Estudos de Psicologia

Estudos de Psicologia, 22(1), janeiro a março de 2017, 1-9

Gender and the capacity to identify facial emotional expressions

Carolina Baptista Menezes. Universidade Federal de Santa Catarina.
Juliana Corrêa Hertzberg. Universidade Federal de Pelotas.
Franciele Ely das Neves. Universidade Federal de Pelotas.
Priscila Flores Prates. Universidade Federal de Santa Maria.
Jaíne Foletto Silveira. Universidade Federal de Santa Maria.
Silvio José Lemos Vasconcellos. Universidade Federal de Santa Maria.

Abstract

Recognizing emotional expressions is enabled by a fundamental sociocognitive mechanism of human nature. This study compared 114 women and 104 men on the identification of basic emotions on a recognition task that used culturally adapted and validated faces to the Brazilian context. It was also investigated whether gender differences on emotion recognition would vary according to different exposure times. Women were generally better at detecting facial expressions, but an interaction suggested that the female superiority was particularly observed for anger, disgust, and surprise; results did not change according to age or time exposure. However, regardless of sex, total accuracy improved as presentation times increased, but only fear and anger significantly differed between the presentation times. Hence, in addition to the support of the evolutionary hypothesis of the female superiority in detecting facial expressions of emotions, recognition of facial expressions also depend on the time available to correctly identify an expression.
Keywords: facial expression; emotion; gender; exposure time.

Resumo

Gênero e a capacidade de identificação de emoções expressas pela face. A habilidade de reconhecer emoções é um mecanismo sociocognitivo fundamental à vida humana. Este estudo comparou 114 mulheres e 104 homens na identificação de emoções básicas no teste de reconhecimento facial, adaptado e validado para o contexto brasileiro. Investigou-se, também, se a diferença de gênero no reconhecimento das emoções poderia variar conforme o tempo de exposição. As mulheres foram melhores na detecção das expressões faciais, mas uma interação sugeriu que a superioridade foi particularmente observada nas emoções de raiva, nojo e surpresa; esses resultados não alteraram conforme idade e tempo de exposição. Entretanto, independentemente do sexo, a acurácia total melhorou conforme aumentou o tempo de apresentação, sendo que apenas o reconhecimento de medo e raiva diferiu entre os tempos de apresentação. Assim, além de apoiar a hipótese da superioridade do sexo feminino em reconhecer expressões faciais emocionais, o reconhecimento das emoções faciais também depende do tempo disponível para conseguir identificá-las.
Palavras-chave: expressão facial; emoção; gênero; tempo de exposição.

Resumen

El género y la capacidad de identificación de emociones expresadas por el rostro. Reconocer emociones es fruto de un mecanismo sociocognitivo fundamental para los humanos. Se comparó el desempeño de 114 mujeres y 104 hombres en la identificación de emociones básicas en la prueba de reconocimiento facial adaptado para el contexto brasileño. Se investigó también la diferencia de género en el reconocimiento de las emociones según diferentes tiempos de exposición. Las mujeres obtuvieron mejores resultados en la detección de las expresiones, pero una interacción sugirió que la superioridad fue especialmente observada para rabia, repugnancia y sorpresa. Los resultados no han cambiado según la edad o tiempo de exposición. Sin embargo, independientemente del sexo, la precisión total mejoró a medida que aumentaron los tiempos de presentación, pero sólo la detección de miedo y repugnancia se diferenció entre los tres tiempos. Luego, además de la confirmación de la hipótesis evolutiva de la superioridad femenina, el reconocimiento de las expresiones faciales también depende del tiempo disponible.
Palabras clave: expresión facial; emoción; género; tiempo de exposición.

DOI: 10.22491/1678-4669.20170001 ISSN (versão eletrônica): 1678-4669 Acervo disponível em www.scielo.br/epsic

One of the central questions in human evolution is the origin of human sociality and human culture. The correct identification of facial emotions plays a fundamental role in the evolution of the social species, of which we belong. The ability to recognize emotional expressions enables individuals to interpret the feelings of others, comprising a fundamental cognitive mechanism of human social life (Cacioppo, Cacioppo, Dulawa, & Palmer, 2014). However, this capacity may not have equally benefited men and women when certain aspects of the *Pleistocene* social life are considered. One of these aspects is, for instance, the parenting of offspring and the necessity to quickly respond to the needs of infants (Vasconcellos, Vargas, & Silva, 2014). Hence, it is possible that both developmental and evolutionary aspects jointly influence gender differences for recognizing emotional facial expressions (Gregoric et al., 2014).

Based on this knowledge, some authors suggested that gender differences can be explained by the fact that women are more specialized in identifying and reacting to the emotional manifestations of others (Babchuk, Hames, & Thomnson, 1985; Kret & De Gelder, 2012). Indeed, it has been demonstrated that women were faster in recognizing emotions from facial cues, compared to men (Hampson, Anders, & Lucin, 2006). This study also showed that the women superiority was not explained by either previous childcare experience, or sex differences in simple perceptual speed. From a methodological perspective, most findings stem from investigations that rely on the classification of seven basic universal facial emotions (Ekman, 2003), namely, fear, happiness, surprise, anger, disgust, sadness, and contempt. Based on this classification, a meta-analysis has supported that females have a small but significant advantage over men to recognize basic emotions portrayed in facial expressions (Mclure, 2000). Interestingly, these results indicated that this advantage did not vary according to different ages.

Despite theoretical and empirical claims that women are more prone to better recognize facial emotion expressions (Hampson et al., 2006; Kret & De Gelder, 2012; Mclure, 2000), it remains unclear whether this superiority applies to all basic emotions, or to some emotion category in particular (Boloorizdeh & Tojari, 2013). One study developed by Collington and colleagues (2009) found that women were significantly better at recognizing fear and disgust. Partially in accordance with these findings, Williams and Mattingley (2006) demonstrated that women had higher scores in the recognition of surprise, happiness, sadness and disgust, whereas men had higher scores in the recognition of anger. Another investigation (Pinto, Dutra, Filgueiras, Juruena, & Stingel, 2013) found that females were significantly better to recognize sad expressions, whereas males were more accurate in identifying happy expressions.

In addition to the divergent results regarding emotion categories, some studies also show conflicting results. For instance, no sex differences were found in studies that either investigated the detection of emotional facial expressions (Palermo & Coltheart, 2004), or the detection of anger and happiness, compared to neutral faces (Sawada et al., 2014). Likewise, there were no sex differences when the detection of faces showing emotional states were presented between the range from 10 to 50 msec. (Grimshaw, Bulman-Fleming, & Ngo, 2004; Kirouac & Doré, 1984). Notably, another study that also used a paradigm in which the presentation time of stimuli was very fast (30 msec.) did not find sex differences for the detection of happy and angry faces either (Pixton, 2011).

Regarding brain parameters, there is some evidence of sex differences in the neural activation of individuals reacting to distinct facial expressions of emotions (Aleman & Swart, 2008). In particular, a more accentuated activation of frontal gyrus, inferior frontal gyrus and superior temporal gyrus was observed in men when contempt was perceived. Women, on the other hand, presented a more accentuated activation of these regions when exposed to the emotion of disgust (Aleman & Swart, 2008). Interestingly, a distinct pattern of brain activity is also detected for the processing of neutral faces (Perilla-Rodríguez, de Moraes Júnior, & Fukusima, 2013). More specifically, Perilla-Rodríguez and colleagues (2013) demonstrated that the brain asymmetry for processing neutral faces was significantly different for men and women depending on the spatial frequency of the image. It was observed that for women, the left hemisphere prioritized high spatial frequencies, which mediates analytical processing (that is, processing of a single feature regardless of the context), whereas the right hemisphere in females prioritized low spatial frequencies (which mediates holistic processing, that is, integrating the facial features) to recognize faces. For males, both the right and left hemispheres prioritized low spatial frequencies to recognize faces

(Perilla-Rodríguez et al., 2013). Hence, men and women seem to present different sensitivity regarding their cerebral asymmetry for recognizing faces.

Collectively, the empirical evidence partially supports the notion that gender distinctly influences the recognition of facial expressions. However, results are mixed as to whether there are specific emotions that are more easily processed by each gender. In addition, it is unclear whether sex differences do not emerge when fast presentation times (such as 30 and 50 msec.) are used. Some authors discuss that many variables may contribute to the heterogeneity of results. For instance, Schmidt and Cohn (2001) emphasize the importance of considering cultural and ethnical aspects in facial expression research, such as the use of faces that resemble the participants' culture and ethnicity. Moreover, some inconsistencies are likely the result of distinct methodological manipulations. For example, some studies did not assess the same number of basic emotions (Grimshaw et al., 2004; Neath & Itier, 2014; Pixton, 2011; Sawada et al., 2014), or did not use a paradigm that is able to assess and compare different presentation times of stimuli (such as exposures ranging from 30 to 200 msec *vs* 500 msec. to 1000 msec.) (Hampson et al., 2006; Palermo & Coltheart, 2004; Pinto et al., 2013 ; Sawada et al., 2014; Williams & Mattingley, 2006).

Hence, the present study aimed to compare the performance of healthy women and men on the identification of six basic emotional facial expressions (happiness, fear, anger, sadness, disgust, and surprise) on a recognition task that used culturally adapted and validated faces to the Brazilian context (Vasconcellos, Salvador, Gauer, & Gauer, 2014). The study also aimed to investigate whether gender differences on emotion recognition would vary according to three different exposure times (200 msec., 500 msec., 1000 msec.). Based on previous findings (Aleman & Swart, 2008; Collington et al., 2009; Pinto et al., 2013; Williams & Mattingley, 2006), our hypothesis was that women would present greater accuracy in recognizing all emotions, compared to men. It was also expected that men would present greater accuracy in the recognition of anger. Moreover, given that no gender differences were found when fast presentation of stimuli was used (Grimshaw et al., 2004; Kirouac & Doré, 1984; Pixton, 2011), and given that regardless of gender, performance in the recognition of facial emotions tend to increase as the presentation time also increases (Neath & Itier, 2014), it was hypothesized that gender differences would not vary according to time exposure.

Method

Participants

A total of 218 university student volunteers participated in the study (17-60 years; M_{age} = 24.2 years; *SD* = 8.1), of which 114 were women (52,3%; M_{age} = 23.74, *SD* = 7.76) and 104 were men (47,7%; M_{age} = 25.63, *SD* = 7.23). Age did not differ between gender group (t_{215} = -1.87, p = .10). Participants had normal or corrected visual acuity in both eyes, and came from different degrees (Psychology, Law, Architecture and Medicine) from both the Federal University of Santa Maria and the Federal University of Pelotas, southern Brazil. All participants provided informed consent according to the current Brazilian ethical guidelines on human experiments (process no. 29622714.6.0000.5317).

Instrument

In order to evaluate the ability to recognize facial expressions of emotions, a program (Facial Expression Recognition Brazilian Task) was built to control the stimulus exposure time on the computer screen. Initially, 80 photos with four theater actors (two men and two women) were produced to represent the multiraciality that characterizes the Brazilian population (white, mixed-race, and black). The photos expressed either fear, sadness, happiness, disgust, surprise, or anger, based on Ekman's classification of basic universal emotions (Ekman, 1992, 2003). A theater director accompanied the photo production, guiding the actors every time the expressions needed to be more representative, always highlighting the facial muscles involved in each emotion. Photographs were taken with 50 mm focal length. Twenty four photos with four photos (two of men and two of women) for each of the six basic emotions were selected by two judges, both psychologists and researchers in this field. These photos were then tested and evaluated by a sample of 110 university students (55 men and 55 women). Paper photos on a black background were presented and each participant had to indicate on a paper form which of the six basic emotions they had identified. Photos obtained correct evaluation ratings varying between 75% and 95%, supporting the validity of the pictures and the portrayed emotions. There was no control for stimulus exposure time in the first stage. Next, a second validation

took place, in which the 24 photos were transferred to the software and presented to a sample of another 100 university students (50 men and 50 women) in three blocks, each with a different exposure time: 200 milliseconds, 500 milliseconds, and 1 second. After the presentation of each photo on a computer screen, each participant had to indicate on a paper form which of the six basic emotions they had identified. There was no time limit for responses. None of the exposure times obtained an average correct identification rate lower than 50%, demonstrating that despite the program's brief presentation of the stimuli, the basic emotions could be identified by most nonclinical participants. This task showed a satisfactory criterion validity evidenced by two studies, one comparing adolescents with and without psychopathic traits (Vasconcellos, Salvador et al., 2014), and another comparing diagnosed and undiagnosed female psychopaths (Salvador-Silva, 2014). In the present study, as in the two previous investigations, the order of presentation of pictures was random but consistent across blocks (Fig. 1). In order to analyze the outcomes, the sum of correct answers for each emotion in each exposure time is computed to generate an index of facial emotional recognition for each emotion (accuracy rates).

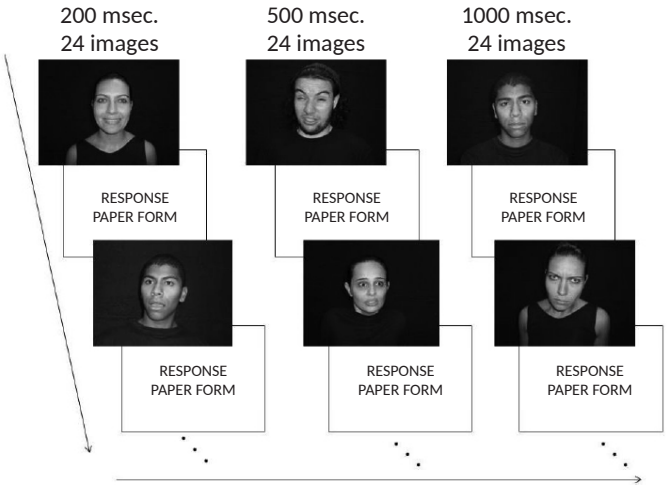

Figure 1. Schematic Representation of Stimulus Presentation. Four Faces Expressing Each of the Six Basic Emotions Were Randomly Presented Within Each Block. Blocks Differed According to Presentation Time, Following a Fixed Order. There Was No Time Limit for Answers.

Procedure

The experimental sessions were conducted in groups of up to 30 people. After instructions about the task, participants were given a paper form on which responses should be marked. Participants were comfortably seated on a chair in a dark room. Images were presented in a multimedia projector (LCD, SVGA resolution of 800 x 600 pixels) by one of the researchers, with no time limit for responses. Hence, images were only displayed after everyone had finished marking their response to the previous stimulus. There were no difficulties reported in the interpretation and visualization of the images. Total assessment lasted about 20 minutes. The study was approved by the Ethics Committee in Research of the Medicine Faculty of the Federal University of Pelotas (process no. 5312).

Data Analysis

The sum of correct answers for each emotion in each exposure time was computed in order to generate an index of facial emotional recognition for each emotion (accuracy rates). In order to explore the interaction between facial emotional recognition and gender, a Repeated Measures General Linear Model (GLM) was carried out considering Emotion (happiness x sadness x anger x disgust x fear x surprise) and Exposure Time (200 msec. x 500 msec. x 1000 msec.) as within factors, and Gender (female x male) as a between factor, controlling for age. ANOVAs, polynomial contrasts, and pairwise comparisons using *t*-test were applied when appropriate. The alpha level for statistical significance was $p = .05$ for GLM analyses, and $p = .008$ for follow up comparisons (.05 divided by the six levels of Emotion). The partial eta squared (ηp^2) was computed as the effect size measure. For all analyses, the SPSS 20.0 was used.

Results

Data were analyzed using a GLM for repeated measures with two within-subjects factors (Emotion: happiness x sadness x anger x disgust x fear x surprise; Exposure Time: 200 msec. x 500 msec. x 1000 msec.) and a between-subjects factor (Gender: male x female). According to Box's M Test, the assumption of homogeneity was met (*Box M* = 83.45, $p = .15$).

Results for the multivariate analyses showed a statistically significant main effect of Exposure Time (Wilk's Lambda = .92, $F_{2, 214} = 9.27$, $p = <.001$; Mauchly's test: $\chi^2_2 = 5.21$, $p = .08$). In univariate tests, the Exposure Time main effect ($F_{1,215} = 18.14$, $p = .000$; effect size (ηp^2) = .08, observed power = .98) revealed the lowest accuracy for 200 msec. ($M_{200ms} = 2.86$, $SD = .03$), followed by 500 msec. ($M_{500ms} = 3.18$, $SE = .03$), and lastly by 1000 msec. ($M_{1000ms} = 3.28$, $SE = .03$), all significant pairwise comparisons at $p < .01$. Univariate tests also showed a

main effect of Gender ($F_{1,215}$ = 24.37, p = .000; effect size (ηp^2) = .10, observed power = .99), in which females presented a significantly higher total accuracy rate (M_{female}= 3.23, SE = .03; M_{male}= 2.97, SE = .03).

A statistically significant interaction between Emotion x Gender was demonstrated by multivariate (Wilk's Lambda = .93, $F_{5, 211}$ = 2.88, p = .015) and univariate tests ($F_{1,215}$ = 4.94, p = .02; effect size (ηp^2) = .02, observed power = .60). Follow up comparisons controlling for age indicated that females presented a significantly higher mean of correct answers for anger (t_{215} = 3.79, p = .000, effet size (ηp^2) = .06, observed power = .96), disgust (t_{215} = 3.11, p = .002, effet size (ηp^2) = .04, observed power = .87), and surprise (t_{215} = 4.23, p = .000, effet size (ηp^2) = .07, observed power = .98) (fig. 2). There were no significant gender differences for happiness, sadness, or fear (p >.008).

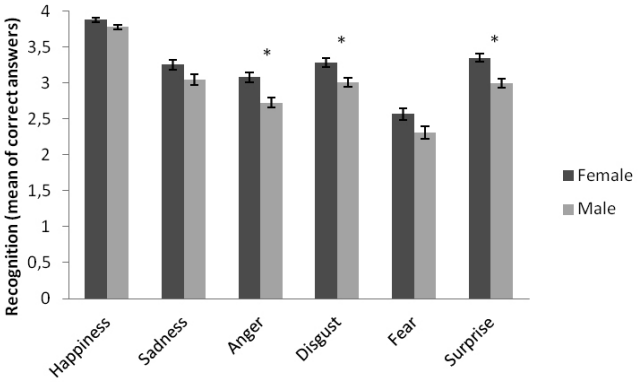

Figure 2. Means and Standard Errors of The Correct Recognition of Happiness, Sadness, Anger, Disgust, Fear, and Surprise According to Gender. Pairwise Comparisons Indicated that the Mean of Accurate Answers for Anger, Disgust and Surprise Were Significantly Higher For Women. * p < .008

A statistically significant interaction between Emotion x Exposure Time was also demonstrated by multivariate (Wilk's Lambda = .89, $F_{10, 206}$ = 2.69, p = .004; Mauchly's test: χ^2_{54} = 29.91, p = .11) and univariate tests ($F_{1,215}$ = 4.29, p = .04; effect size (ηp^2) = .02, power observed = .54). Follow up contrasts controlling for age indicated that correct answers for anger ($F_{1,215}$ = 9.91, p = .002; effect size (ηp^2) = .04, observed power = .88) and fear ($F_{1,215}$ = 14.93, p = .000; effect size (ηp^2) = .06, observed power = .97) were significantly lower in the 200 msec. block, followed by 500 msec., and lastly by 1000 msec. (fig. 3). Happiness, sadness, disgust and surprise did not significantly differ between time exposure (p >.008).

There were no significant interactions between either Time Exposure x Gender ($F_{1,215}$ = .003, p = .95; effect size (ηp^2) = .00, observed power = .05), or Emotion x Time Exposure x Gender ($F_{1,215}$ = .10, p = .74; effect size (ηp^2) = .00, observed power = .06).

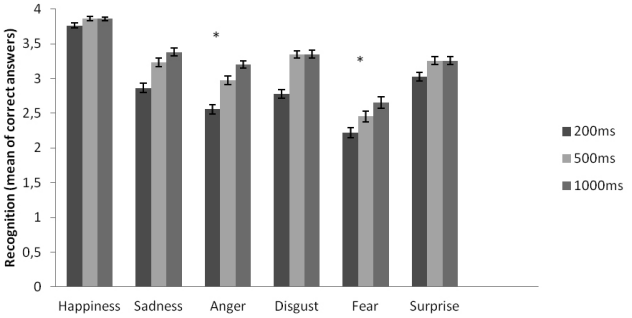

Figure 3. Means and Standard Errors of the Correct Recognition of Happiness, Sadness, Anger, Disgust, Fear, and Surprise According to Time Exposure. A Follow Up Repeated Measures GLM Comparing Recognition of Each Emotion between the Distinct Time Exposures Indicated that the Mean of Correct Answers for Anger and Fear Were Significantly Different Between Time Exposure. * p < .008

Discussion

The present study examined the recognition of faces expressing six basic universal emotions of happiness, fear, sadness, anger, disgust, and surprise. Different from other studies, three distinct presentation times were controlled in an experimental task that was adapted and validated for the Brazilian ethnical diversity. As predicted, a general female superiority in recognizing facial expressions of emotions was demonstrated, and this effect did not change as a function of age. This finding is in accordance with previous studies (Hampson et al., 2006; Mclure, 2000), and with the assumption that evolutionary aspects, such as the child-rearing hypothesis (the understanding that mothers must rapidly respond to the emotional signals of their infants to increase the chances of the infants' survival), may influence the ability of females to more easily identify emotional manifestations of others (Babchuk et al., 1985; Kret & De Gelder, 2012; Vasconcellos, Vargas, & Silva, 2014). Additionally, this result is in disagreement with previous data that did not show sex differences on the detection of emotional facial expressions (Palermo & Coltheart, 2004; Sawada et al., 2014). Notably, these studies investigated samples of 24 and 90 participants, respectively, and did not report effect sizes or observed power. In the present study, 218 participants carried out the task and the statistical power observed for all analyzes indicated that potential significant effects were likely to be detected.

Only partially in accordance to one of the study hypothesis, the significant interaction between emotion and gender indicated that females were particularly better able to recognize three categories of emotions, namely, anger, disgust and surprise, relative to males, with no differences observed for happiness, fear, and sadness. To some extent, this finding is in line with previous studies, in which women were better at recognizing fear and disgust (Collington et al., 2009), as well as sadness, disgust, surprise, and happiness (Williams & Mattingley, 2006). Moreover, the findings for disgust corroborate, in part, the study by Aleman and Swart (2008), which demonstrated that women had a more accentuated neural activation in the identification of this emotion, compared to men. On the other hand, contrary to studies that showed a higher accuracy for happiness (Pinto et al., 2013) and anger (Williams & Mattingley, 2006) among men, relative to women, the present study did not find any significant results for accuracy among men, compared to women. In fact, contrary to the notion that male are prone to more easily process anger (Williams & Mattingley, 2006), the present findings demonstrated that women performed better in the recognition of anger than men. Hence, this result is somewhat in line with previous findings showing that both females and males are better at detecting angry faces compared to happy and neutral faces (Pixton, 2011; Sawada et al., 2014).

In general terms, the evolutionary hypothesis indicates that not only are women more reactive to the emotions of others, but particularly to negative emotions (Vasconcellos et al., 2014). According to the valence model (for a review, see Alves, Fukusima, & Aznar-Casanova, 2008), fear, anger, disgust and sadness are considered negative emotions, whereas happiness and surprise are classified as positive emotions. Hence, in some degree the present findings corroborate the idea that women can more easily identify negative emotions, such as anger and disgust. It is discussed that the female superiority in recognizing negative emotions is related to the "fitness threat hypothesis", which posits that females need to rapidly detect these category of emotions in order to protect their children from potential threats (Hampson et al., 2006).

It has also been demonstrated that female and male differ regarding their subjective emotional ratings of facial expressions (Sawada et al., 2014). In particular, Sawada and colleagues (2014) found that only among women the more arousing they rated the expressions, the more rapidly they detected them. Although this result is limited by the fact that only happy and angry faces were investigated, one may conjecture that even though surprise is not classified as a negative emotion (Alves et al., 2008), it may comprise an arousing emotion for women, consistent with ours and previous findings (Aleman & Swart, 2008).

Concerning exposure time, accuracy rates were linearly better across blocks, congruent with the observation that performance in detecting emotional facial expressions is enhanced as exposure time increases (Kirouac & Doré, 1984; Neath & Itier, 2014). As previously demonstrated by one of these studies (Neath & Itier, 2014), the present findings also showed that fear recognition significantly interacted with time exposure, showing a linear increment that was significantly different between the three presentation times. This finding may seem unexpected, given that a review has indicated that fearful expressions can enhance the activity in the face-selective fusiform cortex, even without explicit voluntary control, and likely through direct feedback connections from the amygdala (Vuilleumier & Pourtois, 2007). Moreover, fearful reactions can still arise in spite of deficits in attention or awareness following parietal damage. However, also according to this review, temporal domain analyses of brain electrical activity suggest that early emotional responses may arise around 120 msec., prior to a full visual categorization stage. Hence, one may hypothesize that an early fear response can already be significantly detected by brain activation, but performance measured by behavioral parameters may benefit from a larger processing time. Additionally, the fact that the accuracy for detecting fearful faces was smaller relative to the other five emotions in the present study is in accordance with other investigations that have also relied on behavioral parameters (Neath & Itier, 2014; Palermo & Coltheart, 2004).

The same interaction pattern was observed for angry faces and exposure time, in which accuracy for detecting anger was linearly and significantly different between the three blocks. Although to the best of our knowledge such pattern has not been previously reported, this result is not unexpected considering that fear and anger might be closely related (Williams & Mattingley, 2006). For instance, both expressions may be considered warning emotions, given that the early detection of anger might reduce the likelihood of an injurious or fatal confrontation, whereas the early

detection of fear might signal a potential threat in the environment. In fact, anger is conceived as a threat-related expression, which potentially leads to fear (Williams & Mattingley, 2006). However, consistent with our observation that performance on the detection of angry faces was better than fearful faces, Williams and Mattingley (2006) also demonstrated that angry faces were more easily detected, relative to fearful faces. According to these authors, this is likely due to the fact that anger represents the source of a threat, in contrast to fear, which is more related to a possible danger elsewhere in the environment.

Finally, although sex differences in emotion recognition were not observed in paradigms that presented stimuli for less than 100 msec. (Grimshaw et al., 2004; Neath & Itier, 2014; Pixton, 2011), contrary to studies that detected sex differences with longer presentation times (Collington et al., 2009; Mclure, 2000; Pinto et al., 2013), in the present study sex differences did not vary as a function of time exposure. However, 200 msec. was the lowest presentation time, which is around the necessary minimum time for brains to process facial expressions (Vuilleumier & Pourtois, 2007). Hence, future studies should also compare subliminar exposure times, such as those ranging from 30 to 100 msec. Moreover, significant interactions between gender, exposure time and emotion category might have been detected if neurophysiological parameters, such as central and autonomic nervous system activation, had been examined.

Therefore, in addition to the methodological advantages of the present study, such as comparing three different exposure times, and using ethnically adapted faces for the Brazilian context, future studies should try to replicate these findings by including subliminar presentation times and biological outcomes. Moreover, future investigations should also attempt to consider directly comparing different methodological manipulations, such as detecting emotional versus emotionally neutral facial expressions, as well as using anti-expressions, different emotional intensities, and subtle or mixed emotions.

Other limitations should also be taken into account. Despite the large sample size, the equal number of participants for each gender group, and the fact that age was controlled for, results should be interpreted with caution due to the following caveats: 1) there is evidence that psychiatric patients present distinct profiles in facial emotional recognition, relative to healthy samples (Cacioppo et al., 2014; De Souza, Barbosa, Lacerda, dos Santos, & Torro-Alves, 2014), but neither psychiatric symptoms, nor mood states, were assessed and controlled for; 2) according to Cohen's (1992) interpretation of effect sizes for multivariate analyses (i.e., .02 small, .15 moderate, .35 large), the observed effects in the present study are considered small, so they should be further tested in order to be confirmed; 3) we were not able to control for the potential moderating effect of the gender of the faces portraying emotions, given that the intensity and the exact movement of facial muscles were not matched between genders portraying each emotion (Huang, 2009); and 4) considering a recent study in which photographs taken with focal lengths longer than 50 mm were rated as more attractive and more masculine/feminine, the present findings should be replicated with varying methods of photograph acquisition, particularly different focal lengths (Třebický, Fialová, Kleisner, & Havlíček, 2016).

Despite the discussed limitations and the variability in methodology among the revised literature, the present results are in accordance with previous data, corroborating the notion that women are generally better at detecting emotions expressed by faces, thus lending support to the evolutionary hypothesis of the female superiority in detecting facial expressions of emotions, compared to males. In addition to this main effect, it was demonstrated that the female superiority was particularly observed for the categories of anger, disgust, and surprise, which was hypothesized as an ability to more easily detect some negative and arousing emotions. Importantly, these results did not change as a function of age of participants or time exposure. However, regardless of sex, accuracy in detecting emotional faces improved as presentation times increased, but only performance in detecting fear and anger significantly differed between the three presentation times. Hence, in addition to the evolutionary aspects that may account for sex differences in the ability to accurately discriminate basic expressions of emotions, recognition of facial emotional expressions may also depend on the time available to correctly identify a facial emotion. Based on this assumption, cognitive trainings targeting faster and efficient recognition of emotional faces, particularly threatening faces, may constitute an alternative for individuals whose ability to rapidly detect these expressions is impaired.

References

Aleman, A., & Swart, M. (2008). Sex differences in neural activation to facial expressions denoting contempt and disgust. *PLoS ONE*, *3*(11), e3622. doi: 10.1371/journal.pone.0003622

Alves, N. T., Fukusima, S. S., & Aznar-Casanova, J. A. (2008). Models of brain asymmetry in emotional processing. *Psychology & Neuroscience*, *1*(1), 63-66. doi: 10.1590/S1983-32882008000100010

Babchuk, W. A., Hames, R. B., & Thompson, R. A. (1985). Sex differences in the recognition of infant facial expressions of emotion: the primary caretaker hypothesis. *Ethology & Sociobiology*, *6*(2), 89-101. doi: 10.1016/0162-3095(85)90002-0

Boloorizdeh, P., & Tojari, F. (2013). Facial expression recognition: age, gender and exposure duration impact. *Procedia – Social and Behavioral Sciences*, *84*, 1369-1375. doi: 10.1016/j.sbspro.2013.06.758

Cacioppo, J. T., Cacioppo, S., Dulawa, S., & Palmer, A. A. (2014). Social neuroscience and its potential contribution to psychiatry. *World Psychiatry: Official Journal of the World Psychiatric Association (WPA)*, *13*(2), 131-139. doi: 10.1002/wps.20118

Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155-159. doi: 10.1037/0033-2909.112.1.155

Collington, O., Girard, S., Gosselin, F., Saint-Armour, D., Lepore, F., & Lassonde, M. (2009). Women process multisensory emotion expressions more efficiently than men. *Neuropsichologia,* 48(1), 220-225. doi: 10.1016/j.neuropsychologia.2009.09.007

De Souza, I. B. M. B., Barbosa, F. F., Lacerda, A. M., dos Santos, N. A., & Torro-Alves, N. (2014). Evaluation of facial expressions in women with major depression: is there a negative bias? *Psychology & Neuroscience*, *7*(4), 513-519. doi: 10.3922/j.psns.2014.4.10

Ekman, P. (1992). Facial expression of emotion: new findings, new questions. *Psychological Science, 3*, 34-38. Retrieved from http://journals.sagepub.com/doi/pdf/10.1111/j.1467-9280.1992.tb00253.x

Ekman, P. (2003). *Emotions revealed: recognizing faces and feelings to improve communication and emotional life*. New York: Times Book.

Gregoric, B., Barbir, L., Celic, A., Ilakovac, V., Hercigonja-Szekeres, M, Kovacevic, M. P., … Heffer, M. (2014). Recognition of facial expressions in men and women. *Medicina Fluminensis*, *50*, 454-461. Retrieved from http://hrcak.srce.hr/129788

Grimshaw, G. M., Bulman-Fleming, M. B., & Ngo, C. (2004). A signal-detection analysis of sex differences in the perception of emotional faces. *Brain and Cognition*, *54*(3), 248-250. doi: 10.1016/j.bandc.2004.02.029

Hampson, E., Anders, S. M., & Lucin, L. I. (2006). A female advantage in the recognition of emotional facial expressions: Test of an evolutionary hypothesis. *Evolution & Human Behavior*, *27*, 401-416. doi: 10.1016/j.evolhumbehav.2006.05.002

Huang, H. (2009). *Gender differences in facial expressions of emotions* (Master's thesis). Retrieved from http://humboldt-dspace.calstate.edu/bitstream/handle/2148/513/hsin_yu_huang.pdf?sequence=1

Kirouac, G., & Doré, F. Y. (1984). Judgment of facial expressions of emotion as a function of exposure time. *Perceptual and Motor Skills*, *59*(1), 147-150. doi: 10.2466/pms.1984.59.1.147

Kret, M. E., & De Gelder, B. (2012). A review on sex differences in processing emotional signals. *Neuropsychologia*, *50*(7), 1211-21. doi: 10.1016/j.neuropsychologia.2011.12.022

McClure, E. B. (2000). A meta-analytic review of sex differences in facial expression processing and their development in infants, children, and adolescents. *Psychological Bulletin*, *126*(3), 424-453. doi: 10.1037/0033-2909.126.3.424

Neath, K. N., & Itier, R. J. (2014). Facial expression discrimination varies with presentation time but not with fixation on features: a backward masking study using eye-tracking. *Cognition & Emotion*, *28*(1), 115-131. doi: 10.1080/02699931.2013.812557

Palermo, R., & Coltheart, M. (2004). Photographs of facial expression: accuracy, response times, and ratings of intensity. *Behavior Research Methods, Instruments, & Computers*, *36*(4), 634-638. doi: 10.3758/BF03206544

Perilla-Rodríguez, L. M., de Moraes Júnior, R., & Fukusima, S. S. (2013). Lateral visual hemifield asymmetry and sex differences in recognizing low and high spatial frequency filtered faces. *Psychology & Neuroscience*, *6*(3), 253-260. doi: 10.3922/j.psns.2013.3.03

Pinto, B. M., Dutra, N. B., Filgueiras, A., Juruena, M. F. P., & Stingel, A. M. (2013). Diferenças de gênero entre universitários no reconhecimento de expressões faciais emocionais. *Avances em Psicologia Latinoamericana*, *31*(1), 200-222. Retrieved from http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S1794-47242013000100017&lng=pt&tlng=pt

Pixton, T. S. (2011). *Expecting Happy Women, Not Detecting the Angry Ones: Detection and Perceived Intensity of Facial Anger, Happiness, and Emotionality*. (Doctoral dissertation).

Retrieved from http://www.diva-portal.org/smash/get/diva2:414454/FULLTEXT01.pdf

Salvador-Silva, R. (2014). *Psicopatia e reconhecimento de faces emocionais em presidiárias* (Master's thesis). Retrieved from http://hdl.handle.net/10923/5861

Sawada, R., Sato, W., Kochiyama, T., Uono, S., Kubota, Y., Yoshimura, S., & Toichi, M. (2014). Sex differences in the rapid detection of emotional facial expressions. *PLoS ONE*, *9*(4). doi: 10.1371/journal.pone.0094747

Schmidt, K. L., & Cohn, J. F. (2001). Human facial expressions as adaptations: evolutionary questions in facial expression research. *Yearbook of Physical Anthropology*, *44*, 3-24. doi: 10.1002/ajpa.2001

Třebický, V., Fialová, J., Kleisner, K., & Havlíček, J. (2016). Focal length affects depicted shape and perception of facial images. *PLoS ONE*, *11*(2), e0149313. doi: 10.1371/journal.pone.0149313

Vasconcellos, S. J. L, Salvador, S. R., Gauer, V., & Gauer, G. J. C. (2014). Psychopathic traits in adolescents and recognition of emotion in facial expressions. *Psicologia: Reflexão e Crítica,* 27, 599-605. doi: 10.1590/1678-7153.201427417

Vasconcellos, S. J. L., Vargas, F., & Silva, J. K. (2014). A expressividade facial nossa de cada dia e seu longo passado evolutivo. In S. J. L Vasconcellos & N. Hauck (Eds.), *A mente e suas adaptações: Uma pesquisa evolucionista sobre a personalidade, a emoção e a psicopatologia*. Santa Maria: UFSM

Vuilleumier, P., & Pourtois, G. (2007). Distributed and interactive brain mechanisms during emotion face perception: evidence from functional neuroimaging. *Neuropsychologia*, *45*(1), 174-194. doi: 10.1016/j.neuropsychologia.2006.06.003

Willians, M. A., & Mattingley, J. B. (2006). Do angry men get noticed? *Current Biology*, *16*, 402-404. doi: 10.1016/j.cub.2006.05.018

Carolina Baptista Menezes, Doutora em Psicologia pela Universidade Federal do Rio Grande do Sul (UFRGS), é Professora do Departamento de Psicologia e Coordenadora do Laboratório de Psicologia Cognitiva Básica e Aplicada da Universidade Federal de Santa Catarina (UFSC). Endereço para correspondência: Campus Universitário - Trindade CEP 88.040-970 - Florianópolis Santa Catarina - Brasil Fone: +55 (48) 3721-2723. E-mail: menezescarolina@hotmail.com

Juliana Corrêa Hertzberg, Graduanda em Psicologia pela Universidade Federal de Pelotas (UFPEL). E-mail: juhertzberg@hotmail.com

Franciele Ely das Neves, Graduanda em Psicologia pela Universidade Federal de Pelotas (UFPEL). E-mail: fran.ufpel@gmail.com

Priscila Flores Prates, Mestra em Psicologia pela Universidade Federal de Santa Maria (UFSM). E-mail: psico_piti@yahoo.com.br

Jaíne Foletto Silveira, Mestranda em Psicologia pela Universidade Federal de Santa Maria (UFSM). E-mail: jainefoletto@hotmail.com

Silvio José Lemos Vasconcellos, Doutor em Psicologia pela Universidade Federal do Rio Grande do Sul (UFRGS), é Professor do Departamento de Psicologia e Coordenador do grupo Pesquisa e Avaliação de Alterações da Cognição Social da Universidade Federal de Santa Maria (UFSM). E-mail: silviojlvasco@hotmail.com

Recebido em 15.Set.15
Revisado em 26.Jan.17
Aceito em 28.Mar.17