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# Journal of Experimental Child Psychology

journal homepage: [www.elsevier.com/locate/jecp](http://www.elsevier.com/locate/jecp)

## Brief Report

# Children's and adolescents' perception of the authenticity of smiles ☆

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## ARTICLE INFO

### Article history:

Received 29 December 2007

Revised 1 August 2008

Available online 18 October 2008

### Keywords:

Emotion

Facial expressions

Authenticity

Duchenne smile

## ABSTRACT

Recently, Thibault and colleagues described the Duchenne marker as a cultural dialect for the perception of smile authenticity. The current study had the goal to follow up on this finding and to investigate the cues that French Canadian children use to evaluate the authenticity of smiles from members of three ethnic groups. The authenticity of six smiles differing in intensity and presence of orbicularis oculi (Duchenne marker) was rated by 1206 children from 4 to 17 years of age. No differences were found as a function of encoder group. All children perceived medium Duchenne smiles as more authentic than equally intense medium non-Duchenne smiles. Furthermore, results suggest a decrease in the reliance on intensity across the age span. Younger children use the intensity marker along the whole continuum to infer authenticity. In contrast, older children (14- to 17-year-olds) rated all smiles that did not contain the Duchenne marker as roughly equally low in authenticity.

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## Introduction

As children grow up, they become more skilled at adjusting their emotional behavior to other people's behavior (Denham, 1998; Saarni, 1999). This improvement in flexibility and adaptability requires the ability to impute meaning to people's emotional behavior. Rudimentary perceptual ability to pro-

☆ To evaluate whether the contacts participants had or have with the three cultural groups influence their perception, all participants completed an adaptation of Tzeng and Jackson's (1994) questionnaire. However, only very small and unsystematic effects emerged for these variables. Therefore, these results are not reported.

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ness facial expressions is present during the first days following birth, as is evidenced by neonatal imitation (Field, Woodson, Greenberg, & Cohen, 1982; Meltzoff & Moore, 1977, 1983, 1997). However, it is only at the end of the first year that infants impute meaning to expressive behavior. When facing an ambiguous situation, 8-month-old and older infants display approach behavior that is modulated by the facial expressions of their caregivers (Hertenstein & Campos, 2004; Klinnert, 1984; Mumme & Fernald, 2003; Sorce, Emde, Campos, & Klinnert, 1985), suggesting that they distinguish between positive and negative emotions. The meaning given to facial expression becomes much more specific in the course of the following 2 years, with 2- and 3-year-olds starting to be able to associate verbal labels with facial expressions for a variety of emotions such as happiness, sadness, and anger (Boyatzis, Chazan, & Ting, 1993; Camras & Allison, 1985; Widen & Russell, 2003, 2008).

The ability to recognize emotions from the face is important for social adaptation. However, the ability to judge the authenticity of emotional facial expressions is also important socially. Gosselin, Perron, Legault, and Campanella (2003) mentioned several benefits for children to be able to judge the authenticity of emotional expressions. For example, at the individual level, it may help children to deal with sarcasm and irony as well as help children to achieve a better regulation of their relationships.

The ability to determine the authenticity of emotional messages on the basis of facial expressions first requires that children understand that there is not always a one-to-one correspondence between the emotion felt by a person (real emotion) and what the person displays on his or her face (apparent emotion). This understanding emerges between 3 and 5 years of age (Banerjee, 1997) but becomes verbally articulated only around 5 or 6 years of age (Gross & Harris, 1988; Josephs, 1994). Second, children need to acquire knowledge about the subtle facial cues that distinguish authentic expressions of emotions from nonauthentic ones, a process that is likely to require exposure to a large amount of social situations.

The facial expression for which the question of detecting authenticity has been of particular interest is the smile. Perhaps of all the facial expressions of affect, the smile is both the most ubiquitous and most confusing (Bugental, 1986). People smile when they are really happy, but they also smile as an indication of politeness or shyness or to display positive affect in public situations (see, e.g., Hess, Beaupré, & Cheung, 2003). In general, smiles vary along two dimensions: the intensity of the activity of the zygomaticus major muscle that pulls the corner of the mouth up and the presence of activity of other muscles. One type of smile that has been given more prominence is the Duchenne smile. This smile combines action of the zygomaticus major muscle and action of the orbicularis oculi muscle (which produces crow's feet wrinkles around the corners of the eyes). The literature generally favors the interpretation that the Duchenne smile is perceived as more joyful than other types of smiles and has been suggested as a marker of enjoyment (Duchenne, 1862/1990; Frank, Ekman, & Friesen, 1993). Ekman and colleagues conducted a series of studies to distinguish "felt" smiles from "unfelt" or social smiles (Ekman, Davidson, & Friesen, 1990; Ekman & Friesen, 1982; Frank et al., 1993) and confirmed Duchenne (1990) (1862) observation. However, several studies have found that non-Duchenne smiles also have been associated with self-reports of happiness in adults (e.g., Hecht & LaFrance, 1998; Hess, Banse, & Kappas, 1995; Jakobs, Manstead, & Fischer, 1999).

In this context, children as young as 6 years of age are able to detect the masking of negative emotions (Soppe, 1988) as well as the presence of negative affect in smiles (Gosselin, Beaupré, & Boissonneault, 2002). Furthermore, children tend to discount the positive implications of a smile if there are cues suggesting that the expressed affect might not be sincere (Bugental, Kaswan, Love, & Fox, 1970). Thus, there is some evidence that even relatively young children are able to make distinctions between different types of smiles.

However, less is known about children's use of smile intensity as a marker of authenticity. Specifically, adults use both intensity and the presence of the Duchenne marker as markers of authenticity, such that smiles for which these two indicators do not match are perceived as particularly inauthentic (Thibault, Levesque, Gosselin, & Hess, 2007). However, this was found to be the case only for French Canadian decoders who judged the authenticity of smiles by French Canadian encoders. This pattern of results is suggestive of a display rule that would need to be acquired during socialization. Whether children of different ages also consider intensity to be indicative of authenticity and how they integrate the two sources of information remain to be investigated.

Thus, another variable that can potentially influence the perception of authenticity of smiles by younger children is the ethnicity of the stimulus person. In fact, it is likely that the same factors that influence the ability to recognize the facial expressions of emotions by members of different ethnic groups also influence the perception of authenticity. Specifically, some evidence suggests that cross-cultural influences may modulate emotion recognition accuracy (e.g., Ducci, Arcuri, Georgis, & Sineshaw, 1982; Elfenbein & Ambady, 2002, 2003) due to encoding or motivational factors. In this vein, Elfenbein, Beaupré, Lévesque, and Hess (2007) found that Gabonese encoders predominantly showed open-mouthed smiles and much less often showed Duchenne smiles when asked to pose an enjoyment smile than did Quebecois encoders. These differences in the way these two groups expressed smiles of enjoyment has been defined by these authors as a cultural dialect. Yet if different cultures have their own cultural dialect of an authentic smile, then it may well be that smiles by members of different cultures may correspondingly be evaluated differently.

In sum, the goal of the current study is to investigate the markers that children use to assess the authenticity of different types of smiles by members of different ethnic groups.

## Method

### *Participants*

A total of 1206 children and adolescents of French Canadian origin (598 girls and 608 boys), enrolled in four middle-class elementary and high schools located in the suburbs of Montreal, Canada, participated in this study. For 4- to 14-year-olds, informed parental consent was obtained. Participants 15 years of age and older gave their own consent. The consent rate was approximately 80%. No form of remuneration or reward was given for participation.

### *Materials*

Color pictures of smiling individuals served as the stimulus material. Encoders were French Canadian, Chinese, and Sub-Saharan African men and women. The smiles varied with regard to both the intensity of the zygomaticus major activity and the presence of orbicularis oculi activity (Duchenne marker). Certain combinations of these two factors tend to not occur in normal situations or are impossible to achieve. For example, intense smiles are always accompanied by wrinkles around the eyes as the cheeks are pushed up. Conversely, it is nearly impossible for most people to combine a weak smile with wrinkles around the eyes. Based on these considerations, the expressions retained for the current experiment were ecologically valid smiles of different intensities with and without the Duchenne marker. Specifically, the expressions were (a) an intense smile with wrinkles around the eyes (intense Duchenne smile), (b) a medium intensity Duchenne smile, (c) a medium intensity smile without the presence of wrinkles (non-Duchenne smile), and (d) a weak smile. In addition, we included (e) a neutral expression and (f) a miserable smile (smile with a frown).

The Duchenne smiles, the weak smile, and the neutral expression were part of the Montreal Set of Facial Displays of Emotion (MSFDE) (Beaupré & Hess, 2005). This set is composed of emotional facial expressions by Chinese, French Canadian, and Sub-Saharan African young adults who were instructed via a direct facial action task to pose facial expressions of emotions. All encoders were between 20 and 30 years of age. The facial expressions were coded by two certified coders using the Facial Action Coding System (Ekman & Friesen, 1978). In the MSFDE, only expressions for which both coders agreed on both the action units and their intensity were retained. Using Adobe PhotoShop, the non-Duchenne smile was produced by the combination of a medium smile with a neutral upper face, and the miserable smile was produced by adding a frowning upper face. Although these expressions occur naturally, they are more difficult to achieve voluntarily. To obtain “clean” expressions, therefore, use of digital image processing techniques was preferred. This resulted in a total of 72 stimuli (6 smiles  $\times$  2 genders  $\times$  3 cultures  $\times$  2 encoders). Fig. 1 shows an example of a set of six expressions. A total of 12 such sets were constructed using a Latin square design. Thus, each set of six expressions contained one example for each of the six smile types, shown by a different male and female encoder from each

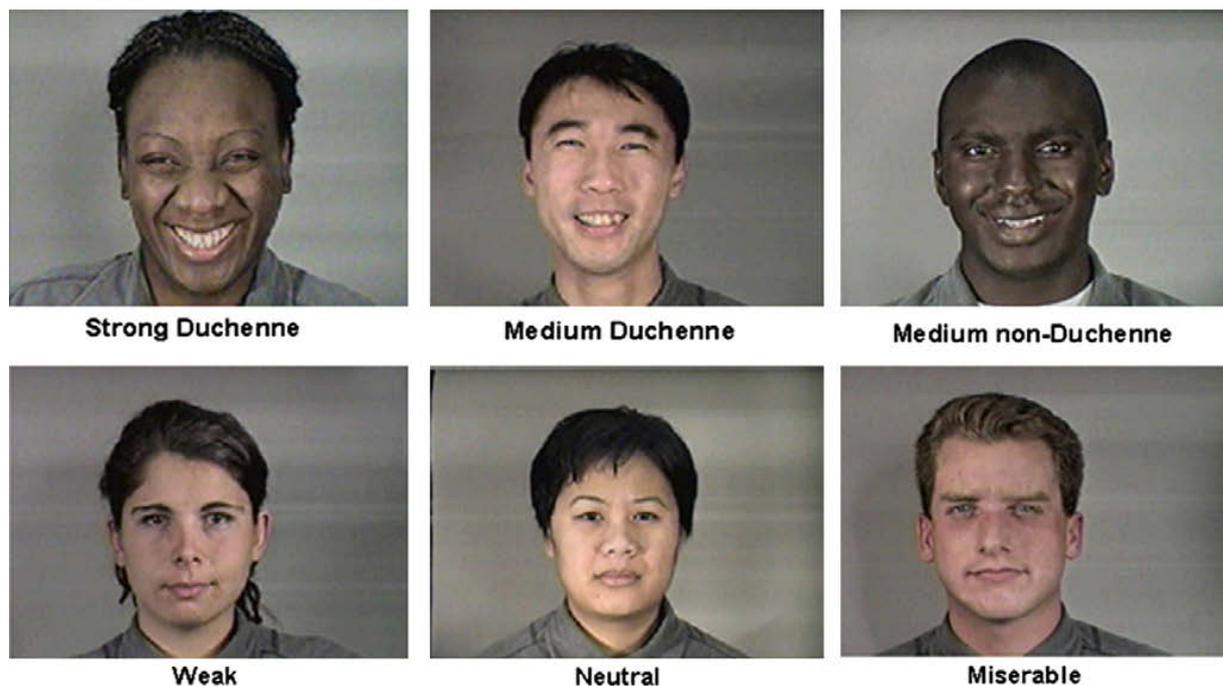


Fig. 1. Examples of facial expressions.

of the three groups, and no set contained more than one example for each expression or actor. This allowed us to treat the data using between-participants analyses.

### Procedure

#### Children

Children from 4 to 12 years of age were tested individually in a quiet room located near the children's classroom. The experimenter explained the notion of authenticity by giving an example (authentic smile: "You see a friend you have not seen for a while"; inauthentic smile: "Your grandmother gives you a pair of brown socks for your birthday"). Children were then asked to describe a situation in which someone's smile reflected his or her emotion (authentic smile) and a situation in which someone's smile was "put on" (not authentic). All children were able to do so. At this point, the children were told that they would see six pictures showing different smiles and that they would need to indicate the level of authenticity of each smile. A practice trial was then conducted. After the children demonstrated correct understanding of the rating scale, the experimenter proceeded with the experiment. No children were eliminated from the study.

#### Adolescents

Adolescents from 13 to 17 of age were tested in groups of 25 to 35 in their classrooms. The same examples were provided to explain the notion of authenticity; however, adolescents were not required to provide an example to demonstrate their understanding.

#### Dependent measures

Children rated the level of authenticity by moving a cursor on a 24-cm scale with the anchors 0 (*not authentic at all*) to 24 (*totally authentic*). Adolescents indicated their ratings on a 24-cm continuous scale by placing a cross at the appropriate place.<sup>1</sup>

<sup>1</sup> To evaluate whether the contacts participants had or have with the three cultural groups influences their perception, all participants completed an adaptation of the Tzeng and Jackson questionnaire (1994). However, only very small and unsystematic effects emerged for these variables. These results will therefore not be reported.

## Results

Initial analyses did not reveal any sex of rater effects. Therefore, this factor was dropped from the analyses reported below.

An analysis of variance (ANOVA) with the between-participants factors Age Group (5)  $\times$  Encoder Sex (2)  $\times$  Encoder Group (3)  $\times$  Smile Type (6) was performed, followed by post hoc Tukey's tests ( $p < .05$ ) to further evaluate significant main effects and interactions. The analysis revealed a main effect for smile type,  $F(5, 7055) = 478.67$ ,  $p < .001$ ,  $\eta^2 = .253$ . Post hoc analysis revealed that across age groups, the intense Duchenne smile was significantly perceived as most authentic ( $M = 18.20$ ,  $SD = 7.00$ ), followed by the medium Duchenne smile ( $M = 16.55$ ,  $SD = 7.05$ ), the medium non-Duchenne smile ( $M = 14.35$ ,  $SD = 7.40$ ), the weak smile ( $M = 11.67$ ,  $SD = 6.56$ ), the miserable smile ( $M = 9.22$ ,  $SD = 6.64$ ), and the neutral expression ( $M = 8.86$ ,  $SD = 6.91$ ). All differences were significant except for the difference between the authenticity for the miserable smile and the neutral expression.

Importantly, however, the ANOVA also revealed a significant interaction effect for Smile Type  $\times$  Age Group,  $F(20, 7055) = 44.46$ ,  $p < .001$ ,  $\eta^2 = .112$  (see Fig. 2).

Independently of their age, children seemed to rely on the presence of the Duchenne marker to judge the authenticity of smiles. Indeed, children from every age group perceived the medium Duchenne smile as significantly more authentic than the medium non-Duchenne smile. It is the use of the intensity of the smiles that differed depending on the age groups. Overall, younger children seemed to accord more importance to the intensity of the expression than did older children. Thus, for children between 4 and 13 years of age, authenticity judgments varied almost linearly with the intensity of the

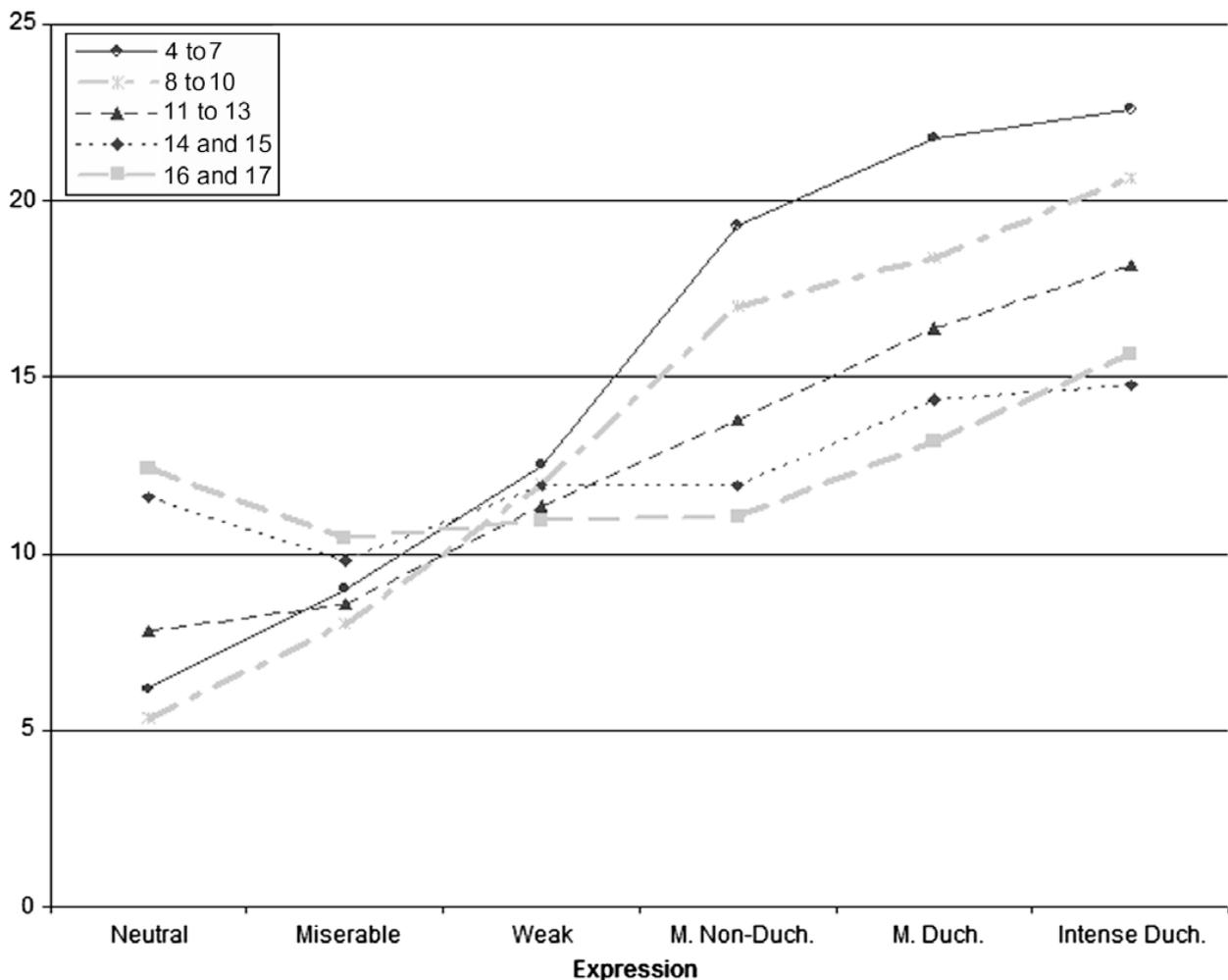


Fig. 2. Authenticity scores by type of expression and age of observer. M., medium; Duch., Duchenne.

smile. These age groups gave the lowest ratings for the neutral expression and the miserable smile and gave the highest ratings for the intense Duchenne smile. All other differences between the neutral expression/miserable smile and the other smiles were significant.

In contrast, 14- and 15-year-olds seemed to rely exclusively on the presence of the Duchenne marker without considering the intensity of the expressions. Thus, the only significant difference was found for the comparison of the medium Duchenne smile with the medium non-Duchenne smile. In contrast, this age group rated the medium Duchenne smile to be no different in authenticity from the intense Duchenne smile. Furthermore, all smiles without this marker were rated as equally authentic except for the miserable smile, which was perceived as significantly less authentic than all of the other smiles, including the neutral expression.

The 16- and 17-year-olds did use intensity as a marker, but only for the comparison of the intense versus medium Duchenne smile; these two smiles were rated as significantly different. Interestingly, this age group perceived the neutral expression and the medium Duchenne smile as equally authentic. All smiles with less intensity were rated as roughly equally authentic, but the medium Duchenne smile was rated as significantly more authentic than the medium non-Duchenne smile as well as significantly less authentic than the intense Duchenne smile. Thus, this group showed the largest degree of integration in the use of the two sources of information.

A main effect of encoder ethnicity group also emerged from the analysis,  $F(2, 7055) = 88.21$ ,  $p < .001$ ,  $\eta^2 = .024$ . The effect of encoder ethnicity group in authenticity judgments can be explained by the fact that smiles from French Canadian encoders ( $M = 11.75$ ,  $SD = 7.87$ ) were overall perceived as significantly less authentic than smiles from either Chinese encoders ( $M = 13.70$ ,  $SD = 7.60$ ) or Sub-Saharan African encoders ( $M = 13.98$ ,  $SD = 7.69$ ).

## Discussion

This study aimed to assess the development of the knowledge that children have about the features that signal the authenticity of a smile. Given that all of the smiles were posed, sensitivity was assessed on the basis of the participants' tendency to judge some smiles as being more representative of authentic smiles than others. Part of the research strategy was to control as much as possible for physical parameters of the stimuli, varying some parameters while keeping others constant. The results provide evidence that both the intensity of the smile and the presence of the Duchenne marker are important elements of the perception of authenticity of smiles.

Regarding the Duchenne marker, these findings replicate findings for adult decoders (Frank et al., 1993) as well as findings by Gross and Harris (1988) and Josephs (1994) that children around 5 or 6 years of age have knowledge about the differences between real and apparent emotions—knowledge that they can articulate verbally. This capacity to use the Duchenne marker, a relatively subtle cue of authenticity, compares to findings by Gosselin et al. (2002) that 6- and 7-year-olds are sensitive to the presence of another subtle cue, the lip tightener, as indicated by their greater tendency to say that a stimulus person was really happy when this action unit was not part of the display than when it was.

Our findings also suggest that the role played by the intensity of the expression in the perception of authenticity varies as a function of age, with a decrease in the reliance on intensity between 4 and 13 years. Specifically, younger children used the intensity marker along the whole continuum to infer authenticity. Hence, in their eyes, a medium intensity smile is more authentic than a weak smile, which in turn is more authentic than a neutral expression. In contrast, the oldest group (16- and 17-year-olds) used intensity to infer higher levels of authenticity for the intense Duchenne smile relative to the medium intensity Duchenne smile. For this group, all smiles that do not contain the Duchenne marker are rated as roughly equally nonauthentic.

The reliance on intensity in younger children is an interesting phenomenon. It suggests that young children use intensity as a cue to authenticity more than do older children. Given the cognitive and perceptual prerequisites for determining the authenticity of emotional expressions, it is not surprising to observe that the older adolescents were better able to integrate intensity levels and the presence of the Duchenne marker to derive their judgment. However, the 16- and 17-year-olds, while using both intensity and the Duchenne marker for their judgments, used the intensity only to discriminate

between the two Duchenne smiles but not to distinguish between weak and medium smiles as do adults older than 18 years (Thibault et al., 2007).

Surprisingly, contrary to Thibault et al. (2007), we found few differences as a function of encoder group. As mentioned above, the main finding regarding the effect of encoder group was that smiles by French Canadian encoders were perceived as significantly less authentic than smiles by members of the two other groups of encoders. It is plausible that children in this study were more critical of the expressions of their in-group because these expressions were more familiar to them, rendering children more confident in their judgments. When confronted with expressions that were less familiar, children tended to rate these expressions as overall more authentic, consistent with the generally observed bias to rate messages that have been observed as honest (e.g., Kraut, 1978, 1980).

In future studies, it would be worthwhile to include children from different ethnic groups as well as to study adults from monocultural environments to disentangle the effects of learning perceptual rules from the effects of learning social display rules. Including children from other ethnic groups would also allow the exploration of a possible universal age-related process involved in the perception of the authenticity of emotional expressions.

In sum, this study investigated the development of the ability to judge the authenticity of different types of smiles based on the intensity of the expressions and on the presence and absence of the Duchenne marker. The current results show that French Canadian children used both the Duchenne marker and the level of intensity to discriminate the levels of authenticity of different smiles. Younger children base their judgment on intensity to a larger degree. The ability to integrate both sources of information increases with age but remains inferior to that of adults. This suggests that the very important ability to infer authenticity from the smiles of others is something that not only young children but also typical adolescents have not yet fully mastered.

## Acknowledgments

This research was supported by a grant from the Fonds Québécois de Recherche sur la Société et la Culture to Pascal Thibault as well as by a grant from the Fonds de Formation des Chercheurs et Aide à la Recherche to Pierre Gosselin, Marie-Lise Brunel, and Ursula Hess. The authors thank Dominique Gravel, Élisabeth Décary, Annabelle Thibault, Maxime Lévesque, Adèle Thibault, and Nathalie Gauthier for their help in collecting the data. The authors also thank the staff and children of the four schools that collaborated for this study.

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