

SEX DIFFERENCES IN THE ASSESSMENT OF PAIN VERSUS SEXUAL PLEASURE FACIAL EXPRESSIONS

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Abstract

Although very distinct emotions, facial expressions of those who are experiencing pain/agonny appear surprisingly similar to those who are experiencing heightened sexual pleasure. We investigated whether sex differences exist between distinguishing facial photos of males and females expressing either pain or sexual pleasure. Photographs obtained from the internet of individuals expressing either emotion were individually shown to ninety-one participants in a slideshow, and participants were asked to identify the emotion. Overall, participants were more able to correctly identify an expression of pain as opposed to sexual pleasure. Participants also showed the highest degree of accuracy when it came to identifying females showing expressions of pain, but were the least accurate at identifying females with expressions of sexual pleasure, and this effect was more pronounced for female raters. Furthermore, participants took longer to respond to male pictures than to female pictures. These findings are discussed in terms of how sex differences in the perception of these facial expressions may be adaptive.

Keywords: facial expressions; pain; sexual pleasure, sex differences

Introduction

As a social species, humans must be able to acquire important information about the affective states of others, and an important source of affective information is facial expression (Darwin, 1872). Several researchers have identified a set of emotional facial expressions that are universal to the human species and can be detected cross-culturally, presumably because they are innate components of our evolutionary heritage (Darwin, 1872, Ekman & Friesen, 1971; Izard, 1971). Interestingly, two facial expressions that portray very distinct yet adaptive emotions, that of extreme pain/agonny and that of heightened sexual pleasure, appear surprisingly similar to one another. While these facial

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expressions have not been extensively studied cross-culturally in humans or examined through an evolutionary lens (see Williams, 2002), it is well-documented that these distinct facial expressions expressing these emotions occur in many of our closely related primates (Darwin, 1872; for review see Dixson, 1999), suggesting they are a feature of our ancestral past.

It may be adaptive to be able to discriminate between facial expressions of extreme pain and heightened sexual pleasure since both portray experiences that are necessary to ensure the survival of the species. Recognizing facial expressions of pain may be adaptive in the sense that it could elicit empathic behavior towards the person experiencing pain, thereby soliciting aid from others. It could also play a role in survival by alarming onlookers of situations of immediate threat and serve as a signal to others of events, stimuli, or activities that one should model to avoid (Williams, 2002). Enhanced ability to detect sexual enjoyment of a partner (by way of facial expression) may have been advantageous so as to determine the likelihood of a partner's willingness to engage in future copulations. Since human females have lost most of their obvious ovulatory cues, humans have evolved a continuous breeding pattern to increase the probability of conception and are highly motivated to have intercourse (Symons, 1979). Therefore, humans may need the ability to detect and then ensure a partner's sexual enjoyment to promote future copulations through positive reinforcement and/or emotional attachment. Perhaps facial expressions could communicate a partner's level of sexual satisfaction and/or devotion to their mate. It may also be possible that detection of facial expressions during sex may be important for sexual communication so as to enhance conception, as it is for several primates. It has been argued that facial displays seen across different primate species (i.e. several species of New World monkeys and great apes) may assist in the coordination and temporal patterning of copulatory movements and may facilitate efficient copulatory activity to augment conception (for review see Dixson, 1999, p. 126). Savage and Bakeman (1978) showed that speed and intensity of thrusting during copulation in bonobos altered directly as a function of the partner's specific facial expressions and/or vocalizations.

Some may argue that the context of a situation is all that is needed to infer whether an individual is experiencing pain or sexual pleasure. Being able to detect subtle changes in these facial expressions to appraise the situation may not be relevant since these events are experienced in very different situations and contexts and with other obvious external cues. However, we will argue here that it is very possible that, in some situations, pain and sexual pleasure could occur concurrently or within a relatively short period of time of one another (i.e. instances of forced copulation, incidence of sadistic and masochistic acts as forms of arousal during sex, etc.) and therefore subtle detection of these instances may be important. In fact, Johnson (2007) claims that many sex offenders often mislabel their victim's facial expressions during a sexual assault as being consensual, erotic, and desirous rather than fearful or painful. Furthermore, it appears that our neural circuitry closely links both sensations of painful stimulation and orgasm to the activation of insular cortex and anterior cingulate cortex in the forebrain (Casey et al., 2001; Komisaruk et al., 2004). Some researchers suggest that a significant (active inhibitory) interaction may occur between sensations of orgasm and pain in these brain areas, and this is the reason for why facial expressions during intercourse and masturbation appear as if to convey pain or suffering (Komisaruk et al., 2006).

Research has shown that individuals generally recognize positive emotional expressions (a "happy-face" advantage) more quickly than negative emotions, and this

tendency is exaggerated for female faces (Grimshaw, et al, 2004; Hugenberg & Sczesny, 2006). However, other studies indicate that there is an “angry-face” superiority, whereby faces of anger are more quickly identified in crowds and is a way to effectively detect signals of threat (Hansen & Hansen, 1988). Eastwood et al. (2001) also found that faces expressing negative emotion guide focal attention more efficiently than faces expressing positive emotion. It would be interesting to examine which may be the case when trying to ascertain whether a facial expression is that of pain versus sexual pleasure since each of these expressions could be easily mistaken for either a positive or negative emotional experience.

Many studies have shown that women are more accurate in the judgment of emotional facial expressions than are men and women have overall superior perceptual abilities (Hall & Matsumoto, 2004; Hampson, van Anders, & Mullin, 2006; Rotter & Rotter, 1988; Thayer & Johnsen, 2000). However, other studies indicated that men are better at discriminating certain expressions such as anger (Rotter & Rotter, 1988). Hall & Matsumoto (2004) showed there was a tendency for women to give a higher rating of intensity for emotions decoded from different facial expressions, and women showed greater variation with their ratings. Furthermore, female judgments of facial expressions corresponded more with their own emotional states suggesting that women may base their judgments of facial affect on emotional content in general rather than facial feature analysis (Thayer & Johnsen, 2000). Yet other studies have failed to detect any sex differences when it comes to the perception of emotional faces and feel that perception of a facial expression is highly dependent on the context in which that expression occurs and the methodology used to make this assessment (Grimshaw et al., 2004).

In this study, we examined whether sex differences exist in the perception of facial expressions of males and females experiencing either extreme agony/pain or heightened sexual pleasure. Since several studies have demonstrated that men generally have more difficulty discriminating between different facial expressions, particularly negative expressions displayed on female faces (Hall & Matsumoto, 2004; Hampson et al., 2006; Rotter & Rotter, 1988; Thayer & Johnsen, 2000), we hypothesize that this finding may hold true for detecting pain expression, but not for the detection of heightened sexual pleasure since it could be easily mistaken for a facial expression of a pain or negative affect. Also, participants may perceive males and female pictures portraying these emotions differently since sex differences exist in both the perception and the expressiveness of facial emotions (Hofman, Suvak & Litz, 2006; Wallbott & Giessen, 1988).

Methods

Participants

Ninety-one participants (males = 50, females = 41) were recruited from summer classes and other summer programs at Albright College. The mean age was 24.3 years (SD = 10.9; range = 16-60). Of the participants, 78.0% were Caucasian, 13.2% were African American, 4.4% were Hispanic, 2.2% were Asian, and 2.2% indicated being another ethnicity. We obtained informed consent from all participants and they were given either extra credit or a chance for a monetary raffle prize for participating in the study. All procedures of this study were approved by the local Institutional Review Board.

Materials

Eighty frontal facial photographs were obtained from the internet of individuals who were identifiably experiencing pain or sexual pleasure (20 males and 20 females expressing pain, and 20 males and 20 females expressing sexual pleasure, see Figure 1 for examples). Only photos of individuals who were clearly engaging in activities that signified they were experiencing extreme pain/agony or heightened sexual pleasure were used and were then cropped to only include an image of the frontal view of the face. Each picture was standardized in black-and white color, size, and shape by *Microsoft Photo Editor*. The pictures chosen were primarily of Caucasian individuals, however other ethnicities were represented and the stimuli pictures seem to match the distribution of our participant demographic. Stimuli were presented using *SuperLab 2.0.4* presentation software.

Procedure

After obtaining informed consent, participants completed a brief demographic questionnaire regarding such information as their sex, age, ethnicity, etc. Then participants were individually shown a slideshow presentation of 80 black-and-white frontal facial photographs, half of which were male and half of female faces. They were asked to indicate whether the stimulus was a person experiencing extreme pain/agony or heightened sexual pleasure by pressing one of two keys (1 or 2) on the number pad of the keyboard. All participants were given unlimited time to respond to the pictures, and the next picture did not present itself until a response was made by the participant. Two participants (one male and one female) had to be excluded from analysis due to the fact that their data was incorrectly entered on the keypad. The accuracy of response and response time for each category of pictures shown (female pain, male pain, female pleasure, and male pleasure) were recorded using *SuperLab 2.0.4* presentation software. All pictures were counterbalanced for each participant's slideshow presentation.

Results

We calculated the number of times each rater accurately identified a stimulus for each of the four stimuli picture conditions (female pleasure, female pain, male pleasure, and male pain) and converted the scores into percentages to analyze comparisons between groups. We conducted a 2 (pain/pleasure stimuli) X 2 (sex of stimuli) X 2 (sex of participant) mixed model ANOVA to examine differences in percent score of accurate assessments of each stimuli picture type. We found a main effect for pain/pleasure stimuli, $F(1, 87) = 5.12$, $p = .026$, $\eta^2 = .056$. Overall, participants correctly identified pain pictures ($M = 79.8\%$, $SE = 1.23$) more frequently than correctly identifying pleasure pictures ($M = 75.3\%$, $SE = 1.33$).

There was a also significant interaction between pain/pleasure stimuli type and sex of stimuli, $F(1,87) = 17.13$, $p = .000$, $\eta^2 = .165$, (see Figure 2). Pictures that were of facial expressions of females in pain were the most correctly identified stimulus type (83.0%), followed by males experiencing sexual pleasure (77.3%), males in pain (76.6%), and pictures of females experiencing sexual pleasure were the most difficult to correctly determine (73.3%). Furthermore, Figure 3 illustrates a significant three-way interaction between pain/pleasure stimuli, sex of stimuli, and sex of participant, $F(1, 87) = 3.89$, $p = .050$, $\eta^2 = .043$.

We conducted a 2 (pain/pleasure stimuli) X 2 (sex of stimuli) X 2 (sex of participant) mixed model ANOVA to examine differences in reaction time to stimuli and found a main effect for sex of stimuli, $F(1, 87) = 9.16$, $p = .003$, $\eta^2 = .095$. Overall, participants took a longer time to respond to male pictures ($M = 2.24$ seconds, $SE = .096$) than to female pictures ($M = 2.10$ seconds, $SE = .084$).

Discussion

Overall, participants were able to correctly identify facial expressions of those displaying pain with a greater accuracy than facial expressions of heightened sexual pleasure. It may be more adaptive to correctly identify expressions of pain of others so as to solicit aid in our social interactions and/or recognize threatening events that one should avoid. We suspect that a proximate explanation for this finding could be due to the fact that individuals may have more exposure to facial expressions of different individuals experiencing pain on a more frequent, daily basis. This finding also supports the body of research that indicates that negative emotions are more easily detected than positive emotions (Eastwood et al., 2001; Hansen & Hansen, 1988) and perhaps facial expressions of those experiencing sexual pleasure may be especially difficult to decode and could be easily confused as being a negative emotion.

Pictures that were of females experiencing pain were the most correctly identified stimulus type. There is evidence that shows that facial responses to pain can be used as a better estimate of the intensity of the subjective pain felt by women than by men (Kunz, Gruber, & Lautenbacher, 2006). Females are also superior in communicating fear and sadness via facial expression, whereas males are more successful in communicating anger (Wallbott & Giessen, 1988). In addition, our data showed that pictures of females experiencing heightened sexual pleasure were the most difficult to correctly determine by participants. Perhaps it is not as important to detect if females are experiencing sexual pleasure, since sensations of pleasure are not necessary for female reproduction as it usually is for males (i.e. ejaculation and pleasure or usually synonymous events).

Aside from females being able to identify other females expressing a pain facial expression, overall females had not performed better on each of the other conditions than did males, a finding which does not support a large amount of literature suggesting females' superior ability at assessing facial expressions (Hall & Matsumoto, 2004; Hampson, van Anders, & Mullin, 2006; Rotter & Rotter, 1988; Thayer & Johnsen, 2000). However, similar to our findings, Grimshaw, et al. (2004), also found no sex differences when using a signal-detection analysis to examine the perception of emotional faces and concluded that sex effects may be heavily dependent upon procedural variables that can influence task performance and not on sex differences in face perception per se. It appears that the perception of a facial expression is highly dependent on the context in which that expression occurs (Grimshaw et al., 2004). Perhaps, males did not perform worse in the particular face recognition tasks of our study because it may be just as adaptive for males as it is for females to be sensitive at detecting both sexual pleasure and pain of others. For instance, being able to ascertain a partner's sexual enjoyment could help increase the likelihood of future copulations (since other evidence of female sexual enjoyment during intercourse is not as prominent as it is for males). Recognition of pain could be important so as to provide aid to others and avoid potentially threatening events,

and an assessment of another male's pain, in particular, could be important for situations of male-male competition.

Female participants showed the highest degree of accuracy identifying female pictures who showed expressions of pain and this was the only condition where female raters performed better than males. It has been shown that female demonstrate a higher level of empathy (Eisenberg, 1983) and realizing other females' pain may be a result of such ability. This finding also supports the "primary caretaker hypothesis," which postulates that females' proficiency in recognizing faces is the result of selective pressures of detecting infant emotional cues, especially in the face, that are important for caretaking practices (Babchuk, Hames, Thomson, 1985) and this ability may just generalize to adult faces. It could also be argued that detection of female pain by other females may be important and related to the act of child birthing and midwifery during our ancestral past.

Males were much better at identifying female sexual pleasure pictures than were other females. Since there is not as many obvious cues of sexual pleasure and orgasm for females as there are for males, males may need to rely more on facial expression to determine if the female is experiencing pleasure so that he may have continual sexual access to her. Similarly, many male primates also rely on female facial expression during copulation as a cue for ejaculatory response to facilitate conception (Dixson, 1999). Furthermore, studies have shown that females are more likely to exhibit positive facial expressions when attempting to flirt with a male partner (McCormick, 1989) and perhaps males may be more sensitive to such cues. This finding is also consistent with studies showing that opposite-sex faces require less processing time than same-sex faces (Hofman et al., 2006).

Overall, participants took longer to respond to male pictures than to female pictures, which support previous findings showing that people respond more quickly to females' faces, especially with positive facial expressions (Hugenberg & Sczesny 2006). This could be due to the fact that females tend to be more expressive than males when comes to facially expressing certain emotions (Wallbott & Giessen, 1988) and could be related to the sex differences seen in empathic responsiveness (Eisenberg & Lennon, 1983).

Altogether, these findings are among the first to empirically examine the similarities that exist between the appearance of facial expressions of heightened sexual pleasure and those experiencing extreme pain/agony by examining sex differences in rater perceptions and of the sex of the target stimuli. It appears that participants are more proficient at correctly identifying pictures of pain as opposed to sexual pleasure, show the greatest degree of accuracy identifying females showing expressions of pain (with this effect was more pronounced for female raters), and participants took longer to respond to male pictures than to female pictures. Future investigations that examine these facial expressions cross-culturally are warranted and should focus on how they relate to other known universal facial expressions.

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Figure 1. Example stimuli pictures obtained from the internet of males and females experiencing either heightened sexual pleasure or extreme agony/pain. (Picture A: male pleasure, Picture B: male pain, Picture C: female pleasure, Picture D: female pain).

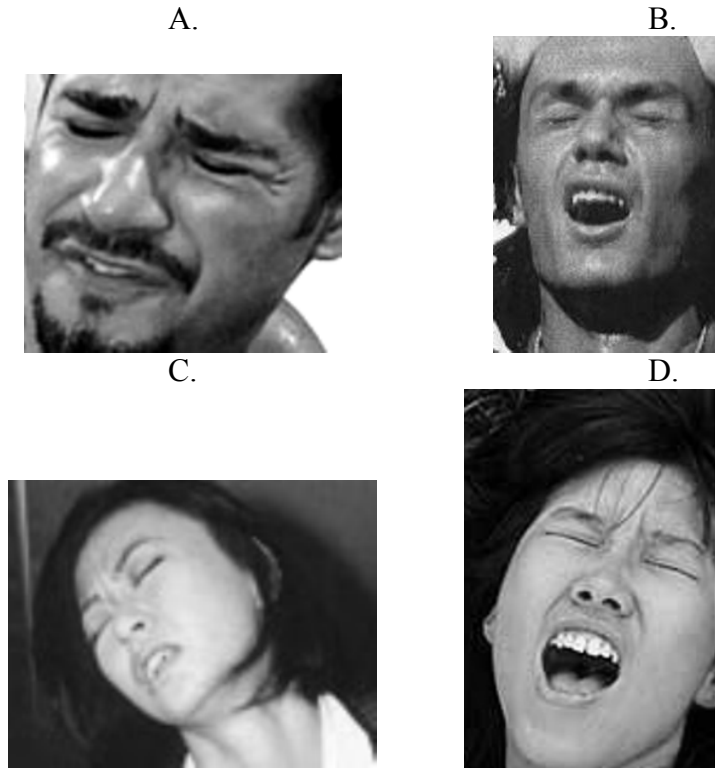


Figure 2. Accuracy of response for detecting facial expression stimuli of males and females expressing either pain or sexual pleasure.

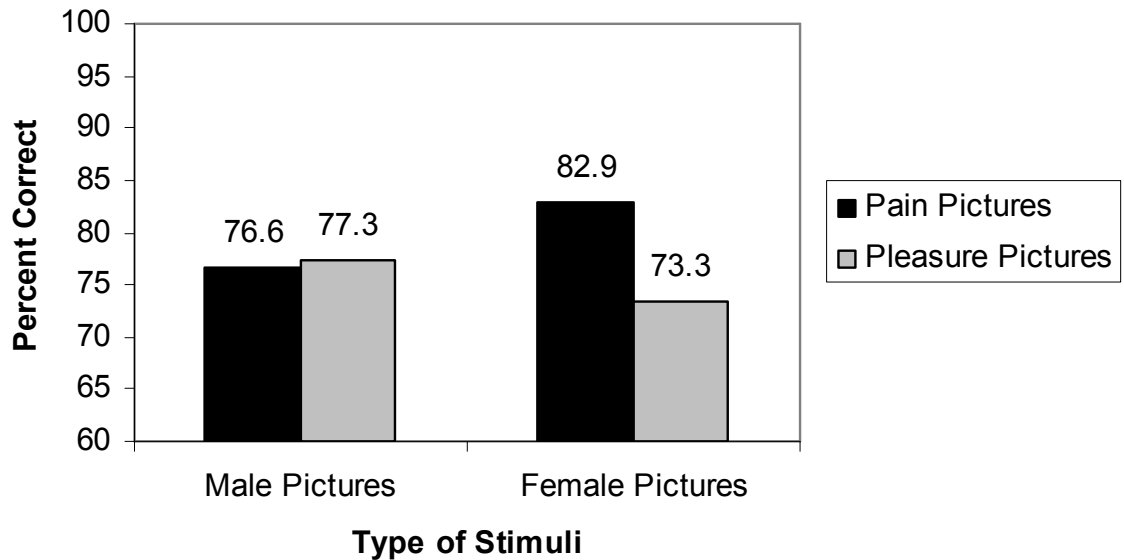


Figure 3. Sex differences between raters for accurate detection of facial expression stimuli of males and females expressing either pain or sexual pleasure.

