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Effects of Sex and Parental Status on the Assessment of Infant Faces

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To date, research on infant face processing has focused on the appraisal of physical features, but investigations of the effects of sex and parental status on infant emotional expressions have been less prevalent. The present study sought to fill this gap by investigating the effects of sex and parental status on the assessment of infant emotional faces using a community sample of 105 participants (55 female) who were split into 2 groups according to parental status: 53 parents (28 female) comprised those who had a child aged <10 years, and 52 nonparents (27 female) comprised those who did not have children and did not work in a childcare environment. A total of 116 infant faces were presented under 5 emotional conditions (positive, muted positive, neutral, muted negative, and negative). The participants were instructed to rate each facial expression with regard to 3 aspects: pleasure, activation, and intensity. The results revealed a significant effect of group, with nonparents perceiving happy and sad infant faces as more intense than parents. We hypothesize that because parents are frequently exposed to intense emotions of their children, their range of intensity may be wider. Therefore, the parents tend to assign a lower intensity to infant emotional faces. In addition, no differences were found between men and women, regardless of parental status, in any of the aspects that were evaluated (pleasure, activation, and intensity) for any emotional expressions (sad, happy, and neutral). This corroborates findings that mothers and fathers are also often more similar than different in their cognitive responses to children.

Keywords: infant faces, emotion, facial expression, parental status

Facial expressions are integral to the expression of human feelings (Darwin, 1872). Ekman (2009) highlighted that facial expressions are the best source of information that we can have on emotions because the morphology of the face allows us to interpret others' feelings even better than we interpret verbal expressions of emotions. In our everyday lives, our face enables us to reveal subtle emotions and may even betray us by displaying feelings we try to hide (Ekman & Friesen, 2003). Different expressions consist of real facial signals. Expressions can exhibit an emotion that is being expressed and the strength of emotions if two or more are blended together and whether control of the emotion is being attempted (Ekman & Friesen, 2003).

It has been widely accepted that emotional understanding is essential for individual well-being, particularly for the establishment of affectionate relationships (Ekman & Friesen, 2003). Given that the face is usually the first source of information about others' feelings, the accurate interpretation of facial expressions assumes a key role in our success in social situations (Lee, Anzures, Quinn, Pascalis, & Slater, 2011). This ability to read others' feelings through facial expressions comprises both biological and social components. The biological component has been highlighted in studies of animal behavior that

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revealed that the recognition of these expressions at first sight helps nonhuman primates make individual decisions, such as cooperating, fleeing, fighting, seeking protection, or mating. Unlike other animals that primarily use olfaction or audition, primates do this mainly by using their visual system (Phelps, & Roberts, 1994; Weiss, Kralik, & Howser, 2001). However, still unknown is whether human beings have a specialized innate superior face-processing mechanism or whether our exposure to faces causes a visual learning phenomenon (Pascalis & Kelly, 2009). Nonetheless, the social component of facial expressions has been largely accepted, and parents and other members of the family shape a good part of what is learned about emotions and facial expressions (Ekman & Friesen, 2003).

If the processing of facial expressions is essential for adults' interactions, then this recognition is even more important for children because babies communicate mostly through facial expressions and other nonverbal forms of communication (Schmidt & Cohn, 2001). Lorenz (1943) proposed what we call "baby schema"—a collection of characteristics and specificities of infants that are specially designed to draw attention from adults and trigger emotional responses of affection and care and mammalian maternal behavior. This scheme includes large eyes, a rounded face, a protruding and large forehead, a receding chin, a small nose, round, chubby, protruding cheeks, and a plump, small body. A biased perception of children's faces has potential evolutionary value and may be related to specific alterations of the neural response (Lorenz, 1971).

Some features of the baby schema point toward an innate mechanism that is evoked in humans and other animals to automatically like and care for the young, increasing the species' chances of survival (Lorenz, 1971). Konrad Lorenz suggested that this basic mechanism is like a symmetrical structure of cuteness in human and nonhuman infant faces. Lorenz highlighted that the attraction of humans for cute animals can be connected to an evolutionary response, in which our brains are fooled by the features we perceive. Humans love animals like puppies because of their similarity to human babies.

Neuroimaging studies have corroborated this hypothesis, showing that neural responses to babies differ from responses to adults (e.g., Kringelbach et al., 2008; Proverbio, Riva, Zani, & Martin, 2011; for review, see Hahn & Perrett, 2014). Furthermore, behavioral studies revealed that pictures of human infants capture attention more than photos of adult faces. Nevertheless, this effect was specific to human stimuli, in which puppies and kittens did not capture attention more than adult cats and dogs (Brosch, Sander, & Scherer, 2007). The authors found no sex difference, suggesting that infant faces are biologically significant for men and women and are thus prioritized by the attention system. Consistent with these results, Senese et al. (2013) tested the same hypothesis but also investigated the effects of parental status and sex. The results revealed no significant group differences, suggesting that infant faces represent highly biologically relevant stimuli that capture attention, regardless of parenting and sex.

Nevertheless, there is some evidence that parental status and sex modulate neural and behavioral responses to infant faces. Cárdenas, Harris, and Becker (2013) showed that although both men and women displayed an attention bias toward infant features, the effects that were observed in women were stronger and more stable than those that were observed in men. In addition, Proverbio, Brignone, Matarazzo, Zotto, and Zani (2006) observed a stronger neural response to suffering infant faces and greater sensitivity to differences in the intensity of suffering in parents than in nonparents of both sexes. An increase in the neural response to infant faces in mothers compared with nonmothers was also reported by Nishitani, Doi, Koyama, and Shinohara (2011) and Weisman, Feldman, and Goldstein (2012). Furthermore, compared with men, women present greater neural responses, regardless of parental status (Proverbio et al., 2006), and a higher rate of accuracy in decoding infants' emotions (Proverbio, Matarazzo, Brignone, Zotto, & Zani, 2007).

Other studies have been particularly interested in the effect of sex on the perception of baby cuteness and motivational salience toward infant faces (Parsons, Young, Kumari, Stein, & Kringelbach, 2011; Sprengelmeyer et al., 2009; Sprengelmeyer, Lewis, Hahn, & Perrett, 2013). By and large, perception of the baby schema produces a greater caretaking

effect in women than in men (Babchuk, Hames, & Thompson, 1985; Glocker et al., 2009). Moreover, compared with males, females exhibit greater sensitivity to infant cuteness (Lobmaier, Sprengelmeyer, Wiffen, & Perrett, 2010; Sprengelmeyer et al., 2009; Yamamoto, Ariely, Chi, Langleben, & Elman, 2009) and expend greater effort to see infant faces (Hahn, Xiao, Sprengelmeyer, & Perret, 2013).

Yet, this effect has not reached a consensus in the literature. Parsons et al. (2014) showed that infants' temperament moderated women's perceptions of cuteness, shedding some light on the way in which temperament can influence caregiving and suggesting that the association between sex and caregiving may not be linear. A recent study corroborated this notion, showing that brain activity in fathers who had a primary care role was comparable to mothers who also assumed a primary care role and markedly different from fathers who assumed a secondary role (Abraham et al., 2014). In addition, Parsons et al. (2011) showed that both women and men presented similar motivational salience toward infant faces.

These results may be associated with greater female facility in recognizing emotions either in general (Babchuk et al., 1985; Hoffmann, Kessler, Eppel, Rukavina, & Traue, 2010) or exclusively for subtle expressions (Thompson & Voyer, 2014). Nevertheless, research to date has focused mostly on the appraisal of physical features (i.e., cuteness, baby schema, and body size), whereas investigations of the effects of sex and parental status on infant emotional expressions have been less prevalent. The present study sought to fill this gap through an exploratory investigation of the effects of sex and parental status on the assessment of infant emotional faces. This is particularly relevant because the identification of infant emotions is related to parental sensitivity, which in turn may be a determining factor in the quality of care (Murray, Kempton, Woolgar, & Hooper, 1993; Papousek & Papousek, 1977; Stanley, Murray, & Stein, 2004). Evidence also suggests that biased interpretations of emotional expressions are present in psychopathologies, including postnatal depression, and this may be a core feature of the difficulties that are observed in mother-child interactions in these situations (Arteche et al., 2011; Stein et al., 2010).

Methods

Participants

A community sample of 122 participants was recruited through a snowball procedure. Given the reported effects of depression and anxiety on the processing of emotional infant faces (Pass, Arteche, Cooper, Creswell, & Murray, 2012), the participants were screened for symptoms of depression and anxiety, and those who scored above the moderate threshold on either the Beck Depression Inventory (BDI; Beck, Steer, & Brown, 1996) or Beck Anxiety Inventory (BAI; Beck & Steer, 1990; $n = 15$) were excluded from the study. Two participants were also excluded because of incomplete data (BDI and BAI incomplete). Thus, the present results were based on 105 participants with complete data (55 female, 50 male) who were split into two groups according to parental status. The parent group comprised those who had a child aged <10 years ($n = 53$). The nonparent group comprised participants who did not have children and did not work in a childcare environment ($n = 52$). The 10-year-old threshold was applied to the parent group because parents with postpuberty/teenager offspring might have different perceptions of child emotional faces.

As expected, the two groups differed in a few demographic measures. Participants in the parent group were significantly older, had a higher education, and were more likely to be married and employed than those in the nonparent group. Based on our exclusion criteria, none of the participants reached clinical thresholds for affective symptomatology. However, those in the nonparent group reported a greater number of both depression and anxiety symptoms than those in the parent group. In the parent group, 61% had a child aged ≤ 6 years. Table 1 depicts the sample characteristics.

Measures

Infant Face Ratings Task. A total of 116 infant faces were presented in three emotion conditions: 37 positive (five positive and 32 muted positive), 40 neutral, and 39 negative (six negative and 33 muted negative). Muted faces

Table 1
Sample Characteristics

Characteristics	Parents (n = 53)	Nonparents (n = 52)	Statistics
Gender			
Male	25 (47%)	25 (48%)	$\chi^2_1 = .01$, $p = .93$, Cramer V = .009
Female	28 (53%)	27 (52%)	
Age (years)			
M (*SD*)	38.79 (8.54)	25.14 (6.77)	$F_{1,100} = 79.50$, $p < .001$, $\eta^2 = .44$
Range	19–64	18–55	
Education			
Secondary school	12 (23%)	5 (10%)	$\chi^2_3 = 11.69$, $p = .009$, Cramer V = .33
Undergraduate	8 (15%)	22 (42%)	
Graduate	15 (28%)	15 (29%)	
Postgraduate	18 (34%)	10 (19%)	
Employment			
Employed	43 (81%)	32 (61%)	$\chi^2_1 = 4.94$, $p = .03$, Cramer V = .22
Unemployed	10 (19%)	20 (38%)	
Marital status			
Married	44 (85%)	6 (11%)	$\chi^2_1 = 55.62$, $p < .001$, Cramer V = .73
Unmarried	8 (15%)	46 (89%)	
Drug use (past)			
Yes	6 (12%)	9 (17%)	$\chi^2_1 = .63$, $p = .42$, Cramer V = .08
Not	45 (88%)	43 (83%)	
Child's age			
0–2 years	13 (32%)	—	—
3–6 years	12 (29%)	—	
7–10 years	16 (39%)	—	
BDI			
M (*SD*)	5.52 (4.0)	7.71 (5.21)	$F_{1,97} = 5.55$, $p = .02$, $\eta^2 = .05$
BAI			
M (*SD*)	5.26 (4.51)	8.65 (5.09)	$F_{1,97} = 12.32$, $p = .001$, $\eta^2 = .11$

Note. BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; *F*, analysis of variance.

were chosen to be midway between neutral and positive, and muted negative faces were chosen to be midway between neutral and negative. The participants were instructed to rate each facial expression with regard to pleasure, activation, and intensity. Pleasure (i.e., how much the image arouses pleasure in the participant) and activation (i.e., how much the image mobilizes/excites the participant) were assessed using a 5-point pictographic Self-Assessment Manikin (Lang, 1980) and related to the feelings that were elicited in the participant by the infant faces. The intensity of the infant expression refers to the assigned emotional intensity by the participant and was assessed using a 9-point Likert-scale, ranging from −4 (*very sad*) to + 4 (*very happy*).

BDI. This 21-item self-report was used to assess the severity of depression. The BDI is a highly reliable and valid instrument, with excellent internal consistency and factorial and convergent validity. Total scores of 0–13 indicate minimal depression, 14–19 indicate mild depression, 20–28 indicate moderate depression, and 29–63 indicate severe depression. For the purposes of this study, clinically significant depression was defined as a BDI score ≥20.

BAI. This 21-item self-report was used to assess the severity of anxiety. The BAI possesses strong psychometric properties that are related to internal consistency, test–retest reliability, and validity. Total scores of 0–10 indicate minimal anxiety, 11–19 indicate mild anxiety, 20–30 indicate moderate anxiety, and 31–63 indicate severe anxiety. For the purposes of this study, clinically significant anxiety was defined as a BAI score ≥20.

Procedures

Initially, we developed the infant images for the Infant Face Ratings Task. Infant images

were acquired by recording 13 Brazilian infants who were selected based on convenience. The infants were of both sexes, aged 4–12 months, and had different ethnicities. All of the babies were filmed in a natural setting, and no active stimulus was used to elicit the emotions. Recording was carried out for as long as needed to achieve happy, sad, and neutral expressions. Five babies were filmed in a nursery environment. One baby was filmed in the university laboratory. Seven babies were filmed at home. In all situations, a responsible adult (mother or nursery nurse) was present.

Adriane Xavier Arteche and two undergraduate students of psychology selected the six clearest, best images of each baby (two of each expression). Those images were then edited and merged with images of 27 infants that were originally compiled by the Oxford Parent Project (for details, see Kringelbach et al., 2008). The five emotion conditions (positive, muted positive, neutral, muted negative, and negative) were rated by the same research team. The selection process for the Brazilian images was the same as the one used for the Oxford set. The final database comprised a total of 116 images, which were presented in grayscale and matched with regard to size and luminosity. One important implication of using grayscale images is that grayscale images, compared with color stimulus images, allow the minimization of perceptions based on skin tone and other stimuli that are unrelated to facial expressions (e.g., hair and eye color; Stepanova & Strube, 2009).

The images were randomly distributed in four blocks so that each participant rated 29 pictures, and each image was evaluated by 30 participants. The images were presented on a 14.7-inch display of a notebook computer, with an exposure time of 2 s. The computer display was approximately 50 cm away from each participant (visual angle = 90°). The participants were instructed to rate each facial expression with regard to three aspects: pleasure and activation (for themselves) and intensity (for infant expression) using a printed evaluation form, with an unlimited response time (see Figure 1).

Assessments were conducted at the participants' homes, individually in a private room. The participants provided written consent to participate in the study and completed the BDI, the BAI, and a demographic questionnaire. Given that studies with substance abusers have shown that such individuals exhibit an impaired ability to recognize facial expressions (e.g., Fernández-Serrano, Lozano, Pérez-García, & Verdejo-García, 2010; Kornreich et al., 2003), we also included a question about current and past drug use. The participants then completed the Infant Face Ratings Task. Data collection procedures took approximately 50 min for each participant.

Results

Overall Data Analysis

Distributions of average scores of intensity, pleasure, and activation for each emotional condition (happy, sad, and neutral) were examined, and all of them met the criteria for normality. Significant associations were found across the three aspects, ranging from weak ($r = .25$, $p = .009$ for sad/activation and pleasure/happy) to

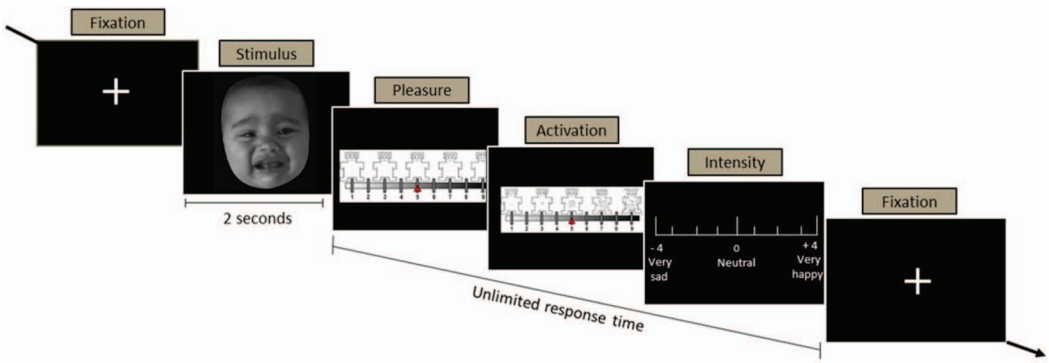

Figure 1. Infant face ratings task. See the online article for the color version of this figure.

strong ($r = .76$, $p < .0001$ for intensity/happy and pleasure/happy) associations. No significant block presentation effects were observed (all $p > .15$). To investigate potential covariates, multivariate analyses of variance (MANOVAs) or linear regressions were used to investigate the effects of age, education, the use of drugs, and depression and anxiety scores on intensity, pleasure, and activation scores. Given our specific interest, a series of multivariate analyses of covariance (MANCOVAs) were then performed, with sex and parental status as fixed factors. Significant covariates were entered in the models as appropriate. Although the number of faces was not balanced between regular and muted emotions, as an exploratory analysis we also investigated the effects of sex and parental status on the intensity of each specific emotional category.

Effects of Age, Education, Use of Drugs, Depression, and Anxiety

For the intensity of emotion, no significant effects of age, education, depression, or anxiety were found in any of the emotional conditions (all $p > .11$). A total of 15 participants reported drug use (10 reported past use, and five reported current use). All 15 participants reported the use of cannabis, five reported the past use of cocaine, five reported the past use of lysergic acid diethylamide, and two reported the past use of ecstasy. Drug use had a significant effect on the appraisal of happy infant faces, with participants who reportedly used drugs (past or current) attributing lower scores to happy faces ($F_{1,101} = 4.70$, $p = .03$, $\eta^2 = .04$; drug use, M = 2.37, $SD = 0.79$; no drug use, M = 1.90 $SD = 0.62$). No significant effects of drug use on sad ($F_{1,101} = 0.03$, $p = .87$, $\eta^2 = .001$) or neutral ($F_{1,101} = 2.58$, $p = .11$, $\eta^2 = .02$) faces were found.

A similar pattern of results was observed for pleasure associated with the processing of infant faces. Although no effects of age, education, depression, or anxiety were found (all $p > .19$), participants who indicated the use of drugs reported lower levels of pleasure when viewing faces of happy babies ($F_{1,101} = 5.37$, $p = .02$, $\eta^2 = .05$; drug use, M = 7.07, $SD = 0.87$; no drug use, M = 6.52, $SD = 0.78$). No significant effects of drug use on the appraisal of pleasure for either sad ($F_{1,101} = 1.84$, $p = .18$, $\eta^2 = .02$) or neutral ($F_{1,101} = 0.77$, $p = .38$, $\eta^2 = .008$) faces were found. For the appraisal of activation, no significant effects of any of the target potential covariates were found (all $p > .08$).

Effects of Sex and Parental Status

Based on the above findings, a MANCOVA, with drug use as a covariate, was conducted for the intensity of infant faces, yielding a significant, albeit weak, group effect. Nonparents ($M = 2.43$, $SD = 0.69$) perceived infant happy faces as happier than parents ($M = 2.16$, $SD = 0.85$). Additionally, nonparents ($M = -2.60$, $SD = 0.80$) attributed greater intensity scores to sad faces than parents ($M = -2.22$, $SD = 1.06$). No significant effects of sex and no Group $\times$ Sex interaction were found any emotional condition (see Table 2). Although p values slightly changed, ranging from significant to marginal, similar effect sizes were observed when the effects of sex and parental status were investigated for regular versus muted emotions (happy, $F_{1,98} = 2.88$, $p = .09$, $\eta^2 = .03$; muted happy, $F_{1,98} = 4.77$, $p = .03$, $\eta^2 = .05$; sad, $F_{1,74} = 3.23$, $p = .08$, $\eta^2 = .04$; muted sad, $F_{1,98} = 4.14$, $p = .04$, $\eta^2 = .04$). With regard to the appraisal of pleasure, a similar MANCOVA, with drug use as a covariate, was conducted, yielding no significant effects of group and no Group $\times$ Sex interaction. A marginal sex effect was observed for pleasure attributed to viewing happy infant faces, with female participants ($M = 7.15$, $SD = 0.95$) reporting higher levels of pleasure than male participants ($M = 6.85$, $SD = 0.76$). When similar analyses were conducted for activation while viewing emotional infant faces, a significant group effect was observed for neutral faces, with parents ($M = 4.81$, $SD = 1.41$) reporting higher levels of activation than nonparents ($M = 4.21$, $SD = 1.36$). No significant effects of group and sex and no group $\times$ sex interaction were found for any other emotional condition.

Subsequent analyses were conducted just in the parent group to investigate potential effects of age of the child on the processing of infant faces. No significant effects of age of the child on the appraisal of intensity or pleasure were found for any emotional condition (all $p > .70$). A marginally significant effect was observed for activation while viewing happy faces ($F_{2,38} = 2.43$, $p = .10$, $\eta^2 = .11$), with parents with

Table 2
Effects of Gender and Parental Status on Intensity, Pleasure, and Activation in Each Emotional Condition

Dimension	Emotion	Group	Gender	*M* (*SD*)	Group effect	Gender effect	Group × Gender interaction
Intensity	Happy	Nonparents	Male	2.30 (.71)	$F_{1,103} = 3.84$, $p = .05$, $\eta^2 = .03$	$F_{1,103} = .34$, $p = .55$, $\eta^2 = .00$	$F_{1,103} = .34$, $p = .55$, $\eta^2 = .00$
			Female	2.56 (.65)			
			Total	2.43 (.69)			
		Parents	Male	2.11 (.62)			
			Female	2.21 (1.04)			
			Total	2.16 (.85)			
	Sad	Nonparents	Male	−2.57 (.83)	$F_{1,103} = 3.94$, $p = .05$, $\eta^2 = .03$	$F_{1,103} = .22$, $p = .88$, $\eta^2 = .00$	$F_{1,103} = .27$, $p = .60$, $\eta^2 = .00$
			Female	−2.64 (.78)			
			Total	−2.61 (.79)			
		Parents	Male	−2.29 (.90)			
			Female	−2.16 (1.22)			
			Total	−2.23 (1.07)			
	Neutral	Nonparents	Male	−.23 (.33)	$F_{1,103} = .11$, $p = .73$, $\eta^2 = .00$	$F_{1,103} = .25$, $p = .61$, $\eta^2 = .00$	$F_{1,103} = .26$, $p = .60$, $\eta^2 = .00$
			Female	−.04 (.59)			
			Total	−.13 (.49)			
		Parents	Male	−.09 (.55)			
			Female	−.07 (.84)			
			Total	−.08 (.71)			

Table 2 (*continued*)

Dimension	Emotion	Group	Gender	*M* (*SD*)	Group effect	Gender effect	Group × Gender interaction
Pleasure	Happy	Nonparents	Male	6.90 (.88)	$F_{1,105} = 1.30$, $p = .25$, $\eta^2 = .01$	$F_{1,105} = 3.10$, $p = .08$, $\eta^2 = .03$	$F_{1,105} = .35$, $p = .55$, $\eta^2 = .00$
			Female	7.30 (.93)			
			Total	7.11 (.91)			
		Parents	Male	6.81 (.65)			
			Female	7.00 (.98)			
			Total	6.91 (.84)			
	Sad	Nonparents	Male	2.97 (1.37)	$F_{1,105} = 1.28$, $p = .26$, $\eta^2 = .01$	$F_{1,105} = 2.05$, $p = .15$, $\eta^2 = .01$	$F_{1,105} = .49$, $p = .48$, $\eta^2 = .00$
			Female	2.34 (.75)			
			Total	2.64 (1.13)			
		Parents	Male	2.90 (1.03)			
			Female	2.92 (1.34)			
			Total	2.91 (1.19)			
	Neutral	Nonparents	Male	4.84 (.62)	$F_{1,105} = .22$, $p = .63$, $\eta^2 = .00$	$F_{1,105} = .54$, $p = .46$, $\eta^2 = .00$	$F_{1,105} = .05$, $p = .82$, $\eta^2 = .00$
			Female	4.90 (.79)			
			Total	4.87 (.70)			
		Parents	Male	4.75 (.58)			
			Female	4.87 (.66)			
			Total	4.81 (.62)			
Activation	Happy	Nonparents	Male	4.93 (2.02)	$F_{1,105} = .05$, $p = .81$, $\eta^2 = .00$	$F_{1,105} = .23$, $p = .63$, $\eta^2 = .00$	$F_{1,105} = .73$, $p = .39$, $\eta^2 = .00$
			Female	5.43 (1.51)			
			Total	5.19 (1.78)			
		Parents	Male	5.16 (2.00)			
			Female	5.02 (2.06)			
			Total	5.09 (2.01)			
	Sad	Nonparents	Male	5.23 (1.46)	$F_{1,105} = .49$, $p = .48$, $\eta^2 = .00$	$F_{1,105} = .76$, $p = .38$, $\eta^2 = .00$	$F_{1,105} = .04$, $p = .83$, $\eta^2 = .00$
			Female	5.44 (1.71)			
			Total	5.34 (1.58)			
		Parents	Male	5.39 (1.69)			
			Female	5.73 (1.67)			
			Total	5.57 (1.66)			
	Neutral	Nonparents	Male	4.07 (1.45)	$F_{1,105} = 5.01$, $p = .02$, $\eta^2 = .04$	$F_{1,105} = .36$, $p = .55$, $\eta^2 = .00$	$F_{1,105} = .13$, $p = .71$, $\eta^2 = .00$
			Female	4.33 (1.28			
			Total	4.21 (1.36)			
		Parents	Male	4.78 (1.18)			
			Female	4.85 (1.60)			
			Total	4.82 (1.40)			

Note. *F*, multivariate analysis of variance.

children aged 3–6 years ($M = 6.33$, $SD = 1.09$) reporting higher levels of activation ($p = .03$) while viewing infant happy faces compared with parents with children aged ≥7 years ($M = 4.70$, $SD = 2.14$). Parents with children aged 0–2 years had an activation mean of 5.33 ($SD = 2.25$) and were not significantly different from the other two parent groups.

Discussion

In the present study, we investigated the effects of sex and parental status on the assessment of infant emotional faces using a community sample. Participants rated infant faces with regard to pleasure, activation, and intensity. The results revealed a tendency toward the nonparents perceiving happy and sad babies as more intense than parents, suggesting that the attribution of emotional intensity significantly varies across parental status, contrary to what was observed for pleasure and activation. We hypothesize that parents are frequently exposed to intense emotions of their children, and their range of intensity may be wider; therefore, they tend to assign a lower intensity for infant emotional faces. Conversely, nonparents may have a narrower range of infant expressions, thus tending to polarize their ratings such that sad is always perceived as very sad and happy is mostly perceived as very happy.

Pleasure and activation may be less influenced by learning because they are more related to innate mechanisms (Kringelbach, 2010). From an evolutionary perspective, these reactions (pleasure and activation) to an infant face have adaptive value, regardless of parental status, because this increases the chances of survival of the species. The activation results appear to support this hypothesis, in which both parents and nonparents reported similar levels of activation when viewing babies' emotional expressions (happy and sad). This suggests an innate characteristic of activation in response to viewing an emotional infant face and not a characteristic that is related to parenting, thus corroborating prior similar results (Brosch et al., 2007; Senese et al., 2013). For unemotional neutral faces, parents presented greater activation than nonparents, suggesting that experience modulates the perception of infant faces when they are not accompanied by intense emotions. This result is corroborated by other studies that found that brain areas that are linked to affect exhibited an increase in activation in mothers compared with nonmothers when viewing infant faces (e.g., Nishitani et al., 2011).

We did not find differences between men and women, regardless of parental status, in any of the assessed core aspects (pleasure, activation, and intensity) for any of the emotional expressions (sad, happy, and neutral). This result differs from several studies that found significant sex differences (Glocker et al., 2009; Lobmaier et al., 2010; Parsons et al., 2011; Proverbio et al., 2006; Sprengelmeyer et al., 2009). However, our results are consistent with Lobmaier et al. (2010), who also did not find any sex differences in the judgment of infant facial expressions. However, these authors focused on physical features of infant faces or neural responses. Our study targeted the emotional component of infant expressions, and the present results appear to mirror the same trend that was observed in prior attentional bias studies, which also did not find sex differences (Brosch et al., 2007; Senese el al., 2013). Our results suggest that in the attribution component (i.e., pleasure, activation, and intensity), men are as sensitive as women to infants, thus corroborating findings in which mothers and fathers were also often more similar than different with regard to cognitive responses to children (Dunsmore, Her, Halberstadt, & Perez-Rivera, 2009; for review, see Miller, 1988). Consistent with other studies, parents' emotional processing has a great impact on children's socioemotional outcomes, such as emotion regulation, social competence, peer relations, and school adjustment (Eisenberg, Cumberland, & Spinrad, 1998; Denham & Kochanoff, 2002). One possibility is that our measure was not sufficiently sensitive to capture potential sex differences because we used a Likert-type scale. Studies that use a binary accuracy measure might reveal possible differences between men and women.

Lastly, the drug effect that we found, in which participants who reported drug use attributed lower intensity and lower levels of pleasure in response to happy faces. These results appear to reflect a broader trend that has been found in previous studies that reported impairments in accurately recognizing emotional faces in drug abusers at a global level (Kornreich et al., 2003), specifically expressions of happiness (also surprise and fear, but such expressions

were not assessed in the present study) but not sadness or neutral faces, thus corroborating our results (Fernández-Serrano et al., 2010). In addition, cannabis users (i.e., the main drug used by our participants) presented impairments in emotional face recognition (Hindocha et al., 2014).

Conclusions

The present results show that nonparents perceived happy and sad infant faces as more intense than parents. We found no differences between men and women, regardless of parental status, in pleasure, activation, or intensity for any of the emotional expressions (sad, happy, and neutral). The limitations of this study include the strategy of sample recruitment. Studies that use random samples or use a higher offspring age threshold for inclusion in the parent group may provide a wider pattern of responses. Finally, future studies could benefit from larger samples and a longitudinal design.

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