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Does parenting affect recognition of emotions conveyed by children?

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Abstract—**The present work investigates those factors affecting the way people recognize face, gestures, and more specifically emotional expressions. To this aim, a study is proposed, in which were involved sixty participants split in two groups (parents and childless subjects). Participants were required to label pictures of male and female children belonging to different ethnicity displaying static expressions of anger, disgust, fear, happiness, sadness, surprise, and neutrality. Results showed that the gender and the ethnicity of the stimulus clearly affected results; moreover, differences were observed between parents and childless participants concerning percentages of emotions recognition accuracy.**

Index Terms—**emotion processing, face recognition**

I. Introduction

Information and Communication Technologies (ICTs) find a large number of applications in different fields such as psychology, education, and rehabilitation; moreover, ICTs and humans' cognitive processes are deeply linked and mutually affects each other. Among humans' cognitive processes emotions play a significant role. A core aspect, which also represent a fundamental component of what is defined "emotional intelligence", is face and gesture recognition. However, emotion recognition processes are complex, and may be affected by numerous factors, both related to "who" is recognizing an emotional expression and to "who/what" is the subject of the recognition process.

Several features of the person who is encoding a facial expression affect this process, among these, subject's age, aging [1][2][3], and gender, as well [4][5][6]. In addition, even features of the showed face influence the decoding process, as the typology [7], the age [8][9] and the gender [10]. Concerning the differences between men and women in the interpretation of emotions some studies emphasized women's greater ability to accurately detect emotional expression compared to men [4]. Other studies showed that the gender effect may be related to factors such as the stimulus intensity, emphasizing that women have greater accuracy especially for subtle expressions of emotion [11]. Previous studies highlighted an effect of the modality in which the stimulus is presented and the associated sensory channel, in fact women are more accurate than men when interpreting in particular emotional prosody [6].

As regards as the effect on emotion recognition of both the gender of the encoder and of the stimulus, some have proposed an effect known as "Own Gender Bias" [12], which suggests that people decode facial expressions of the same gender faster and more accurately compared to faces of the opposite sex [13].

Another factor of interest is the effect of faces' ethnicity on emotion recognition. In literature a well-known phenomenon is the Own Race Bias (ORB) [14], according to which faces belonging to unfamiliar racial groups are worse decoded compared to own-race faces. The Own race bias is often explained through the "contact hypothesis" [15] according to which the amount of contact that an individual has with another race is positively correlated with the recognition accuracy for faces of that race. Ethnicity is a key factor in the field of emotion recognition, even considering that people are ethically biased when deciphering emotions [16][17][18].

An interesting aspect in relation to the person decoding a face that in our knowledge has not been investigated in depth, concerns whether the continuous exposure to certain facial features could somehow facilitate and makes people more capable to recognize the expressions conveyed by that type of face, more specifically we refer to differences between parents and childless people in the ability to code facial expressions of children.

Considered the aforementioned factors and their effects on emotion recognition processes, and the weight of emotions within ICT field, a study is proposed. Static pictures depicting children, belonging to different ethnicity were exploited for this research; two group of participants (parents and childless) were required to recognize facial expressions of anger, disgust, fear, happiness, sadness, surprise, and neutrality. The presented investigation aims at assessing the effect of participants' parenthood on their capability to decode children' static facial expressions and the effect of stimuli's gender and ethnicity (European, African American, Latino American, and Asian) on participants' ability to decode facial emotional expressions.

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II. Materials and Methodology

A. Participants

The study involved 60 healthy subjects aged between 20-50 years, split into two groups: a group of 30 childless participants (mean age=31.53; SD= ±0.9, 17 females) and a group of 30 parents (mean age=37.53; SD= ±8.5, 19 females). Participants were administered an emotion decoding task, more in detail a recognition task of children static emotional faces taken from the CAFE database. Participants, all Italians, were recruited through e-mails and social networks; they joined the study after reading and agreed to an informed consent formulated according to the Italian and European laws about privacy and data protection. The research was authorized by the ethical committee of the Department of Psychology at the Università degli Studi della Campania "Luigi Vanvitelli" with the protocol number 25/2017.

B. Stimuli

The emotional decoding task required participants to decode images of female and male children, belonging to different ethnicity (European, African American, Latino American, and Asian) expressing anger, disgust, fear, happiness, sadness, surprise, and neutrality. Pictures were taken from the Child Affective Facial Expression Set (CAFÉ) [19]. The database consists of a collection of pictures depicting children of 2- to 8- year-old, interpreting emotional facial emotional expressions of sadness, happiness, surprise, anger, disgust, and fear and neutrality. The database includes female and male actors of different ethnicity (African American, Asian, European/ European American, Latino, and South Asian). The current experiment exploits fifty-six faces of European, African American, Latino American, and Asian children displaying the seven facial expressions of anger, disgust, fear, happiness, sadness, surprise, and neutrality (for each emotional category were selected 8 pictures, a male and a female child for each ethnicity). Unfortunately, since the images in the CAFE dataset are copyright protected cannot be published. If interested in visioning the stimuli is possible to require them at: https://nyu.databrary.org/volume/30.

C. Tools and Procedures

The study was developed using Lab.js, an online study builder, successively exported on JATOS, a tool allowing to generate the links that have been given to participants. Each participant was provided with a link to be opened from a laptop. Once opened the link, participants gave their consent to a personal data processing form and after this participants' demographic data were collected. The study consisted in a trial session (composed by six static images) and by an experimental session (composed by fifty-six static images), both characterized by the presentation of randomized stimuli. For each picture, participants were required to select an emotional label choosing among these options: disgust, anger, sadness, fear, happiness, surprise, neutrality. If, according to the participant, the emotion was not described by none of the proposed category they were given the possibility to select the "other emotion" option of response (this option was considered in order to try to influence participants' answer as little as possible, allowing them further freedom while selecting the answer).

III. Data Analysis and Results

A. Data Description

The dependent variable measured in our study is emotion recognition accuracy; we investigated how it is affected by variables (which represent the independent variables of the study) related to the participants (as their gender and genitoriality) and by variables related to the stimulus (as the gender and the ethnicity); study's independent variables are summarized in Table 1. For each emotional category (disgust, anger, sadness, fear, happiness, surprise, neutrality) 8 stimuli were shown (one male and one female child for each ethnicity). When participants correctly decoded the emotion portrayed by a stimulus the answer was coded with the scoring "1", while when the emotion was not correctly recognized the scoring was equal to "0", table 2 summarize this information. Means of recognition accuracy vary from 0 to 1 concerning the statistical analysis performed singularly for each emotional category (section C), while vary from 0 to 8, for the analysis performed on emotional category total decoding scores (section B). In the following sections will be shown the statistical procedure used to the test the effects of the previously mentioned variables on emotion recognition accuracy, more specifically we used Repeated measures ANOVA's since it allowed us to test both the effects of between subjects' variables (such as participants' gender and genitoriality) and within subjects' variables (such as stimuli's gender and ethnicity) on emotion recognition accuracy.

TABLE I
STUDY'S INDEPENDENT VARIABLES

Participants' Gender	***Participants' Genitoriality***	***Stimuli's Gender***	***Stimuli's Ethnicity***
Twenty-four males Thirty-six females	Thirty parents Thirty child-free	Female and male children static faces	Static faces of children belonging to different ethnicity (European, African American, Latino American, Asian)

TABLE II
STUDY'S DEPENDENT VARIABLE (Recognition Accuracy)

Typology of stimulus for each emotional category	***Recognition Accuracy Scores***
Male European	1=stimulus correctly decoded 0=stimulus wrong decoded
Male African American	
Male Latino American	
Male Asian	
Female European	
Female African American	
Female Latino American	
Female Asian	

B. Emotional total scores

A first elaboration of the data was performed with the aim to assess participants' ability to correctly decode the proposed emotional categories (i.e., anger, disgust, fear, happiness, sadness, surprise, and neutrality.) independently from the age and the ethnicity of the faces. Repeated measures ANOVA were performed on the collected data, considering participants' gender and group (parents and childless) as between subjects' variables, and total decoding scores of the proposed emotional category as within subjects' variables. The significance level was set at $\alpha < .05$ and differences among means were assessed through Bonferroni's post hoc tests.

Significant differences [$F(6, 336) = 57.368$, $p<<.01$] emerged concerning emotions recognition scores. Bonferroni post-hoc tests revealed that each emotional category significantly differed from each other: Happiness (mean=7.618), Surprise (mean=7.511), Anger (mean=7.013), Disgust (mean=6.662), Neutrality (mean=6.500), Sadness (mean=5.253), Fear (mean=4.099), $p<.01$; between anger and surprise the difference was slightly lower ($p=.038$).

The only exceptions were represented by Disgust, which did not significantly differ from Anger ($p=1.000$) and Neutrality ($p=1.000$), by Anger which did not significantly differ from Neutrality ($p=.980$) and by Happiness which did not significantly differ from Surprise ($p=1.000$). Figure 1 shows these results.

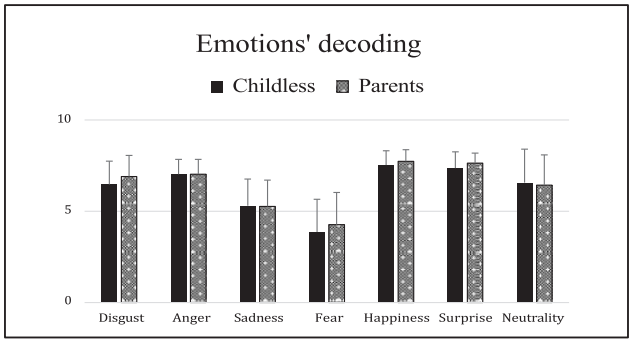

Fig. 1. Recognition scores of childless participants and parents for each emotional category. Y- axis means vary between 0 and 8 and represent for each emotional category total decoding scores.

C. Effects of faces' gender and ethnicity

To test the effect of some variables as the gender and the ethnicity of the showed faces on emotion decoding accuracy, ANOVA repeated measures analyses were carried out for each emotional category (disgust, anger, fear, sadness, happiness, surprise, and neutrality) considering participants' group (parents and childless) as between subjects' factors, and gender and ethnicity of stimuli (European, African American, Latino American, and Asian) as within factors. The significance level was set at $\alpha < .05$ and differences among means were assessed through Bonferroni's post hoc tests.

Disgust

Significant effects of the gender of stimuli were observed [$F(1,56) = 12.444$, $p=.001$]. Bonferroni post hoc tests revealed that this was due to female facial expressions (mean=.894) which were better recognized compared to male facial expressions (mean=.771, $p=.001$).

Significant effects of the ethnicity of stimuli were observed [$F(3, 168) = 9.816$, $p<<.01$]. Bonferroni post hoc tests revealed that this was due to African American facial expressions (mean=.979) which were better recognized compared to European (mean=.756, $p<<.01$), Latino American (mean=.784, $p<<.01$) and Asian (mean=.811, $p<<.01$) facial expressions.

A significant interaction emerged [$F(3,168) = 5.783$, $p=.001$] between gender and ethnicity of stimuli. Bonferroni's post hoc tests were performed for each single factor (gender and ethnicity of stimuli). These tests revealed that:

a) Concerning gender of stimuli: Female Latino American faces were better decoded (mean=.945) compared to male Latino American faces (mean=.624, $p<<.01$).

b) Concerning ethnicity of stimuli: as regard as male faces, African American faces were better decoded (mean=.972) compared to European (mean=.693, $p<<.01$), Latino American (mean=.624, $p<<.01$) and Asian (mean=.796, $p=.001$) facial expressions. As regard as female faces, African American faces were better decoded (mean=.987) compared to European (mean=.819, $p=.010$) and Asian (mean=.826, $p=.011$) facial expressions. Figure 2 shows these results.

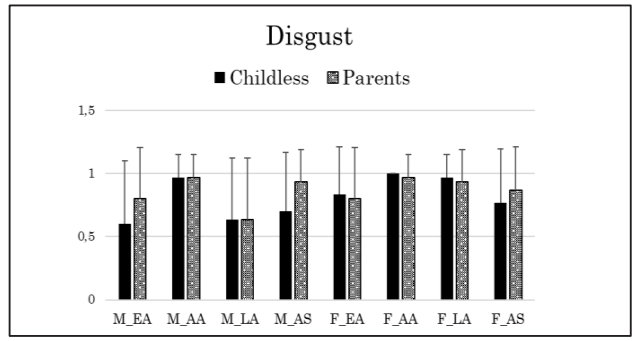

Fig. 2. Recognition scores of childless participants and parents for disgust. Means are showed for each stimulus, the first letter indicates the gender of the face (M=male, F=female), letters after the underscore refers to faces' ethnicity (EA=european, AA=african american, LA=latino american, AS=asian).

Anger

Anger Significant effects of the ethnicity of stimuli were observed [$F(3, 168) = 30.405$, $p<<.01$]. Bonferroni post hoc tests revealed that this was due to Asian facial expressions (mean=.667) which were worse recognized compared to European (mean=.971, $p<<.01$), Latino American (mean=.894, $p<<.01$) and African American (mean=.975, $p<<.01$) facial expressions. Figure 3 summarize these results.

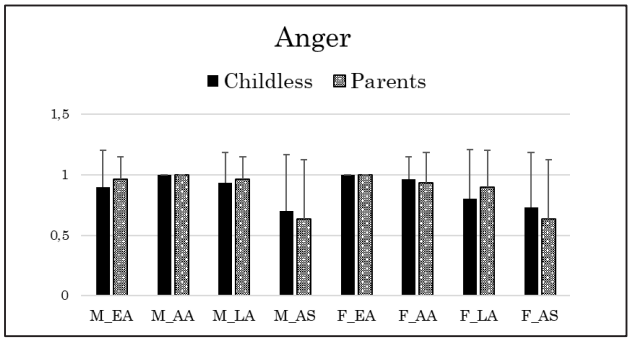

Fig. 3. Recognition scores of childless participants and parents for anger. Means are showed for each stimulus, the first letter indicates the gender of the face (M=male, F=female), letters after the underscore refers to faces' ethnicity (EA=european, AA=african american, LA=latino american, AS=asian).

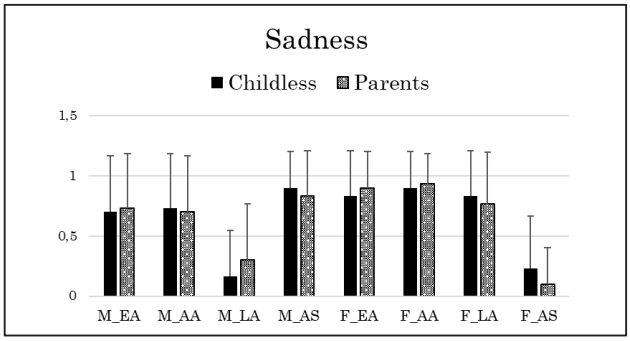

Fig. 4. Recognition scores of childless participants and parents for sadness. Means are showed for each stimulus, the first letter indicates the gender of the face (M=male, F=female), letters after the underscore refers to faces' ethnicity (EA=european, AA=african american, LA=latino american, AS=asian).

Sadness

Significant effects of the ethnicity of stimuli were observed [F (3, 168) = 21.017, p<<.01]. Bonferroni post hoc tests revealed that this was due to Latino American (mean=.520) and Asian facial expressions (mean=.514) which were worse decoded compared to European (mean=.783, p<<.01) and African American (mean=.809, p<<.01) faces.

A significant interaction emerged [F (3,168) = 63.815, p=.001] between gender and ethnicity of stimuli. Bonferroni's post hoc tests were performed for each single factor (gender and ethnicity of stimuli). These tests revealed that:

a) Concerning gender of stimuli: Female European faces were better decoded (mean=.864) compared to male European faces (mean=.702, p=.021); female African American faces were better decoded (mean=.915) compared to male African American faces (mean=.703, p=.003); female Latino American faces were better decoded (mean=.802) compared to male Latino American faces (mean=.239, p<<.01); male Asian faces were better decoded (mean=.857) compared to female Asian faces (mean=.170, p<<.01).

b) Concerning ethnicity of stimuli: as regard as male faces, Latino American faces were worse decoded (mean=.239) compared to European (mean=.702, p<<.01), African American (mean=.703, p<<.01) and Asian (mean=.857, p<<.01) facial expressions. As regard as female faces, Asian faces were worse decoded (mean=.170) compared to European (mean=.864, p=.010), African American (mean=.915, p=.011) and Latino American (mean=.802, p<<.01) facial expressions. Figure 4 summarize these results.

Fear

Significant effects of the gender of stimuli were observed [F (1, 56) = 57.083, p<<.01]. Bonferroni post hoc tests revealed that this was due to female facial expressions (mean=.647) which were better recognized compared to male facial expressions (mean=.378, p<<.01).

Significant effects of the ethnicity of stimuli were observed [F (3, 168) = 14.963, p<<.01]. Bonferroni post hoc tests revealed that this was due to Latino American facial expressions (mean=.288) which were worse recognized compared to European (mean=.631, p<<.01), African American (mean=.587, p<<.01) and Asian (mean=.543, p<<.01) facial expressions.

A significant interaction emerged [F (3,168) = 32.087, p<<.01] between gender and ethnicity of stimuli. Bonferroni's post hoc tests were performed for each single factor (gender and ethnicity of stimuli). These tests revealed that:

a) Concerning gender of stimuli: Female European faces were better decoded (mean=1.000) compared to male European faces (mean=.262, p<<.01); female African American faces were better decoded (mean=.805) compared to male African American faces (mean=.370, p<<.01); male Latino American faces were better decoded (mean=.369) compared to female Latino American faces (mean=.207, p=.028).

b) Concerning ethnicity of stimuli: as regard as male faces, Asian were better decoded (mean=.510) compared to European (mean=.262, p=.020). As regard as female faces, Latino American faces were worse decoded (mean=.207) compared to European (mean=1.000, p<<.01), African American (mean=.805, p<<.01) and Asian (mean=.576, p<<.01) facial expressions. Figure 5 summarize these results.

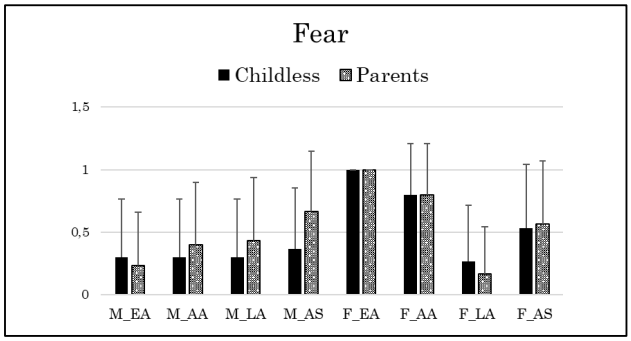

Fig. 5. Recognition scores of childless participants and parents for fear. Means are showed for each stimulus, the first letter indicates the gender of the face (M=male, F=female), letters after the underscore refers to faces' ethnicity (EA=european, AA=african american, LA=latino american, AS=asian).

Happiness

Significant effects of the gender of stimuli were observed [F (1, 56) = 5.323, p=.025]. Bonferroni post hoc tests revealed that this was due to male facial expressions (mean=.973) which were better recognized compared to female facial expressions (mean=.932, p=.025). Figure 6 show these results.

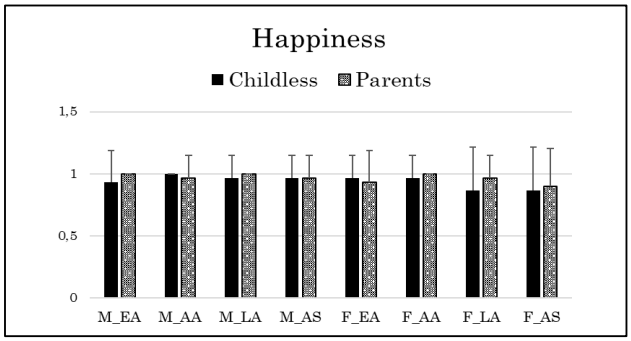

Fig. 6. Recognition scores of childless participants and parents for happiness. Means are showed for each stimulus, the first letter indicates the gender of the face (M=male, F=female), letters after the underscore refers to faces' ethnicity (EA=european, AA=african american, LA=latino american, AS=asian).

Surprise

Significant effects of the gender of stimuli were observed [F (1, 56) = 6.172, p=.016]. Bonferroni post hoc tests revealed that this was due to male facial expressions (mean=.964) which were better recognized compared to female facial expressions (mean=.913, p=.016).

A significant interaction emerged [F (3,168) = 8.379, p<<.01] between gender and ethnicity of stimuli. Bonferroni's post hoc tests were performed for each single factor (gender and ethnicity of stimuli). These tests revealed that:

a) Concerning gender of stimuli: male European faces were better decoded (mean=.985) compared to male European faces (mean=.860, p=.020); male Latino American faces were better decoded (mean=1.000) compared to female Latino American faces (mean=.828, p=.001); female Asian faces were better decoded (mean=.985) compared to male ones (mean=.872, p=.010).

b) Concerning ethnicity of stimuli: as regard as male faces, African American (mean=1.000) and Latino American (mean=1.000) facial expressions were better decoded compared to European (mean=.985, p=.039) and Asian facial expressions (mean=.872, p=.039). As regard as female faces, Latino American faces were worse decoded (mean=.828) compared to African American (mean=.981, p=.016) and Asian (mean=.985, p=.032) facial expressions. Figure 7 show these results.

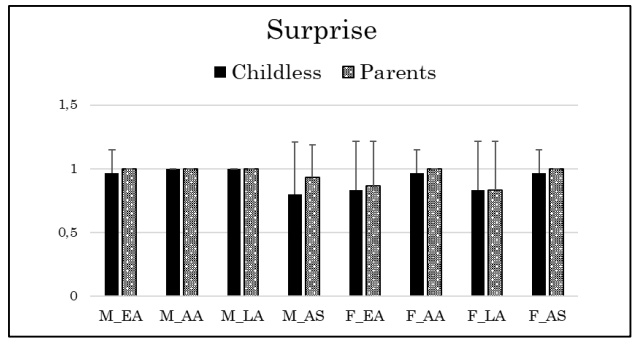

Fig. 7. Recognition scores of childless participants and parents for surprise. Means are showed for each stimulus, the first letter indicates the gender of the face (M=male, F=female), letters after the underscore refers to faces' ethnicity (EA=european, AA=african american, LA=latino american, AS=asian).

Neutrality

Significant effects of the ethnicity of stimuli were observed [F (3, 168) = 5.656, p=.001]. Bonferroni post hoc tests revealed that this was due to Latino American (mean=.911) which were better decoded compared to African American (mean=.777, p=.035) and Asian (mean=.726, p=.002) faces.

A significant interaction emerged [F (3,168) = 13.326, p=.001] between gender and ethnicity of stimuli. Bonferroni's post hoc tests were performed for each single factor (gender and ethnicity of stimuli). These tests revealed that:

a) Concerning gender of stimuli: Female European faces were better decoded (mean=.951) compared to male European faces (mean=.721, p<<.01); male Asian faces were better decoded (mean=.865) compared to female Asian faces (mean=.587, p<<.01).

b) Concerning ethnicity of stimuli: as regard as male faces, Latino American faces were better decoded (mean=.951) compared to European (mean=.721, p=.005). As regard as female faces, Asian faces were worse decoded (mean=.587) compared to European (mean=.951, p<<.01), African American (mean=.783, p=.034) and Latino American (mean=.871, p=.001) facial expressions. Figure 8 show these results.

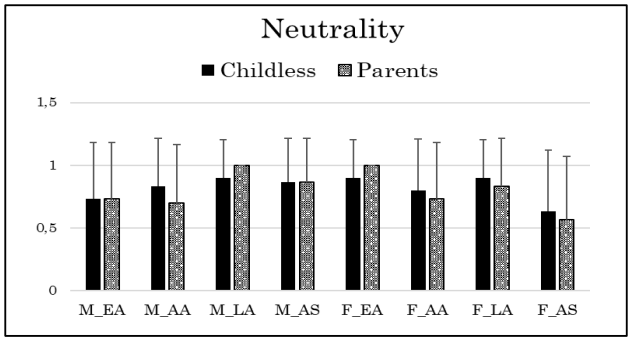

Fig. 8. Recognition scores of childless participants and parents for neutrality. Means are showed for each stimulus, the first letter indicates the gender of the face (M=male, F=female), letters after the underscore refers to faces' ethnicity (EA=european, AA=african american, LA=latino american, AS=asian

TABLE III
CHILDLESS PARTICIPANTS' AND PARENTS DECODING ACCURACY (IN %) OF EMOTIONAL FACES

	Decoding accuracy of children faces in %						
	Disgust	*Anger*	*Sadness*	*Fear*	*Happiness*	*Surprise*	*Neutral*
Childless	80.8	87.9	66.3	48.3	94.2	92.1	82.1
Parents	86.3	87.9	65.8	53.3	96.7	95.4	80.4

TABLE IV
CONFUSION MATRICES OF CHILDLESS PARTICIPANTS' DECODING ACCURACY (IN %) FOR EACH EMOTIONAL CATEGORY

Childless %								
	Disgust	*Anger*	*Sadness*	*Fear*	*Happiness*	*Surprise*	*Neutral*	*Other emotion*
Disgust	**80.8**	9.6	5.0	0.8	0.0	0.0	0.0	3.8
Anger	4.2	**87.9**	3.3	1.3	0.0	0.0	0.0	3.3
Sadness	13.8	0.0	**66.3**	4.6	0.0	0.4	4.6	10.4
Fear	5.4	0.8	1.3	**48.3**	0.4	33.3	2.1	8.3
Happiness	0.4	0.0	2.1	0.0	**94.2**	0.8	1.7	0.8
Surprise	0.0	0.0	0.0	5.0	2.5	**92.1**	0.0	0.4
Neutral	0.4	4.2	5.0	4.2	0.0	0.4	**82.1**	3.8
Disgust	80.8	9.6	5.0	0.8	0.0	0.0	0.0	3.8

TABLE V
CONFUSION MATRICES OF PARENTS' DECODING ACCURACY (IN %) FOR EACH EMOTIONAL CATEGORY

Parents %								
	Disgust	*Anger*	*Sadness*	*Fear*	*Happiness*	*Surprise*	*Neutral*	*Other emotion*
Disgust	**86.3**	8.8	3.8	0.0	0.0	0.0	0.0	1.3
Anger	5.4	**87.9**	2.9	0.8	0.0	0.0	0.0	2.9
Sadness	16.7	0.8	**65.8**	3.8	1.3	2.1	3.3	6.3
Fear	1.7	1.3	0.8	**53.3**	0.4	35.0	2.1	5.4
Happiness	0.4	0.0	0.0	0.4	**96.7**	0.8	0.8	0.8
Surprise	0.0	0.0	0.0	2.5	2.1	**95.4**	0.0	0.0
Neutral	0.8	3.8	7.9	2.1	0.0	0.8	**80.4**	4.2
Disgust	86.3	8.8	3.8	0.0	0.0	0.0	0.0	1.3

IV. DISCUSSION

The presented work provides an investigation aimed at exploring whether and how variables, such as participants' gender and parenting, as well as the gender and the ethnicity of the stimulus administered, in this case children static faces, affect the process of decoding emotional expressions. Testing the effects of these factors on people's ability to decode emotions, could be helpful in order to increase knowledge concerning this fundamental human cognitive process. Participants, split in childless and parents, were administered an emotion recognition task depicting children's facial expressions belonging to different ethnicity (European, African American, Latino American, and Asian) and required to select an emotional label to each picture choosing among anger, disgust, fear, happiness, sadness, surprise, and neutrality. We observed that the factors which mostly influenced results were the gender and the ethnicity of the showed faces, even if these effects vary according to the emotional category analyzed.

For instance, as regards as faces' gender, disgust and fear were more accurately decoded when conveyed by female children, while happiness and surprise were better decoded on male children faces. In literature the impact of the gender of a face conveying an emotion on facial expressions' accuracy recognition has been widely investigated. A well-known theory concerns the "Own Gender Bias" according to which people should easily decode faces of their same gender compared to faces of the other gender [12][13]. Nevertheless, our investigation does not confirm this bias but rather highlighted that variables as for instance the gender of a face, could not have an absolute effect on emotion recognition abilities, rather seems to be mediated by the emotional category considered.

Ethnicity is a fundamental factor in the field of emotion recognition, even considering the concept of "Racialized Emotion Recognition Accuracy" suggesting that humans are ethically prejudiced when decoding emotions, in particular when attributing anger [16][17][18] and that this is true not only while decoding adults' facial expressions but children' faces as well [20]. As regards as our study once again the effect of this factor depends on the emotional category considered. When decoding disgust, African American faces were more accurately decoded; when recognizing anger Asian facial expressions were worse decoded while when decoding sadness Asian and Latino American faces were less accurately recognized. Concerning fear, once again Latino American children were worse decoded, while on the contrary when decoding neutrality participants better decoded Latino American faces with respect to the other ethnicities. Still, when focusing on the ethnicity of a face, scientific studies encourage the existence of a facilitation effect, known as Own-Ethnicity Bias [21], according to which people would better process faces that belong to their own ethnicity. But once again our results do not confirm this hypothesis, as we should have observed, considered that our participants were

all European, that facial expressions of European children would have been systematically better recognized compared to those of other ethnicities, but this was not the case. Indeed, for many emotional categories African American faces have been better recognized, confirming once again that the influence of variables such as the ethnicity of a face have on facial expressions processing is not a direct effect, rather this could interact with other variables, like the features of the face itself.

Even tough statistical analyses do not highlight significant differences between childless participants and parents, examining percentages of decoding accuracy (table 3) we observed that Sadness and Neutrality were more accurately decoded by childless participants, while Disgust, Fear, Happiness, and Surprise were more accurately decoded by parents. These results are very interesting as they partially confirm one of the initial questions that inspired the study, namely the desire to investigate whether in some way the fact that a person is (or has been) exposed to children's facial expressions on a daily basis could facilitate him/her while decoding emotional expressions conveyed by children compared to a person who does not have daily intercourse with children. Our results show that for most of the emotional categories investigated this is true, as parents showed higher recognition accuracy rates compered to childless participants. The only exceptions were represented by Sadness and Neutrality, which instead were more accurately recognized by childless subjects. Interesting insights were also provided by confusion matrices showing the percentage of participants' decoding accuracy for each emotional category for both the groups of childless participants and parents (tables 4 and 5), which showed that disgust, anger, happiness, surprise, and neutrality were correctly classified by both groups, which showed a percentage of decoding accuracy higher than 80%. Some misclassifications were observed, in both groups, concerning sadness, mostly confused with disgust, or identified as other emotion, and fear, mostly confused with surprise, as expected since fear and surprise are often blended in facial expressions [22]. Moreover, was observed that the emotional categories better decoded were Disgust, Anger, Happiness, Neutrality, and Surprise, while Sadness and Fear were the emotional categories worse decoded by both groups of participants.

V. Conclusions

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