Personality and Individual Differences 96 (2016) 65–69

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Mothers are less disgust sensitive than childless females

Pavol Prokop [a,b,*], Jana Fančovičová [a]

[a] Department of Biology, Faculty of Education, Trnava University, Trnava, Slovakia
[b] Institute of Zoology, Slovak Academy of Sciences, Bratislava, Slovakia

ARTICLE INFO

Article history:
Received 6 January 2016
Received in revised form 22 February 2016
Accepted 24 February 2016
Available online 3 March 2016

Keywords:
Disgust
Emotion
Gender
Parental investment

ABSTRACT

Disgust is a basic emotion which motivates avoidance of disease cues. Females consistently display higher disgust sensitivity than males, although the evolutionary origin of this difference remains unclear. We examined the parental investment hypothesis, which posits that higher disgust sensitivity amongst females is adaptive since mothers may be more sensitive to potential pathogens which can negatively influence their offspring's survival. Contrary to the parental investment hypothesis, mothers demonstrated lower disgust sensitivity than childless females. Neither the total number of reported children, nor having at least one dependent child, resulted in heightened disgust sensitivity. Reduced disgust sensitivity may be caused by the source effect, which suggests that familiar stimuli are perceived to be less disgusting than unfamiliar stimuli. Lower disgust amongst mothers caring for a dependent offspring may facilitate cleaning of offspring's feces, dirty clothes or removal of uneaten foods.

1. Introduction

According to evolutionary perspectives on emotion (Al-Shawaf, Conroy-Beam, Asao, & Buss, 2015; Darwin, 1872; Nesse & Ellsworth, 2009; Tooby & Cosmides, 2008), disgust is a basic human emotion which motivates avoidance of pathogens (pathogen disgust), sexual partners (sexual disgust) and avoidance of moral norm violators (moral disgust) (Tybur, Lieberman, & Griskevicius, 2009). Pathogen disgust demonstrates cross-culturally consistent facial expressions (Ekman, 1972) and its elicitors (e.g., feces) are also cross-culturally similar (Curtis & Biran, 2001; Curtis, Aunger, & Rabie, 2004). Blind people also produce similar disgust expressions as healthy people (Galati, Scherer, & Ricci-Bitti, 1997). Subjects viewing disgust-relevant stimuli show increased brain activation in the occipital–temporal lobe, in the prefrontal cortex, in the thalamus (Phillips et al., 1997) and amygdala (Stark et al., 2003; Schienle, Schäfer, Walter, Stark, & Vaitl, 2005). This suggests that pathogen disgust is a universal emotion that evolved to motivate the avoidance of contact with disease-causing objects or people (Curtis et al., 2004; Oaten, Stevenson, & Case, 2009; Tybur, Bryan, Lieberman, Caldwell Hooper, & Merriman, 2011; Tybur, Lieberman, Kurzban, & DeScioli, 2013).

Females are typically more disgust sensitive than males (e.g., Curtis et al., 2004; Davey et al., 1998; Haidt, McCauley, & Rozin, 1994; Olatunji et al., 2009; Prokop & Fančovičová, 2010; Schienle, Schäfer, Stark, Walter, & Vaitl, 2005; Schienle, Stark, Walter, & Vaitl, 2003; Tybur et al., 2009, 2011; for a review see Oaten et al., 2009). Higher sensitivity in the pathogen disgust domain occurs with pubertal females (Prokop & Jančovičová, 2013) and is influenced by sex hormones (Fessler & Navarette, 2003), suggesting that these differences are related functionally and physiologically to reproduction and mating.

Guided by an evolutionary perspective, there are at least two hypotheses for explaining heightened sensitivity to pathogen disgust amongst females (Fleischman, 2014). The vulnerability to disease hypothesis suggests that females are more disgust sensitive in sexual and pathogen domain due to their higher vulnerability to sexually transmitted diseases such as HIV, chlamydia, human papilloma virus and herpes virus (Madkan, Giancola, Sra, & Tyring, 2006). Higher vulnerability to diseases would explain why females demonstrate a greater avoidance of pathogen-relevant stimuli (Porzig-Drummond, Stevenson, Case, & Oaten, 2009; Prokop & Fančovičová, 2010; Prokop, Usak, & Fančovičová, 2010; Fleischman, 2014). In contrast, the parental investment hypothesis is based on different contributions by females to offspring compared with males (Trivers, 1972). While males produce large amounts of sperm cells, females (particularly mammals) invest time and energy into gravidity, lactation and protection of offspring. It is therefore reasonable to expect that women who care for infants, who need to be protected from infectious diseases, should be more sensitive to disease cues than childless women (Curtis et al., 2004; Fleischman, 2014; Oaten et al., 2009).

In this study, we examined the parental investment hypothesis in order to test why females are more disgust sensitive than males from an evolutionary perspective. We predict that 1) mothers are more disgust sensitive than childless females, 2) females with more children are more disgust sensitive than females with less children and that 3) females with dependent children are more disgust sensitive than females with older children.

* Corresponding author at: Department of Biology, Faculty of Education, Trnava University, Trnava, Slovakia.
E-mail address: pavol.prokop@savba.sk (P. Prokop).

http://dx.doi.org/10.1016/j.paid.2016.02.064

2. Methods

2.1. Participants

The participants were 299 Slovak females (aged 16 to 48 years, $M = 26.8$, $SD = 6.6$) selected based on their age (being older than 16) and reporting a heterosexual orientation. The participants were recruited for the study online via university website and the study was conducted online, similarly as with other research in this field (e.g. Curtis et al., 2004; Fessler & Navarette, 2003). The language of the online questionnaire was Slovak. A total of 124 females reported being childless and 174 females reported having at least one child ($M = 1.6$, $SD = 0.7$, $n = 174$). One female did not report whether she has any children and two females did not report the age of their children. The reported age of the mothers ($M = 29.4$, $SD = 6.94$) was higher than the reported age of the childless females ($M = 23.1$, $SD = 3.5$) (t-test, $t = 9.33$, df $=$ 269, $p < .001$). Thus, the effect of age was controlled in the statistical analyses. The reported age of the children varied between 1 month and 30 years. We classified children till the age of 5 years as dependent, because survival in this age group is at the highest risk of being contaminated by ingestions of pathogens (Curtis, 2011). The survival of these young children is consequently highly dependent on the parent's abilities to control their behavior (Rottman, 2014).

2.2. Research instruments

2.2.1. Disgust inducing visual cues of pathogens

Ratings of objects were used as complementary research instruments because these are often more sensitive than disgust scales (Fleischman & Fessler, 2011a, 2011b, J. M. Tybur, pers. comm.). Following Prokop and Jančovičová (2013), we presented 16 color pictures to participants. Each picture contained one insect and was presented individually. Overall, eight out of the sixteen pictures presented to each participant were insects, either disease-relevant (head lice [*Pediculus capitis*], hard tick [*Ixodes ricinus*], human flea [*Pulex irritans*] and mosquito [*Anopheles gambiae*]), or their disease-irrelevant antipoles (Old World swallowtail [*Papilio machaon*], ladybird beetle [*Coccinella septempunctata*], leaf beetle [*Chrysomela fastuosa*] and azure damselfly [*Coenagrion puella*]). Similar invertebrates were used by Prokop and Fančovičová (2010). The images of the objects holding a potential disease threat were taken from a published study examining people's perception of pathogens (Curtis et al., 2004) and recently used by Little, DeBruine, and Jones (2011) and Prokop, Rantala, and Fančovičová (2012). Each high pathogen image had a low pathogen counterpart, for example, a plate of viscous liquid looking like bodily fluids (high pathogen cue) or a blue chemical dye (low pathogen cue). More details can be found in Prokop and Jančovičová (2013). The pictures were presented in a random order. Each picture was presented for 30 s. During this time, participants rated their disgust toward the presented pictures (e.g., How disgusting would you consider this animal?) on a 7-point scale (1 = not at all, 7 = extremely disgusting). The reliability of the ratings was high (Cronbach's alpha = 0.87). We calculated the individual scores for the disgusting pictures (DP, pictures with disgusting animals and high pathogen cues pooled) and the control pictures (CP, pictures with control animals and low pathogen cues pooled) by summing the responses to the constituent items.

2.2.2. The Three Domain Disgust Scale

There is general agreement that the emotion of disgust has three relatively independent domains: pathogen, sexual, and moral disgust. Pathogen disgust (PD) refers to disgust elicitors caused by the sources of various pathogens (e.g., stepping in dog excrement). Moral disgust (MD) refers to disgust that pertains to social transgressions (e.g., deceiving a friend). These social transgressions broadly include non-normative, often antisocial activities such as cheating, stealing, etc. Sexual disgust (SD) refers to disgust which motivates sexual avoidance of an unsuitable mating partner or other reproductively costly behavior (e.g., performing anal sex or being in a situation with a high probability of having sex with a stranger). We were particularly interested in pathogen disgust and, consequently, decided to use the pathogen disgust (PD) domain of the Three Domain Disgust Scale (Tybur et al., 2009). We also measured moral disgust (MD) from the same questionnaire (Tybur et al., 2009) in order to examine whether possible changes caused by the experimental manipulation would influence the PD domain, but not the MD domain. Both the PD and MD subscales consist of seven Likert scale items (1 = not at all disgusting, 7 = extremely disgusting). Examples of the items are: Stepping in dog excrement, and stealing from a neighbor, respectively. The PD and MD domains had acceptable reliabilities (Cronbach's alpha = 0.74 and 0.80, respectively). We calculated the individual scores of DP and MD by summing the responses to the constituent items.

2.3. Statistical analyses

Continuous data were $\ln(x + 1)$ transformed to achieve normality (Kolmogorov–Smirnov test) and a Multivariate Analysis of Covariance (MANCOVA) with having at least one child (or not) as the categorical predictor and the summed scores from the measured domains (PD, MD, DP, and CP) as the dependent measures was performed. Age is known to correlate with disgust sensitivity (Oaten et al., 2009) and was therefore treated as a covariate. In order to see the more detailed influences of having children on disgust domains, the results of univariate ANCOVAs were examined. Partial η^2 was used in order to measure the effect size (0.01 was considered small, 0.04 moderate, and 0.10 large; Huberty, 2002). The total reported number of children (dependent variable) fits with the Poisson distribution. The Generalized Linear Model with the Poisson distribution was therefore used for examining these data.

3. Results

There were no effects of having a child or not on the scores obtained from the PD, MD domain and the DP and CP pictures ($F(4292) = 1.46$, $p = .21$, eta$^2 = 0.02$). The associations between the participant's age and the dependent variables were, however, significant ($F(4292) = 5.17$, $p < .001$, eta$^2 = 0.07$). Considering univariate results, mothers demonstrated significantly lower disgust scores than childless females both in the pathogen disgust domain and in the Pathogen pictures (Table 1). Note that the identical means for the pathogen disgust are raw data, but least-squares means of $\ln(x + 1)$ transformed data favored higher scores of childless females (least-squares $M = 1.53$, $SD = 0.11$) compared with mothers (least-squares $M = 1.49$, $SD = 0.17$). There were no differences in the moral disgust domain or in the control pictures between these two groups of females (Table 1). Pathogen and moral disgust scores increased with the age of the participants ($F(1295) = 12.75$ and 7.15, $\beta = 0.23$ and 0.18, $p < .001$ and 0.01, eta$^2 =$ 0.04 and 0.02, respectively), but not with the scores from the disgusting and control pictures ($F(1295) = 0.91$ and 0.65, $\beta = 0.06$ and -0.05,

Table 1
Differences in disgust domains and the ratings of pictures between females with and without children (untransformed means and standard deviations). Reported statistical analyses are based on $\ln(x + 1)$ transformed data.

	Disgust				Pictures			
	Pathogen		Moral		Disgusting		Control	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Without children ($n = 124$)	32.2	6.7	35.3	7.2	36.9	9.4	17.9	7.2
Mothers ($n = 174$)	32.2	8.3	35.5	7.7	34.7	10.8	16.3	6.7
$F(1295)$	4.19	–	1.38	–	4.85	–	1.78	–
p	0.04	–	0.24	–	0.03	–	0.18	–
η^2	0.01		0.005		0.02		0.006	