

# Tolerance of Frogs among High School Students: Influences of Disgust and Culture

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Amphibians play an important role in the functioning of ecosystems and some of them inhabit human gardens where they can successfully reproduce. The decline of amphibian diversity worldwide suggests that people may play a crucial role in their survival. We conducted a cross-cultural study on high school students' tolerance of frogs in Chile, Slovakia, South Africa and Turkey (n = 655 high school students). We found that about 6 % of students reported active killing of frogs and 30 % reported moving frogs away from their home gardens. Pathogen disgust negatively correlated with frog tolerance suggesting that people who are more sensitive to pathogen conoting cues are less tolerant toward frogs. Tolerance of frogs in parents or other family members appears to significantly influence student tolerance of frogs. Females tended to show higher tolerance of frogs than males. This study highlights the importance of the emotion of disgust in human willingness to protect frogs from a cross-cultural perspective.

*Keywords:* amphibians, conservation, disgust, frogs, students

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## INTRODUCTION

Frogs belong to a well known group of animals with slimy bodies and unpleasant appearance for humans. Slimy bodies are obviously considered disgusting (Davey et al., 1998) and low aesthetic value of animals are associated with negative attitudes

toward them (Knight, 1998; Pinho, Grilo, Boone, & Galvin, 2014; Prokop & Fančovičová, 2013). All these characteristics in all probability contribute to a negative attitude (Schlegel & Rupf, 2010; Tomažič, 2008), intolerance (Prokop & Fančovičová, 2012), and persecution (Ceriaco, 2012; Pagani, Robustelli, & Ascione, 2007) of frogs. On the other hand, these amphibian species play a crucial role in the functioning of ecosystems (Hocking & Babbitt, 2014; Whiles et al., 2006). According to the International Union for Conservation of Nature's (IUCN) Red list (IUCN Red List of Threatened Species, 2013), about one-third of the known amphibian species are threatened and many have already gone definitely extinct due to habitat loss, degradation, and vulnerability to pathogens (Cushman, 2006). Information about the attitude toward frogs in the general public is therefore important for improving their reputation and conservation through environmental education and/or through nature protection programmes.

Disgust is one of the basic human emotions that evolved to protect the body against contamination and diseases (Curtis, Aunger, & Rabie, 2004; Oaten, Stevenson, & Case, 2009; Olatunji et al., 2007; Wagler & Wagler, 2014, 2015; Woody & Teachman 2000). Findings in recent studies reveal that the emotion of disgust negatively correlates with the willingness to protect various animals (Jacobs, Vaske, Dubois, & Fehres, 2014; Prokop & Fančovičová, 2013). Among the few studies attempting to identify factors associated with attitudes toward frogs (Jimenez & Lindemann-Matthies, 2015a,b; Prokop & Fančovičová, 2012), perceived disgust of frogs was found to be inversely associated with tolerance of frogs (Prokop & Fančovičová, 2012). However, there is a lack of research studies investigating whether disgust sensitivity influences tolerance of frogs. Females are more disgust-sensitive than males (Curtis, Aunger, & Rabie, 2004; Prokop & Fančovičová, 2010; Prokop & Jančovičová, 2013) and perceive frogs as less beautiful than males (Jimenez & Lindemann-Matthies, 2015a). This would suggest that females express lower support for frog conservation than males although no evidence for this claim was found (Prokop & Fančovičová, 2012).

This study investigated tolerance of frogs by students from various countries with respect to disgust sensitivity. In this article we use the term frog to refer to a member of the Anura order; we also use this term to maintain consistency with previous studies dealing with students' attitude towards this amphibian species. In those publications the term frog is included in surveys and questionnaires (e.g., Jimenez & Lindemann-Matthies, 2015a,b). There are cross-cultural studies on attitudes toward animals including birds (Hummel, Özel, Medina-Jerez, Fančovičová, Usak, Prokop, & Randler, 2015), but research on frogs is limited (Jimenez & Lindemann-Matthies, 2015a,b). We hypothesize that disgust-sensitive students (compared with less disgust-sensitive) and female students (compared with male

### *State of the literature*

- The decline of amphibian diversity worldwide suggests that people may play a crucial role in their survival.
- Frogs are small, slimy animals which elicit disgusting responses.
- The emotion of disgust may play a more important role in attitudes to animals than previously suggested.

### *Contribution of this paper to the literature*

- Students in four different cultures appear to show high tolerance of frogs.
- Parents and family members appear to influence student tolerance of frogs and female students are more tolerant than males.
- The emotion of disgust uniquely predicted student tolerance of frogs supporting its crucial role in human willingness to protect unpopular animals.

students) are less tolerant toward frogs. Participants were asked to rate their parents' and other family members' tolerance of frogs. This item was treated as one of the potential predictors, as it is known that parents influence attitudes of their children towards nature and animals (Heo, 2013; Prokop, Prokop, & Tunnicliffe, 2008; Schlegel, Breuer, & Rupf, 2015).

## METHODOLOGY

### The sample

Participants were recruited using a convenience sample method. The students were from secondary school grade levels and represented the following countries: Chile (n = 199), Slovakia (n = 123), South Africa (n = 224) and Turkey (n = 109). The mean age of participants was 14.8 years (SE = 0.04, n = 655); they were in the 12 – 19 age range. Although differences between age with respect to countries were significant (ANOVA,  $F(3,651) = 28.7$ ,  $p < 0.001$ ), their importance had low practical significance; Slovak participants were on average 15.3 years old (SE = 0.09), while the participants from other countries were on average about 14 years old (Chile: M = 14.9, SE = 0.07; South Africa: 14.7, SE = 0.07, Turkey: 14.1, SE = 0.1). In order to control for the possible confounding effect of age, we included this variable in all statistical analyses. Further basic demographic questions were gender and grade.

### Data collection instruments

#### *Pathogen disgust (PD)*

PD refers to disgust elicitors caused by various pathogen sources. We decided to use the following Pathogen Disgust items which we adopted from Tybur, Lieberman, and Giskevicius (2009): Stepping on dog poop; Sitting next to someone who has red sores on their arm; Shaking hands with a stranger who has sweaty palms; Seeing some mold on old leftovers in your refrigerator; Standing close to a person who has body odor; Seeing a cockroach run across the floor; Accidentally touching a person's bloody cut. This domain consists of 7 items (Cronbach  $\alpha = 0.72$ ) rated by participants on a Likert scale (1 = not at all disgusting, 5 = extremely disgusting). We calculated the individual scores of PD by averaging the responses to the constituent items (M = 3.6, SE = 0.03).

#### *Disgust and importance of frogs*

Disgust of frogs (M = 5.5, SE = 0.13) was measured by one item (How much are frogs disgusting for you?) adopted from Prokop and Fančovičová (2012). Similarly, the importance of frogs (M = 6.1, SE = 0.1) was measured by one item (How much do you consider frogs important in nature?). Both items were rated by participants on a 10-point scale from 1 (not at all) to 10 (extremely disgusting/important).

#### *Tolerance of frogs*

Participants' tolerance was examined by one item (If you have some frogs in your home garden, what do you do with them?). Three possible answers were adopted from Prokop and Fančovičová (2012): 1) kill them, 2) remove, or 3) accept them in the home garden. Parent and other adults in the family tolerance was examined by the same item, but the word "you" was replaced with "your parents and other adults in the family".

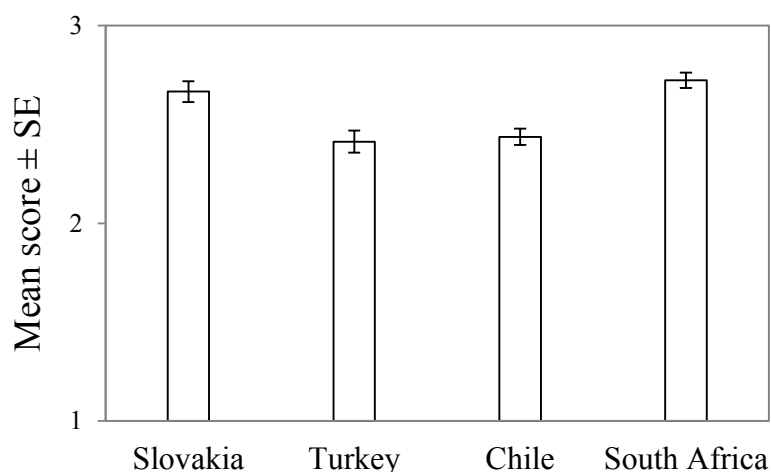
### Data analysis

Ordinal multiple regression with main effects was performed to examine whether country, gender (categorical predictors) and age, disgust of frogs, importance of frogs, parent tolerance of frogs and pathogen disgust (covariates) influence student

tolerance of frogs (dependent ordinal variable). All analyses were performed in SPSS ver. 19.0.

## RESULTS

Only 6 % of participants (37/655) reported killing frogs while the majority of them opted for accepting frogs (63%, 413/655). The remaining 205 participants (31%) chose the option of removing frogs from their home gardens. The highest killing of frogs was reported by students from Slovakia (6.5 %), followed by their counterparts from South Africa (6.3%), Chile (5.5 %) and Turkey (3.7 %). Ordinal regression analysis resulted in significant model ( $\chi^2 = 279.6$ ,  $P < 0.0001$ ) and explained 43 % of the variance of results (Nagelkerke  $R^2$ ). As predicted, higher parental tolerance of frogs was positively associated with student tolerance of frogs (Wald  $\chi^2 = 169.1$ ,  $P < 0.0001$ ). More disgust-sensitive participants showed lower tolerance of frogs (Wald  $\chi^2 = 6.2$ ,  $P < 0.05$ ) and female students were more tolerant toward frogs than male students (Wald  $\chi^2 = 4.7$ ,  $P < 0.05$ ). This result is particularly interesting, because even after controlling for the effect of country and age, females were more disgust sensitive than males (ANCOVA,  $F(1, 652)=10.7$ ,  $P = 0.001$ ). Disgust of frogs and the perceived importance of frogs were not associated with tolerance of frogs (Wald  $\chi^2 = 0.19$  and  $1.72$ ,  $P = 0.89$  and  $0.19$ ). Older students expressed more tolerance toward frogs than younger students (Wald  $\chi^2 = 5.57$ ,  $P < 0.05$ ). As shown in Figure 1, students from Slovakia and South Africa reported higher tolerance of frogs than their counterparts from Turkey and Chile (Wald  $\chi^2 = 11.9$ ,  $P = 0.01$ ).



**Figure 1.** Tolerance of frogs in four countries

## DISCUSSION

This paper investigated tolerance of frogs and perceived diversity of frogs in home gardens by high school students from Chile, Slovakia, South Africa and Turkey. We found that both of these variables (i.e., tolerance and perceived diversity) are significantly influenced by human factors, particularly by the emotion of disgust.

Previous research suggests that the perceived aesthetic value of animals is linked to attitudes (Jimenez & Lindemann-Matthies, 2015a,b; Knight, 1998; Pinho et al., 2014) therefore suggesting that emotions may play a significant role in attitudes toward animals. Jacobs et al. (2014), for example, found that disgust of wolves was consistently and significantly associated with acceptability of lethal control of wolves both in Dutch and Canadian university students. Prokop and Fančovičová

(2012) found that disgust of frogs was negatively related to their tolerance. In this study we suggest that a relationship between the tolerance of frogs and the emotion of disgust has broader implications: not only specific disgust of frogs (Prokop & Fančovičová, 2012), but disgust from disease-connoting cues in general (pathogen disgust, cf. Tybur et al. (2009)) is negatively correlated with tolerance of frogs. This result is particularly important for conservation programmes, because disgust is associated with some personality traits, such as with neuroticism (Haidt, McCauley, & Rozin, 1994; Tybur et al., 2009), meaning that eliminating the disgust of frogs in the general public might become initially more problematic. Allowing physical experiences of humans with frogs may be a viable strategy to inhibit the disgust of these species (Fančovičová, Prokop, & Lešková, 2013; Tomažič, 2008, 2011a,b; Randler, Ilg, & Kern, 2005).

A positive aspect that surfaced in this study was the relatively low frequency of frog killing (about 6% of students) which is much less than what we found in an adult Slovak public sample (about 30 %) (Prokop & Fančovičová, 2012). Still, about one-third of participants reported removing frogs from their home gardens suggesting lower level of tolerance. A detailed analysis of habitats where these frogs are removed from along with educational actions informing the public about suitability of some habitats for frogs can be suggested as conducive measures for the protection and preservation of this amphibian species. Parent education may play an important role here as well, because as we suggest, parents and other family members may influence student tolerance of frogs. Explaining the importance of frogs may play a significant role in this process, because a correlation between perceived importance of frogs and tolerance of them which has been frequently reported in the literature (Jimenez & Lindemann-Matthies, 2015a,b; Prokop & Fančovičová, 2012). Although we did not examine the amount of time the participants spent in home gardens, it would be expected that adults work more and, thus, their behaviour toward frogs is more crucial compared with the behaviour of high school students. Further research is needed in order to determine the role of age and gardening on tolerance of frogs.

Females in this study showed stronger frog tolerance than males. This result is particularly surprising, because tolerance of animals positively correlates with disgust sensitivity (Prokop & Fančovičová, 2012, 2013) and perceived aesthetic value (Knight, 1998; Pinho et al., 2014). Although females are more disgust-sensitive than males (Curtis, Anger, & Rabie, 2004; Prokop & Fančovičová 2010; Prokop & Jančovičová, 2013) and perceive frogs as less beautiful than males (Jimenez & Lindemann-Matthies, 2015a, but see Jimenez & Lindemann-Matthies, 2015b), tolerance of frogs tended to be higher in females when compared with males. This paradox suggests that some unknown factors beyond our measures influences gender differences in the attitude toward frogs. Perhaps greater environmental concerns found in females (Prokop & Kubiato, 2014; Zelezny, Chua, & Aldrich, 2000) may at least partially explain this phenomenon. Another possibility is that females avoid touching frogs because they are more disgust sensitive which promotes avoidant behaviour. Further research can examine gender differences from the perspective of associations between environmental concerns, willingness to touch animals, and attitudes toward animals (Binngießer & Randler, 2015).

## CONCLUSIONS

To conclude, we found relatively high rates of non-lethal tolerance of amphibians among high school students from four different countries, but a substantial proportion of participants still report moving frogs away from their home gardens. This suggests that the importance of frogs is not well understood and further education in this field is necessary. Sensitivity to disease connoting cues showed

significant association with frog tolerance suggesting that the emotion of disgust plays a very important role in individual differences in willingness to protect frogs.

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