherman et al., 2015; Vellante et al., 2013).

In the "Real/Apparent Emotions" task (Sidera et al., 2011, 2013), children are presented with four double-scene scenarios in which protagonists are "faking" their emotions. Participants are asked what emotion is really experienced by the characters and to justify their answers. While in the original version, the test is administered face-to-face, we designed an online version with open questions for the participants to justify their answers. For each scenario, one point is given for the correct identification of the emotion and, according to the complexity of the answer and the reference to mental states, 0 to 2 points can be awarded for the explanation. Two experts discussed how to evaluate each explanation and involved a third expert in case of disagreement, until a full consensus was reached. This scoring criterion is derived from the false belief task and typically shows good test-retest reliability, as well as strong test-retest correlations in samples of children of all levels of ability (Hughes et al., 2000). Scores can range between 0 and 24. The instrument showed good internal consistency in our sample (α = .75).

Emoji Comprehension

Lastly, we selected 35 facial emojis depicting specific emotions to test participants' emoji comprehension. From a theoretical perspective, we selected the emotions based on Plutchik's (2003) psychoevolutionary theory, which, unlike other models (e.g., Russell, 1980), focuses not only on the emotion's valence and arousal but also on the developmental progression of emotion comprehension. According to it, emotions are structured hierarchically, with "innate" primary emotions forming the core from which more complex emotions, namely, secondary and tertiary, develop. Secondary emotions (e.g., guilt, pride) are also called "self-conscious", as they provide the ability to evaluate one's actions compared to societal norms and emerge during childhood (Saarni, 1999). Tertiary Emotions (e.g., shame, anxiety) arise from combinations of primary and secondary emotions. They emerge from even more sophisticated social and cognitive processing. Given the well-developed nature of primary emotions by this stage (Saarni, 1999), our task was expanded to include secondary and tertiary emotions to obtain a more comprehensive understanding of higher-order emotional development.

To operationalize the identified emotions, we selected our target emojis based on the Unicode v15 classification (unicode.org; e.g., Davis & Edberg, 2024) and the meaning assigned to them by Emojipedia.org, as proposed by Ferré et al. (2023)[1]. The emojis we selected also meet a stability of interpretation criterion (Ferré et al., 2023; Kutsuzawa et al., 2025). As emoji design varies across services (i.e., Twitter, Instagram, Facebook, and WhatsApp), the present study, based on its prominent use among adolescents in Italy (Mascheroni & Ólafsson, 2018), used the designs displayed on WhatsApp. The emojis were saved as image files and sized to ensure that participants could observe them clearly (3.00×3.00 cm). Participants had to select the correct emotions each emoji represented, among four alternatives. Given the complexity of discerning the appropriate emotion from facial expressions, which is further influenced by cultural variations (Russel, 1994), we employed a forced-choice response format. This method is also particularly suitable for the age group of our participants (Harrigan, 1984; see also Betz et al., 2019, for a study on emojis' labelling). To design an adequately challenging task, each item included four alternatives: the correct emotion and three distractors, each systematically varying along dimensions of arousal and hedonic tone. Distractors could match the correct response in either arousal (i.e., high or low) or hedonic tone (i.e., positive or negative valence) or both. In the latter case, the distractor belonged to a different primary semantic area (e.g., fear vs. anger, both high-arousal negative emotions). To envision the complete set of items and response alternatives, please refer to Table A2 in the Supplementary Material. One point was attributed to correct answers; scores ranged between 0 and 35. The scale showed satisfactory internal consistency, with a KR-20 coefficient of .76.

Data Analysis

First, we computed the scores for all the variables. The scores obtained at the "Reading the Mind in the Eyes", the "Real/Apparent Emotions", and the emoji comprehension task were obtained by totaling the correct answers. SMU was expressed as the sum of the average time spent on each social media, to have a realistic picture of the time overall employed online by the participants. All the analyses were performed with R (R Core Team, 2024). Per each variable, we computed descriptive analyses and calculated the correlations among variables, as a preliminary analysis, employing the packages *psych* (Revelle, 2024) and *sjPlot* (Lüdecke, 2025), respectively. We then performed three linear regression models to test our hypotheses. In each model, the two ToM tasks were the predictors and SMU was the moderator. In model 1, overall scores in the emoji comprehension task were the dependent variable, while in models 2 and 3, dependent variables were scores on the comprehension of easy- and difficult-to-classify emojis, respectively. Additionally, we computed partial eta-squared for each term in the three models, employing the package *effectsize* (Ben-Shachar et al., 2020). To disentangle significant interaction effects, when emerged, we ran simple slope analyses, employing the package interactions (Long, 2024). To graphically represent the results, we employed the package *effects* (Fox & Weisberg, 2019).

Results

Preliminary Analyses

Descriptive analyses for all the main variables, as well as the correlations among them, are presented in Table 1. Both the "Reading the Mind in the Eyes" task and the "Real/Apparent Emotions" task are correlated positively and significantly to the emoji comprehension task, while they are marginally and positively correlated to one another. Based on this premise, we proceeded to test the linear regression models.

Table 1. *Means, Standard Deviations, and Correlations Among Study Variables (N = 303).*

	M(*SD*)	Eyes	RealApp	SMU	Emoji	Easy Emoji	Difficult Emoji
Eyes	17.35(3.56)	—					
RealApp	13.74(4.64)	.11	—				
SMU	4.50(3.43)	−.01	.01	—			
Emoji	25.03(4.87)	$.19^{***}$	$.58^{***}$	.07	—		
Easy emoji	12.48(1.99)	$.13^{*}$	$.47^{***}$	.09	$.85^{***}$	—	
Difficult emoji	12.61(3.26)	$.20^{***}$	$.56^{***}$	.05	$.95^{***}$	$.63^{***}$	—

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

Main Analyses

To test H1 and H2, we conducted a linear regression model with the score of the emoji comprehension task ("emoji") as the dependent variable, the score at "Reading the Mind in the Eyes" ("eyes") and the "Real/Apparent Emotions" ("realapp") tasks as the predictors, and SMU ("mediause"; mean-centred) as the hypothesized moderator.

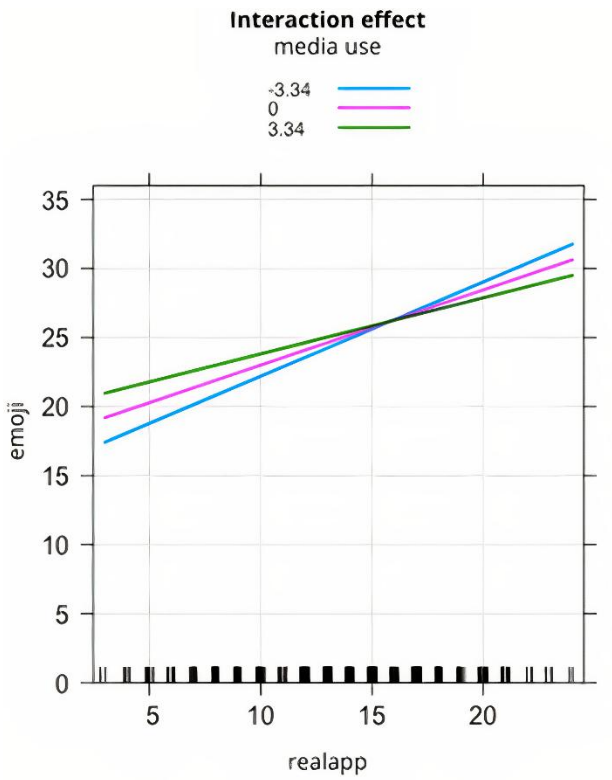
Results (portrayed in Table 2) showed that both the Eyes and the Real/Apparent Emotions tasks were positively and significantly associated with the emoji comprehension task, while no direct effect of SMU emerged. Moreover, we found a significant and negative interaction between the Real/Apparent Emotions tasks and SMU. We computed the partial association for each term in the model and found that that Real/Apparent Emotions task had the largest effect on emoji comprehension, while the Eyes test, as well as the interaction between the Real/Apparent Emotions tasks and SMU, had modest effects. SMU and the interaction between SMU and the Eyes test had negligible effects (Cohen, 1988).

Table 2. *The Association Between the ToM Tasks and Emoji Comprehension at the Boundary Condition of Social Media Use (+/−1SD).*

	Emoji Comprehension				
Predictors	*b*	Std. Error	*t*-value	*p*-value	η_p^2
Intercept	13.809	1.295	10.663	< .001	—
Eyes	0.216	0.066	3.288	.001	0.03
RealApp	0.544	0.050	10.799	< .001	0.30
SMU	0.629	0.419	1.501	.134	0.006
Eyes*SMU	0.002	0.021	0.074	.941	0.000
RealApp*SMU	−0.041	0.016	−2.517	.012	0.02
Adjusted R^2			.316		

To unpack the significant interaction effect, we ran a simple slope analysis, testing the effect of the Real/Apparent Emotions tasks across the levels of SMU (−1SD, +1SD). As shown In Figure 1, the relationship between the Real/Apparent Emotions task score and emoji comprehension was stronger at low ($b = 0.68$, $SE = 0.07$, $p < .001$) levels of SMU, whereas it was weaker at high levels of SMU ($b = 0.41$, $SE = 0.07$, $p < .001$; see Figure 1). This result is consistent with the hypotheses of a stronger association between affective Theory of Mind and emoji comprehension in the case of low SMU.

Figure 1. *The Moderation of Social Media Use in the Model for Emoji Comprehension.*



To identify differences in emoji comprehension, we categorized emojis based on correct response rates, using an 80% accuracy threshold (Kaplan & Saccuzzo, 2017). Fourteen emojis were classified as easy-to-classify, and twenty-one were classified as difficult-to-classify (see Table A2 in the Supplement Material for a more detailed comment on this classification).

We then conducted two regression models identical to the principal one, one with easy-to-classify emojis and one with difficult-to-classify emojis as dependent variables. In both models, the predictors were the scores at "Reading the Mind in the Eyes" and at the "Real/Apparent Emotions", while SMU (mean-centred) was again the hypothesized moderator.

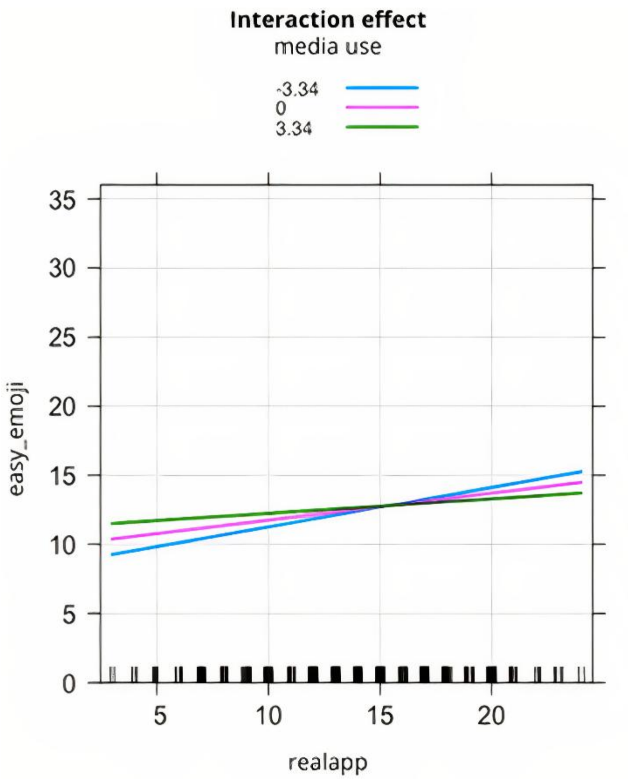
In the model for easy-to-classify emojis (Table 3, Panel A), we found results mainly consistent with the main model. The Real/Apparent Emotions task was positively and significantly associated with the emoji comprehension task, while for the Eye task only we only found a marginal effect. This time, we also found a significant and positive main effect of SMU. In line with previous results, the interaction between the Real/Apparent Emotions tasks and SMU had a statistically significant and negative association with emoji comprehension. Partial eta squared calculations were generally consistent with previous results: the Real/Apparent Emotions tasks had a moderate effect, while its interaction with SMU had a modest effect. Both the Eyes task and SMU had minimal effects, while their interaction had negligible effects (Cohen, 1988).

Table 3. *The Association Between the ToM Tasks and Both Easy-to-Classify vs Difficult-to-Classify Emoji Comprehension at the Boundary Condition of Social Media Use (+/−1SD).*

	Panel A: Easy-to-classify Emoji Comprehension					Panel B: Difficult-to-classify Emoji Comprehension				
Predictors	*b*	Std. Error	*t*-value	*p*-value	η_p^2	*b*	Std. Error	*t*-value	*p*-value	η_p^2
Intercept	8.885	0.551	16.125	< .001	—	5.080	0.858	5.920	< .001	—
Eyes	0.053	0.028	1.890	.060	0.01	0.131	0.044	3.000	.003	0.03
RealApp	0.195	0.021	9.092	< .001	0.23	0.383	0.034	11.367	< .001	0.32
SMU	0.361	0.178	2.025	.044	0.01	0.270	0.278	0.971	.333	0.003
Eyes*SMU	0.003	0.009	0.368	.713	0.000	−0.001	0.014	−0.102	.919	0.000
RealApp*SMU	−0.027	0.007	−3.875	< .001	0.05	−0.015	0.010	−1.376	.170	0.006
Adjusted R^2	.257					.326				

Again, we then ran a simple slopes analysis, assessing two slopes in total (−1*SD*, +1*SD*; Figure 2). All slopes were significant but when SMU was equal to +1SD the relationship between the Real/Apparent Emotions tasks score and emoji comprehension was weaker ($b = 0.10$, $SE = 0.03$, $p < .001$).

Figure 2. *The Moderation of Social Media Use in the Model for Easy-to-Classify Emoji Comprehension.*



This result was in line with the main model pattern: when emojis are easier to decode, ToM seems less involved in comprehending them if SMU is higher. Conversely, no interaction effect was found when we ran the model for difficult-to-classify emojis, where only both ToM tasks emerged as significant predictors (Table 3, Panel B).

Finally, in the model for difficult-to-classify emojis, the Real/Apparent Emotions task again had a moderate effect, while the Eyes test only had a modest effect; all the remaining terms had negligible effects (Cohen, 1988).

Discussion

Despite youngsters being avid media users (Hougaard & Rathje, 2018), their ability to effectively interpret emojis in digital communication might vary according to both individual and environmental factors. Research on these predictors is still scarce, especially when it comes to the psychological skills which could be relevant in this process. To start filling this gap, the present study investigated the role of affective ToM in determining emoji comprehension, also considering, at the environmental level, the role of social media. Overall, our results aligned with the tested hypotheses. Specifically, in line with H1, both ToM tasks were positively associated with emoji comprehension.

Affective ToM, intended as the ability to understand others' emotions and affective states, emerged as a significant predictor of emoji comprehension among early adolescents. Affective ToM is critical in interpreting non-verbal cues such as facial expressions and body language in face-to-face interactions (Lee et al., 2014). In digital communication, emojis convey emotions through visual symbols; hence, it is consistent that affective ToM plays a role in accurately interpreting them. Adolescents with more developed affective ToM appear better at discerning the emotional cues conveyed by emojis, thus supporting prior research that highlights the importance of ToM in fostering positive social interactions (Baron-Cohen et al., 2001).

Interestingly, our regression models consistently show that the "Real/Apparent Emotions" task is a stronger predictor of emoji comprehension compared to the Eyes test. Unlike the Eyes test, which requires recognizing emotions from facial cues, the “Real/Apparent Emotions” task involves interpreting emotions within contexts (e.g., pretense or deception) where the emotional displays are aimed at influencing others’ behaviour. Although the emoji comprehension task might seem similar to the Eyes test, as both require identifying emotions from visual cues, in everyday life, emojis are primarily used for pragmatic functions, such as disambiguating the meaning of a sentence (e.g., Boutet et al., 2021; Du, 2024; Sampietro, 2020). Therefore, the “pragmatic” component of affective ToM captured by the “Real/Apparent Emotions” task might be more crucial for accurately deciphering emojis than simply associating a facial expression with an emotion.

In line with H2, we also found that SMU moderates the link between the “Real/Apparent Emotions” task and emoji comprehension, which is stronger for those with low SMU. This suggests that, while affective ToM is necessary to decode emojis, exposure to social media enhances familiarity with them, aiding comprehension. Recent literature (Li et al., 2024) suggests that the human cognitive system processes facial emojis as social information by jointly soliciting ToM and general cognitive resources, such as social working memory capacity, that is, the ability to maintain and manipulate a limited set of social information (Meyer et al., 2012). In one of their experiments, Li et al. (2024, Study 4) found a significant positive correlation between WM capacity and ToM when the stimuli to be retrieved were either faces or emojis, but not when they were geometric symbols, thus suggesting that WM for facial emojis is intertwined with ToM. Moving from these results, we could argue that a vast use of social media, presumably increasing familiarity with emojis, may favour decoding automatization and, consequently, reduce the load on working memory thanks to cognitive shortcuts, which do not require the involvement of affective ToM in the interpretation of commonly used emojis. This explanation is supported by the fact that the moderation effect is only found in the relationship between emoji comprehension and the “Real/Apparent Emotions” task, which, by employing vignettes depicting different scenarios, might represent a more cognitively demanding task compared to the Eyes test.

Lastly, following H3, our findings indicate that familiarity with social media influences the cognitive mechanisms underlying emoji interpretation, but its impact varies depending on the complexity of the emoji. Specifically, for easily recognizable emojis, greater familiarity appears to facilitate automatic decoding, reducing the reliance on ToM. However, when emojis require deeper introspection or convey ambiguous meanings, ToM remains essential for accurate interpretation. This suggests that while familiarity with social media may streamline the decoding of simple emojis, for complex ones, ToM remains crucial. These findings support prior research on the role of ToM in understanding implicit meanings in digital messages (Castonguay, 2022; Gentina et al., 2021), suggesting implications for both theory and practice. Specifically, while familiarity aids in automatic decoding, training programs should prioritize enhancing affective ToM skills. Indeed, most digital education programs tend to focus on familiarizing youngsters with emojis and other digital cues. Based on our results, this strategy might have limited benefits if not paired with a psychological training aimed at fostering one’s “mind reading” abilities.

Moreover, being the “Real/Apparent Emotions” task a stronger predictor of emoji comprehension than the Eyes test, ToM training might emphasize understanding emotions in context rather than merely recognizing facial expressions. This approach could be particularly beneficial in educational interventions for individuals who struggle with nonverbal cues, such as autistic youth. Lastly, our findings offer valuable insights for professionals seeking to utilize emojis as response options in child research, particularly for assessing affective reactions to specific stimuli (e.g., foods, actions). Given that emoji comprehension is influenced by ToM development, it is essential to consider this factor when designing age-appropriate response scales for youth.

Despite the originality of this research, we acknowledge its limitations. First, our emoji comprehension test was based on the Unicode meanings assigned to them, but emojis often convey multiple emotions. Jaeger and Ares (2017) found that most emojis can express a range of emotions or meanings. Plus, emoji interpretation may vary across genders and age cohorts (Herring & Dainas, 2020). Future studies should examine ToM in the contextualized understanding of emojis. Second, despite aligning with previous studies (e.g., Ferré et al., 2023), we did not pre-test the items used in the test to ensure their validity and difficulty level. In the future, pre-testing will enhance the robustness of the emoji comprehension assessment and minimize potential biases in item selection.

Lastly, our task required participants to guess the emotion expressed by a single, decontextualized emoji. However, just as a single emoji can have different meanings, its use can alter the meaning of an entire sentence (Hand et al., 2022). Indeed, emojis are used to modulate the affective coloring of digital messages, by intensifying or softening them (Dresner & Herring, 2010; Du, 2024; Sampietro, 2020), thus modifying the entire sentence’s meaning. Future research should employ tasks where emojis are used to disambiguate otherwise ambiguous sentences, such as ironic or sarcastic expressions, to investigate their pragmatic function more ecologically.

Conclusion

In the present study, we investigated the moderating role of SMU in the association between affective ToM and emoji comprehension in early adolescents. We discovered that emoji comprehension is substantially predicted by emotional ToM, with the correlation being stronger for those with lower SMU. In other words, while frequent exposure to social media provides adolescents with opportunities to become familiar with emoji use and interpretation, their underlying ability to decipher emotions remains the most critical component in comprehending them.

Our results suggest practical implications for improving youth communication skills in digital contexts. Indeed, since emojis are highly used in online messaging, the ability to interpret them accurately is key to successful online communication. ToM playing a significant role in this process implies that educational programs aimed at enhancing affective ToM could support early adolescents, particularly those with less exposure to digital media and overall less digital literacy, in improving their comprehension and use of emojis.

From an applicational perspective, educators might want to consider fostering ToM before focusing on media literacy training in order to build digital literacy skills on the basis of well-developed individual resources, namely ToM.

To conclude, as digital communication becomes more widespread among the youngest, the ability to navigate this medium efficiently is essential. Training programs that integrate the development of affective ToM alongside digital literacy may ultimately better prepare youngsters for the challenges of online communication.

Footnote

[1] Importantly, we made some a priori adjustments to the Unicode Emojipedia labels applied to emojis (see Table A1 in the Supplement Material to see labels and emojis). Specifically, inspired by the standard graphical depiction of hate speech, Emoji 22 was designated "hatred" rather than "rage/yelling obscenities", Emoji 33 was listed as "inattention" rather than "foggy state of mind", and Emoji 35 was listed as "interest" rather than "flirtation". Indeed, while the original labels were established in adult samples, they were deemed too complex or confusing for early adolescents, leading us to provide more straightforward yet semantically similar labels.

Conflict of Interest

The author has no conflicts of interest to declare.

Use of AI Services

The authors declare they have not used any AI services to generate any part of the manuscript or data.

Authors' Contribution

Elisa Bisagno: conceptualization, methodology, validation, writing—original draft, project administration. **Simone Pinetti**: investigation, writing—review and editing. **Alice Lucarini**: data curation, formal analysis, writing—review and editing. **Martina Basciano**: writing—review and editing, visualization. **Alessia Cadamuro**: conceptualization, resources, writing—review and editing, supervision.

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Data Availability Statement

Data, codebook, and R script of the present study are openly available at: https://osf.io/7vj3a.

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