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### **Ability to distinguish genuine from non-genuine smiles in children aged 10- to 12-years: Associations with peer status, gender, social anxiety and level of empathy**

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## ABILITY TO DISTINGUISH GENUINE FROM NON-GENUINE SMILES IN CHILDREN AGED 10- TO 12-YEARS: ASSOCIATIONS WITH PEER STATUS, GENDER, SOCIAL ANXIETY AND LEVEL OF EMPATHY

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**Abstract:** Associations between children's ability to distinguish genuine (Duchenne) from non-genuine smiles and peer status, gender, social anxiety, or level of empathy were examined in a sample of 10- to 12-year-old children ( $N = 80$ ). Children were presented with genuine and non-genuine smiles in a dynamic (videos) or a static (photos) mode of presentation and were asked to rate the genuineness of each. Children's peer status was tested with a sociometric measure, whereas social anxiety and level of empathy were measured via self-report measures. There was no evidence that peer status was associated with children's ability to distinguish genuine from fake smiles in either mode of stimuli presentation. However, gender appeared to predict children's performance. Compared to boys, girls were better at distinguishing genuine from fake smiles, but only when the stimuli were presented in a dynamic mode. In addition, empathy was associated with children's perception of genuine smiles but only in the static stimuli. The results are discussed in the light of recent evidence indicating that socially excluded adults are more competent at distinguishing genuine from non-genuine smiles.

**Key words:** Children, Duchenne smiles, Non-genuine smiles, Peer status

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## **INTRODUCTION**

Smile is one of the most important signals in human communication and a major component of children's ability to socially connect with other people (Bayet & Nelson, 2019; Maringer, Krumhuber, Fischer, & Niedenthal, 2011). Judging the authenticity of a smile constitutes a difficult and potentially confusing task for children. A smile may be induced by positive emotions, such as enjoyment or happiness, but people may also fake a smile to conceal other emotions (e.g., sadness) or to pretend that they experience an emotion (happiness), when actually they feel nothing (Ekman, Friesen, & Ellsworth, 1972). The development of children's ability to distinguish between genuine and non-genuine smiles has been of interest to developmental researchers for some time now (Hess & Hareli, 2015).

A genuine smile, which is also referred to as Duchenne smile in reference to the French neurologist Duchenne de Boulogne who first described it, is a spontaneous expression of a real positive emotion. According to the Facial Action Coding System (Ekman & Friesen, 1978), the genuine smile activates the zygomaticus major muscle (called Action Unit 12, AU12), that pulls the lip corners up into a smile, and the orbicularis oculi muscle (called Action Unit 6, AU6), which activates a cheek raise and creates crow's feet around the eyes. In contrast, in the non-genuine smile, often called false, fake or social smile, the activation of the orbicularis oculi muscle is lacking (Duchenne, 1862/1990; Ekman, Davidson, & Friesen, 1990; Gunnery & Hall, 2014).

Being able to recognize genuine or Duchenne smiles and distinguish them from the non-genuine ones is a vital aspect of children's emotional and social competence. This ability serves both intrapersonal and interpersonal functions (Gosselin, Perron, Legault, & Campanella, 2002). At the intrapersonal level, the appreciation that one can hide their true emotions from other people may lead children to achieve a better regulation of their own emotions. At the interpersonal level, this ability can help children to create and maintain positive social relationships. For example, genuine smiles can be expressions of positive social intentions and non-genuine smiles may reflect an intention to dominate and control others (Niedenthal, Mermillod, Maringer, & Hess, 2010). Decoding a smile's true meaning, may also help children to trust or distrust others and regulate their behavior appropriately in social interaction (Clément, Bernard, Grandjean, & Sander, 2013).

Developmental studies have shown that children's ability to accurately distinguish Duchenne from non-genuine smiles begins to develop in the early years of life and becomes more sophisticated with increasing age. For example, Bugental, Kopelkin, and Lazowski (1991) video-taped 3- to 6-year-old children's responses to different types of smiles during interactions with an adult. They found that children tended to withdraw their gaze when the adult displayed a non-genuine smile, indicating that they have a precocious "implicit" awareness of the genuine vs. non-genuine smile distinction. In a more recent study, Song, Over, and Carpenter (2016) showed that when presented with two photographs and asked in which one the individual was

“really smiling”, 4-year-olds, but not younger children, systematically chose the correct photograph. Older children manifested an increased sensitivity in their recognition of Duchenne smiles. Del Giudice and Colle (2007) showed that 8-year-olds' judgments of Duchenne smiles were positively predicted by the activation of the AU6, but also by the activation of the inner part of the orbicularis oculi (labeled AU7), which is voluntarily activated to tighten the eyelids.

Thus, mounting evidence indicates that children's ability to distinguish genuine from non-genuine smiles develops and becomes more sophisticated with increasing age. However, in addition to chronological age, other factors may also contribute to individual differences in this ability. Some researchers have proposed that differences in children's socialization histories may have an effect on the development of their ability to process smiles (Bugental et al., 1991). Acquiring the ability to “read” the authenticity of smiles is a dynamic process that is based on the child's interactions with others. Hence, it is reasonable to assume that children who have atypical social interactions, for example children who have low peer acceptance, may deviate in important ways from other children in their ability to recognize and distinguish true from fake smiles. The present study sought to investigate the relation between children's peer status—that is, their immediate position (or status) in the peer context (Rizzo & Killen, 2018)—and individual differences in their ability to process genuine and non-genuine smiles.

### ***Peer status and children's recognition of genuine vs. non-genuine smiles***

Children's interaction with peers is a key context in which they develop and practice their emotional skills, such as the ability to recognize the emotional expressions of others (Denham, von Salisch, Olthof, Kochanoff, & Caverty, 2002). A body of studies has shown that children's ability to decode others' facial expressions of emotion is positively associated with positive peer interactions and high peer acceptance (e.g., Cassidy, Parke, Buttkovsky, & Braungart, 1992; Leppänen & Hietanen, 2001; Wocadlo & Rieger, 2006). However, very little is known about the association between low peer status and children's ability to recognize others' facial expressions of emotion (e.g., Miller, 2005), and no previous study has specifically examined children's ability to process genuine and non-genuine smiles.

There are two possible consequences that might stem from low peer status as far as the processing of genuine and non-genuine smiles is concerned: it is plausible that low peer status motivates children to withdraw from social interactions and the surrounding social environment, which results in decreased attention to the facial emotional displays of others. Conversely, low peer status may result in children becoming hypersensitive to social interactions and better attuned to signals of social inclusion or peer acceptance (e.g., Duchenne smiles; Powers & Heatherton, 2012).

The latter hypothesis is in line with Gardner, Pickett, and Brewer's (2000) theory, who postulate that low social status and the associated social exclusion

activates a social monitoring system which directs individuals' attention and other cognitive resources to social cues that may facilitate re-affiliation. Indeed, studies have shown that, relative to adults who are socially included, excluded adults are more able to accurately "read" the emotion expressed in the vocal tone and the faces of others (Pickett, Gardner, & Knowles, 2004), show a memory bias for the faces of their own-group in tasks of emotion recognition (Van Bavel, Swencionis, O'Connor, & Cunningham, 2012), and show greater ability to orient attention in accordance with another individual's eye gaze (Wilkowski, Robinson, & Friesen, 2009).

As regards the distinction of genuine and non-genuine smiles specifically, Bernstein, Young, Brown, Sacco, and Claypool (2008) carried out a study with adults to assess whether this ability is associated with adults' ratings of their need for belonging following recalled experiences of social exclusion. These researchers presented 32 university undergraduates with a rejection manipulation; specifically, they asked participants to write essays about experiences of inclusion, exclusion or a control condition (about the events of the previous day). Next, participants were presented with videos of adult faces displaying either a genuine or a non-genuine smile and were asked to decide whether each was real or fake. Bernstein et al.'s (2008) results showed that socially excluded participants were significantly more accurate than those in the social-inclusion or control groups in distinguishing genuine from non-genuine smiles. These results were replicated in a second study by Bernstein et al. (2008) which showed that socially excluded adults showed a greater preference to work with individuals who display genuine as opposed to non-genuine smiles, which again indirectly demonstrates the acute ability of excluded adults' to differentiate between genuine and non-genuine smiles.

### ***The present study***

In this study we examined children's ability to distinguish between genuine and non-genuine smiles and explored whether individual differences in this ability are associated with variations in children's peer status. No study to our knowledge has directly examined whether children's peer status is related to their understanding of the authenticity of smiles. Thus, the present research investigated this novel question at an age, 10 to 12 years, when children's ability to recognize others' facial expressions of emotion is expected to have been sufficiently developed (Dawel, Palermo, O' Kearney, & McKone, 2015).

Another aim of this study was to examine whether the mode of presentation, specifically static vs. dynamic presentation, influences the way children with different degrees of peer acceptance process genuine and non-genuine smiles. Studies investigating children's ability to perceive facial expressions of emotion typically use static stimuli. Static facial expressions of emotion have advantages including the more accurate display of the emotion being expressed (given that the depicted stimulus –the face –is constant; Pollak Messner, Kistler, & Cohn, 2010). However, such stimuli lack

the dynamism of the emotional expressions that children experience during their everyday interactions with others (Nelson & Russell, 2011; Vieillard, & Guidetti, 2009). Indeed, some studies have demonstrated that dynamic characteristics of the smile can override the Duchenne marker's importance in determining judgments of how authentic the smile is (Krumhuber et al., 2007). Hence, it is possible that children's ability to recognize genuine from non-genuine smiles would be even better if they were presented with richer, dynamic stimuli, a possibility that to our knowledge has not been tested.

Finally, based on research indicating that there is significant association between children's peer status and social anxiety (Halldorsson & Creswell, 2017), as well as empathy (Boele et al., 2019), the study also examined the contribution of these variables, as well as children's age and gender, in explaining children's ability to distinguish genuine from non-genuine smiles.

Instead of arbitrarily categorizing children into separate peer-status groups based on their score on a sociometric test, children's peer status was treated as a continuous variable (ranging from 'low' to 'high' peer status). Consistent with the findings reviewed above (Bernstein et al., 2008), we hypothesized that children low in peer status would be more accurate in their perception of the two types of smiling expressions (genuine, non-genuine) compared to children who were high in peer status. Older children were expected to be more accurate than younger children in distinguishing genuine from non-genuine smiles. No firm hypothesis was made concerning the contribution of social anxiety and empathy, because we do not know of any previous study examining whether these variables predict smile perception. Finally, this study also pursued the question of whether the mode of presentation of a smile is associated with children's ability to judge its authenticity.

## **METHOD**

### ***Participants***

Eighty children (36 boys and 44 girls) aged 10 to 12 years ( $M = 11.10$ ,  $SD = 0.90$ ) took part in the study. They were recruited from five classrooms in two state primary schools in a medium-sized city in Western Greece. Thirty-two students were attending the fifth grade and 48 were attending the sixth grade. All participants were native Greek and were primarily from middle and lower-middle socioeconomic backgrounds. To participate in the study children received informed parental consent and gave their own assent.

### ***Materials***

#### ***Peer status***

Peer status was measured with a sociometric test (Coie & Dodge, 1983; Coie, Dodge, & Coppotelli, 1982), in which participants were presented with an alphabetized list of

their classmates and were asked to nominate three of their classmates whom they liked most (LM) and three of their classmates whom they liked least (LL). Then, two scores (LM and LL) were calculated by summing the choices each child received and then standardized within each class:  $Z_{LM}$  (LM= Liked Most) and  $Z_{LL}$  (LL = Liked Least). Finally, based on the procedures outlined by Coie and Dodge (1983) and Coie et al. (1982), children's social preferences core was calculated ( $Z_{LM} - Z_{LL}$ ) and standardized within each class. Scores higher than 1 indicate popularity and scores lower than -1 indicate social exclusion.

#### *Social anxiety*

The Greek version of the Social Anxiety Scale for Children-Revised (SASC-R; LaGreca & Stone, 1993) was used. The SASC-R is a 22-item unifactorial self-report measure that has been constructed to assess children's subjective feelings of social anxiety (and its correlates, such as avoidance and inhibition) in the context of various interpersonal situations. It contains 18 descriptive self-statements (e.g., "I worry that other children don't like me") and 4 filler items reflecting children's activity preferences (e.g., "I like to play sports"). Children were asked to rate on a 5-point Likert-type (from 1 'never' to 5 'always') scale how true each statement was for them. Satisfactory psychometric properties of the SASC-R (e.g., internal consistency, discriminant and concordant validity, test-retest reliability) have been demonstrated in numerous primary school samples (e.g., La Greca, Dandes, Wick, Shaw, & Stone, 1988; La Greca & Stone, 1993). In the present sample, Cronbach's alpha was .84.

#### *Empathy*

The Greek version of the Index of Empathy for Children and Adolescents (IECA; Bryant, 1982) was used, which includes 22 statements rated on a yes/no scale, was used to measure children's general levels of empathy. A higher total score reflects higher levels of empathy. Example items include 'It makes me sad to see a girl who can't find anyone to play with' and 'Seeing a boy who is crying makes me feel like crying'. The measure has demonstrated satisfactory reliability and construct validity in the past (Bryant, 1982). In the present sample, Cronbach's alpha was .64. Both the SASC-R and IECA have been validated in previous studies with Greek samples (Mitsopoulou & Giovazolias, 2013; Vassilopoulos, 2008; Vassilopoulos, Brouzos, Moberly, & Spyropoulou, 2017).

#### *Animated videos with smiling people*

Participants watched a movie made with the use of Windows Movie Maker 2016 (<http://www.windows-movie-maker.org/>), which included an initial video-example about what they are going to watch (*Brain Games - Duchenne Smile*, retrieved from

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<https://www.youtube.com/watch?v=ZxgCpyOAqGI>) and then a smiles stimuli set of 20 videos from the BBC Science and Nature website (*Spot the fake smile*, BBC, n.d.; <http://www.bbc.co.uk/science/humanbody/mind/surveys/smiles>). The smiles stimuli were displayed in a random order as in the study of Gadassi and Mor (2016). Each video lasted approximately 4 seconds, while the whole set depicted smiling adults (13 women and 7 men) with an initially neutral expression that shifted to a smiling expression and then returned to a neutral expression. Ten of these smiles were genuine whereas the other ten were fake. Participants rated the statement: *The smile is real*, with a scale from 1 (*not at all*) to 4 (*extremely*).

### *Pictures with smiling people*

Participants were presented with a set of 12 photographs of smiling individuals, six adult men and six adult women. Specifically, three men displayed a genuine smile and the other three a fake one; similarly, three women displayed a genuine smile and three a fake one. The pictures were obtained from the Karolinska Directed Emotional Faces set (KDEF, Lundqvist, Flykt, & Öhman, 1998), the Smiles Picture Set (SPS, Del Giudice, & Colle, 2007), and the stimuli used in Miles and Johnston's (2007) study. Participants responded to the statement "The smile is a genuine one", using a scale from 1 (not at all) to 4 (extremely). This continuous –instead of categorical– rating of smile genuineness presents some advantages as it allows for the detection of subtle differences in perception across participants (Dawel et al., 2017).

### ***Procedure***

A pilot study ( $N = 12$ ) was conducted before the main study to ensure the appropriateness of the measures and validate the experimental procedures. The main study took place in participants' classrooms and lasted approximately 90 minutes. Participants were randomly divided into groups of 5-12 children. All groups were administered the study measures in the same order. First, children completed the sociometric test and then the social anxiety scale followed by the scale measuring empathy. Next, children assessed the authenticity of smiles, depicted first on animated videos and then on static pictures (for fear that the assessment of static faces might contaminate the assessment of animated videos, the order of the presentation mode was fixed with the presentation of static pictures always following the presentation of the animated videos). In both cases, children observed the smiling faces projected on their classroom's board before they wrote down their assessments on a given questionnaire. Finally, they were debriefed and thanked for their participation.



## RESULTS

### *Power analysis*

We performed a retrospective power analysis to ascertain whether the study was sufficiently powered to detect significant effects. Using G\*Power, with a sample size of 80, the study had power of .80 to detect (two-tailed) effect sizes as follows: Bivariate correlation:  $r = .31$  (medium effect; Cohen, 1992), paired  $t$ -test:  $d_z = .31$  (medium effect), multiple regression – three predictors in Step 2 jointly explain significant variance:  $f^2 = .144$ ,  $R^2 = .126$  (medium effect), multiple regression – whether one predictor is significant after Step 2:  $f^2 = .101$ ,  $R^2 = .092$  (medium effect). In sum, the study was adequately powered to detect medium effect sizes. If there really were genuine effects of medium size, we would expect to detect them in 80% of studies (of this sample size). If there were genuine effects of large size, we would expect to detect them in > 99% of studies. If there were genuine effects of small size, we would expect to detect them only 14% of the studies.

### *Receiver operating characteristic analysis*

We calculated the receiver operating characteristic (ROC) and the area under the curve for each participant using Eng's web-based calculator for ROC curves (JROCFIT; Eng, 2013). This application uses maximum likelihood estimation to generate a binormal ROC curve and calculate the area under the ROC curve from each participant's ratings. We calculated this separately for dynamic and static faces. Area under the curve is an indicator of how well each participant could discriminate Duchenne from fake smiles as manifest in ratings (Stanislaw & Todorov, 1999). This index is independent of response bias relating to adopting conservative or liberal criteria for specific ratings. Scores of 0.5 indicate chance performance and scores of 1.0 indicate perfect discrimination.

Discriminability of Duchenne smiles was positively correlated when comparing videos and static photographs of faces,  $r = .32$ ,  $p < .01$ <sup>1</sup>. In addition, age and gender were positively correlated with empathy, such that girls and older children appeared to be more empathic than boys and younger children. Furthermore, social anxiety scores negatively correlated with peer status, such that children with higher social anxiety

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<sup>1</sup>Ratings of the extent to which smiles were real were significantly positively correlated were positively correlated across videos and photographs, both for Duchenne and fake smiles,  $r_s = .39$ ,  $p_s < .01$ . There was no significant correlation between the extent to which persons rated Duchenne smiles as genuine and the extent to which they rated fake smiles as genuine, both in videos,  $r = .01$ ,  $p = .96$ , and in photographs,  $r = -.01$ ,  $p = .96$ .

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scores appeared to be lower in peer status than children with lower social anxiety scores. Finally, empathy was found to be positively associated with the ability to discriminate smiles in photos (see Table 1).

***Dynamic stimuli***

To test the hypothesis that peer status would predict participants' ability to recognize videos of Duchenne smiles, we ran a hierarchical regression with the area under the ROC curve (index of discriminability) as the criterion variable. Gender and age were included in the first step, followed by social anxiety, empathy, and peer status in the second step.

***Table 1. Correlations and descriptive statistics for all the study variables***

	2	3	4	5	6	7	<i>M</i>	<i>SD</i>
1. Gender	.11	.08	.15	.42***	.40***	.21	—	—
2. Age	—	-.15	-.05	.27*	.09	.19	11.1	0.9
3. SASC-R		—	-.35**	.21	.07	.08	44.1	14.2
4. Peer status			—	.17	-.04	.02	0.0	1.60
5. Empathy				—	.09	.25*	14.8	3.5
6. Video discrimination					—	.32**	.68	.14
7. Photo discrimination						—	.77	.15

*Note:* SASC-R = indicator of social anxiety; Gender dummy-coded 0 = male, 1 = female. \*  $p < .05$ . \*\*  $p < .01$ .

***Table 2. Results of hierarchical regression analysis (N = 80) with discriminability of videos of genuine smiles as the outcome variable***

Independent Variables	<i>b</i>	<i>SE</i>	$\beta$
Step 1			
Gender	.11	.03	.40***
Age	.01	.02	.05
Step 2			
Gender	.12	.03	.45***
Age	.01	.02	.08
SASC-R	.00	.00	.05
Empathy	-.00	.01	-.12
Peer Status	-.01	.01	-.06

*Note:* SASC-R = indicator of social anxiety. \*\*\*  $p < .001$ .

Gender and age jointly predicted a significant 16.5% of variance in genuine ratings of Duchenne smiles,  $F(2, 77) = 7.58, p = .001$ . However, gender was the only significant predictor,  $\beta = .40, t = 3.80, p < .001$ , with girls being more likely than boys to correctly rate Duchenne smiles as genuine. Age was not a significant predictor,  $\beta = .05, t < 1, p = .66$ . Unexpectedly, the predictors added in the second step explained a non significant 1.9% of variance,  $F(3, 74) < 1, p = .63$ , with social anxiety, empathy and peer status being non significant predictors of the extent to which Duchenne smiles were rated as genuine,  $\beta_s < |.13|, ps > .34$  (see Table 2).

***Static stimuli***

To test the hypothesis that peer status would predict participants' ability to recognize photographs of Duchenne smiles, we ran a hierarchical regression with the area under the ROC curve (index of discriminability) as the criterion variable. Gender and age were included in the first step, followed by social anxiety, empathy, and peer status in the second step. Gender and age jointly predicted 7.1% of variance in genuine ratings of Duchenne smiles,  $F(2, 77) = 2.94, p = .06$ , but this effect was nonsignificant. Neither gender,  $\beta = .19, t = 1.71, p = .09$ , nor age,  $\beta = .17, t = 1.52, p = .13$ , was significant predictor. Unexpectedly, the predictors added in the second step explained 2.2% of additional variance,  $F(3, 74) < 1, p = .61$ , but this effect was nonsignificant, with social anxiety, empathy and peer status being non significant predictors of the extent to which Duchenne smiles were rated as genuine,  $\beta_s < |.15|, ps > .29$  (see Table 3).

***Table 3. Results of hierarchical regression analysis (N = 80) with discriminability of photographs of genuine smiles as the outcome variable***

Independent Variables	<i>b</i>	<i>SE</i>	$\beta$
Step 1			
Gender	.06	.03	.19
Age	.03	.02	.17
Step 2			
Gender	.04	.04	.13
Age	.03	.02	.14
SASC-R	.00	.00	.06
Empathy	.01	.01	.14
Peer Status	.00	.01	.00

***Note:*** SASC-R = indicator of social anxiety.

## **DISCUSSION**

The aim of this study was to examine associations between peer status and individual differences in 10- to 12-year-old children's ability to distinguish genuine from non-genuine smiles. We also investigated whether the mode of presentation – static vs. dynamic – had an impact on the way children with different degrees of peer acceptance process genuine and non-genuine smiles.

Our results showed that there was no statistically significant association between variations in children's ability to correctly discriminate genuine from non-genuine smiles and peer status, in either mode of stimulus presentation. Thus, there was no support for our main hypothesis that children with low peer status are more attuned to signals of social acceptance, such as the smile.

These results appear to contradict the findings of earlier research showing that socially rejected and excluded adults (or participants experiencing the risk of social exclusion) are faster at detecting social cues of acceptance (e.g., smiling faces, see Bernstein et al., 2008; DeWall, Maner, & Rouby, 2009). Given research evidence suggesting that children as young as 4 years old are able to recognize individuals who are “really smiling” (Song et al., 2016), it appears that low peer status or social exclusion in middle childhood does not present any opportunity or advantage for the less accepted children to become more sensitive to “evolutionary important signals of honest affiliative and cooperative intent” (Song et al., 2016, p. 490), in their attempt to regain their affiliations or improve their social status. Perhaps, low peer status children of this age may lack the mechanism to facilitate reconnection with others that has been observed in rejected adults (Bernstein, Young, Brown, Sacco, & Claypool, 2010), which in part could account for the detrimental consequences of social exclusion and peer rejection in childhood (McDougall, Hymel, Vaillancourt, & Mercer, 2001; Mulvey, Boswell, & Zheng, 2017).

The analyses also revealed a significant association between gender and the perception of smiling faces, but only when the stimuli were presented in animated videos. Girls were better at detecting a genuine smile compared to boys, which corresponds to preliminary evidence suggesting that women show greater accuracy in adaptive face perception (Sacco, Brown, Lustgraaf, & Young, 2017). This result is hardly surprising in the light of robust findings that women are socialized to be more attuned to their social environments than men are (Antonucci, 1994). Perhaps this social attunement, when combined with the presentation of richer, dynamic stimuli, provides girls with an advantage over boys in social cognition.

In addition, a significant association between empathy and the accurate detection of Duchenne smiles was observed, but only when the stimuli were presented in a static mode of presentation (photos). Thus, the more empathic children appear to be better at detecting a genuine smile, given that a static display of the emotion is expressed. This finding is in line with previous results suggesting that empathic children are better at detecting emotional facial expressions (e.g., Ya, Pei, & Su, 2017). However, it is not clear why this effect emerged in the presentation of static stimuli only. Future studies

should further investigate whether empathy, when combined with a specific type of stimuli, presents an advantage for children engaging in social perception.

Regarding social anxiety, no significant associations with smile perception were observed. This result is in line with Gutiérrez-García and Calvo's (2014) findings, who also reported that social anxiety does not affect sensitivity in the recognition of prototypical facial expressions in adults. Although individuals with high levels of social anxiety generally appear to be particularly attuned to their social environment and are faster at detecting subtle social cues and signs of rejection by others (Vassilopoulos, 2005, 2011; for a review see Bögels & Mansell, 2004), nevertheless this preferential attentional allocation appears to be restricted to threat cues and does not give them any advantage over the processing of positive social cues such as the display of a genuine (Duchenne) smile. Interestingly, high social anxiety scores correlated with lower peer status, which is in line with previous observational studies indicating that socially anxious youth tend to be less liked by their peers (Blöte, Kint, & Westenberg, 2007; Spence, Donovan, & Brechman-Toussaint, 1999).

#### *Limitations of the study*

There are limitations that must be pointed out. First, the sample was relatively small (although the study was adequately powered to detect medium effect sizes). Thus, this study can only be considered exploratory, warranting the replication in larger groups of children. Similarly, the nonsignificant findings regarding the age effect could be due to the small age range of the children participating in the current study. Second, peer status in the present study was assessed with a measure that asked children to nominate students in their classrooms whom they "liked-most" and "liked-least". However, being viewed by other children as low in popularity is not identical to feeling not accepted by one's peers. It is likely that had we asked participants to report their thoughts about their social status, our results would have been different. Future research needs to replicate the present findings by utilizing self-report measures of children's peer status and need for belonging in conjunction with a more "objective" sociometric measure. Third, despite the benefits of assessing children in real-life environments, the fact that the measures were administered in a classroom (or in a group of children) instead of a laboratory setting may have had some influence on their responses. Future research should examine the extent to which assessing the genuine vs. non-genuine smile distinction in a real-life setting is comparable to that in a laboratory setting (or in a setting where children are asked to complete the task on their own). Fourth, although the inclusion of male and female stimulus faces seems a necessary prerequisite in these studies, given the gender stereotype that women smile more than men, the cue quality of the different stimuli may differ depending both on the sex of the sender and the sex of the perceiver. In a similar vein, the inclusion of adult face stimuli poses another limitation in that the results might have been different had we used pictorial stimuli and videos of smiling youth. Last, the artificiality of the

faces used put further limitations in the generalizability of the present findings to the real world.

To summarize, the present study was the first to investigate the association between peer status and children's ability to accurately discriminate genuine (Duchenne) from non-genuine smiles. No evidence was found that children low in peer status are better at accurately identifying genuine smiles at rates greater than chance, which contradicts the results reported in the adult literature.

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