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The effect of fear and compassion on human willingness to protect predators and prey

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Human perception of predators is extremely important because the decline in biodiversity requires greater involvement from the public in species conservation. We conducted an online study in Slovakia with 225 adult participants (151 women; mean age = 24 years), who viewed a series of short videos depicting predator-prey interactions in which the predator either won or lost the encounter. Most of the predators depicted were large mammals (e.g., leopards, lions), one of which was a snake. We examined participants' compassion towards both the predator and prey and their willingness to protect these species. Participants exhibited greater compassion towards predators when they lost, whereas prey received higher compassion scores when they lost than when they won. Prey generally received higher compassion scores than predators. Fear of perceived animals was negatively correlated with compassion for predators and prey. Perceived fear and compassion for both predators and prey were positively correlated with the willingness to protect them (WTP), although these correlations were negative for the majority of predator species. WTP was not significantly influenced by the outcome of the encounter. Snakes, often considered prototypical stimuli for human fear, elicited less compassion and lower WTP compared to mammalian predators. We conclude that human sensitivity to physical interactions between predators and prey does not necessarily translate into a willingness to protect these animals. Conservation strategies need to consider the emotional and cognitive biases people hold toward different species. By acknowledging these biases, especially fear and perceived charisma, conservation campaigns may more effectively foster public support for protecting a broader range of species.

Keywords Animal cruelty, Emotions toward animals, Perception of predators

Predators have exerted significant selective pressure on human ancestors[1–3]. The primary predators of humans are believed to have been fast-moving mammals, primarily felids and canids[4,5]. However, snakes hunted small placental mammals, from which the order Primates—including humans—eventually evolved around 85 million years later[2]. Nonetheless, aversion to snakes may also stem from the more immediate and historically persistent threat that venomous species have posed to humans and livestock[3]. This means that snakes also posed a significant threat to predation for early human ancestors. Given the long evolutionary history of this threat, emotional adaptations to detect and evade predators likely evolved early in our lineage. One such adaptation is fear, a basic emotional and behavioural response that has evolved to enhance survival by triggering rapid 'fight or flight' reactions in the face of potential danger[6–9]. For example, research using eye movements showed that participants were quicker to detect predators facing forward (e.g., a lion) among predators facing away than the opposite[10]. There is a gender difference in the initiation of this adaptation, wherein women are traditionally more afraid of dangerous animals than men[11–21].

Negative perceptions of predators and the reluctance to protect them can vary significantly by species[22,26,32]. Although large carnivores, such as tigers and lions, often evoke admiration and are perceived as charismatic[20,33,34], snakes tend to evoke stronger fear responses that are rooted in our evolutionary history[2,7,35]. This fear is deeply ingrained, making snakes prototypical stimuli for fear, which in turn leads to less empathy towards them compared to other predators and ultimately reduces the public's willingness to protect them[36–38]. However,

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human perceptions of predators are not static and may be influenced by the context of their interactions with prey. While a general aversion or admiration exists for certain species, observing a predator engage in a hunt, with varying outcomes, could potentially impact emotional responses; for instance, an outcome where a typically feared predator is unsuccessful might lead to reduced fear and increased compassion towards that animal.

Human willingness to pay (WTP) is often correlated with a broader willingness to protect living organisms[39]. WTP animals is influenced by emotional responses elicited by animals, which consequently shape attitudes towards wildlife[21]. Fear often leads to negative perceptions of certain animal species, particularly predators[9,11,22,23]. In particular, the presence of large carnivores, such as lions or tigers, in human environments can generate strong opposition to the conservation of these species[24,25]. Media portrayals that emphasise the dangers associated with these animals may contribute to increased public fear[26], which contributes to decreased tolerance for predators and reduced support for conservation initiatives[22,27,28]. Experimental studies have shown that exposed fear-inducing images of predators, such as predators in aggressive postures, exhibited a lower willingness to support conservation efforts than those presented with non-fear-inducing images[29,30]. In a recent study, Prokop and Fančovičová[31] conducted a short-term intervention using positive depictions of wolves (e.g., their crucial role in ecosystems). This intervention significantly improved schoolchildren's attitudes toward these animals compared to negative depictions, suggesting that the perception of predators is highly sensitive to fear-based cues. Understanding how people emotionally perceive predators may clarify how media portrayals affect conservation willingness.

On the contrary, emotions such as compassion and empathy can foster positive attitudes toward wildlife conservation. Compassion is defined as an emotional response to the suffering of others, characterised by a genuine desire to alleviate that suffering[40], while empathy involves both cognitive and affective understanding of the feelings of another without necessarily prompting action[41,42]. Empathy and compassion for animals are strongly correlated[43], yet emotional connection to animals has received limited attention in Western psychology[44,45]. A moderate correlation between empathy for humans and empathy for animals has been reported, suggesting that people who show compassion towards one group tend to extend similar feelings toward the other[46–48]. This suggests that promoting compassion and empathy for certain animals would increase the willingness of people to engage in pro-environmental behaviours, such as conservation efforts[49,50], but it should not necessarily be applied to other animals. For example, when participants were presented with film stimuli depicting various animals in victimised circumstances, birds elicited lower empathy than mammalian stimuli[46]. Compassion is closely related to empathy for animals and nature-relatedness, suggesting that these emotional responses can predict concern for animal welfare and environmental stewardship[45]. Cultivating compassion and empathy for animals, as well as for humans who live alongside them, is essential to promote a deeper commitment to wildlife conservation and protection of nature[51].

Research consistently shows that women exhibit higher levels of compassion and empathy for animals than men[52–54]. On the contrary, men are often socialised to adopt a more utilitarian view of animals, which can manifest itself in less emotional engagement and greater acceptance of practices such as animal research[55,56].

To date, little is known about how the outcomes of predator-prey interactions influence compassionate responses and willingness to protect these animals. Research in zoological gardens has shown that most visitors disapprove of feeding cheetahs and tigers live rabbits during exhibits[57,58], suggesting that people tend to view predation negatively. The present study aimed to fill this gap by exploring compassion and willingness to protect animals in situations where the prey escapes or is defeated by the predator. We investigated how combat outcomes (victorious vs. non-victorious), self-perceived fear, predator taxonomy (mammal vs. snake), participant sex, compassion towards humans, and target animal (predator vs. prey) influence compassionate responses and willingness to protect these animals. We hypothesized that animals portrayed as losers in predator–prey interactions elicit greater compassion than those portrayed as winners, and that elevated compassion increases the willingness to protect these animals. Women are expected to show significantly more compassion toward prey than men[52,53], as prey are more likely to trigger caregiving responses than predators. Individuals with higher levels of dispositional compassion are more likely to express greater compassion toward animals[44,45], especially those perceived as losers. In contrast, increased fear toward an animal is expected to suppress the willingness to protect it[27,28,30]. Finally, mammals are predicted to elicit more compassion than reptiles (e.g., snakes), due to their closer phylogenetic relationship to humans[15]. Understanding how combat outcomes and emotional responses influence willingness to protect predators and prey can inform targeted interventions to mitigate fear and promote compassion, ultimately increasing public support for conservation initiatives.

Methods

Participants

Participants were 225 Slovak adults (151 women) between the ages of 18 and 62 years (M = 24.1, SE = 0.53). Participants were primarily recruited through advertisements placed on social networking sites, specifically Facebook, and potentially via emails distributed through the university website targeting the student population. The advertisements and information provided to potential participants described the study as investigating human attitudes toward animals. Participation was entirely voluntary, and no financial or other incentive was provided for participation. Following initial recruitment, participants were also asked to recruit additional volunteers from their acquaintances using the snowball sampling method[59]. We invited individuals to participate in our research project on a voluntary basis without revealing the specific hypotheses involved.

Photographs as visual stimuli

We prepare colourful visual stimuli of predators (N = 6 pictures) and their prey (N = 5 pictures) (Table 1). All visual stimuli were downloaded from Google. We were unable to find predatory interactions between the snake and the hare with the same snake species, therefore, we used means of self-perceived fear from pictures using

Predators			Prey		
English name	Latin name	Described by	English name	Latin name	Described by
Lion	*Panthera leo*	(Linnaeus, 1758)	African buffalo	*Syncerus caffer*	(Sparrman, 1779)
Cheetah	*Acinonyx jubatus*	(Schreber, 1775)	Gazelle	*Gazella* sp.	Blainville, 1816
Leopard	*Panthera pardus*	(Linnaeus, 1758)	Porcupine	*Hystrix* sp.	Linnaeus, 1758
Cougar	*Puma concolor*	(Linnaeus, 1771)	Guanaco	*Lama guanicoe*	(Müller, 1776)
Western rat snake[1]	*Pantherophis obsoletus*	(Say, 1823)	Hare	*Lepus* sp.	Linnaeus, 1758
Burmese python[2]	*Python bivittatus*	Kuhl, 1820	Hare	*Lepus* sp.	Linnaeus, 1758

Table 1. List of species used in visual material (videos and photographs). [1]video in which prey wins (scaring off snake). [2]video in which predator wins (devouring rabbit).

both snake species. Participants were asked to rate self-perceived fear of each animal using 7-point Likert scales (1 = not at all, 7 = very much).

Videos as visual stimuli

Videos showing predator-prey interactions ($N = 10$) with the same species as described in Table 1 were downloaded from YouTube. Half of the videos showed victorious attacks of the predator against the prey (predator approach toward the prey, attack and killing). Half of the videos showed non-victorious attacks of the predator against the prey (predator approaching the prey, attacking, and killing). Each video lasted up to 30 s and was played without volume. Participants were asked to rate compassion (To what extent do you feel sorry for the 'animal that lost the encounter') and willingness to protect (WTP) each animal (Do you think this species should be protected by laws?) in videos using a 7-point Likert scale (1 = not at all, 7 = very much). The reliability of compassion and WTP was high (Cronbach $\alpha = 0.88$ and 0.89, respectively).

General compassion questionnaire (GCQ)

General compassion was assessed using a 16-item compassion questionnaire developed by Pommier et al.[60]. Items were rated on a scale from 1 (almost never) to 5 (almost always). Negatively worded indifference items were scored in reverse order. The GCP comprises items such as "I notice when people are upset, even if they don't say anything", or "When others feel sadness, I try to comfort them". The reliability of the scale was high (Cronbach $\alpha = 0.86$). High scores indicate a high level of general compassion for other people.

Procedure

The online survey was available to participants for a period of approximately six weeks, from November to December 2024, and the estimated time for completion was no more than 10 min. The participants first completed the informed consent form and then rated their fear of animals based on pictures. They responded to 16 items from the GCQ and finally rated the animals in videos on compassion and willingness to protect. The last section of the questionnaire included demographic questions (participant gender and age). The participants received four versions of the questionnaire, in which pictures, items and videos were presented in random order. At the beginning of the questionnaire, participants were instructed to complete it on a computer to ensure that they could view predator-prey interactions on screens of an appropriate size. Completing the questionnaire through the smartphone or mobile phone was not allowed. This version clarifies the sequence of tasks and ensures consistency in verb tense and style.

Statistical analyses

All statistical analyses were performed using two separate models, one for each of the two dependent variables (compassionate responses and willingness to protect). A Generalised Linear Mixed Model was used to test whether the following factors influenced compassion toward predators and prey: categorical predictors included predators vs. prey, predator victories vs. prey victories, taxonomic grouping (mammals vs. reptiles), and participant gender (man or woman), while continuous predictors included scores from the General Compassion Questionnaire, and self-perceived fear of animals. If compassion towards predators and prey (ordinal) was the dependent variable, the participant ID and the version of the questionnaire were defined as random effects. When willingness to protect (WTP) was used as the dependent variable, the predictors remained the same, but compassion toward predators and prey was included as an additional continuous predictor. All interactions between factors were included to initial models to capture complex relationships, to improve model accuracy, and to provide deeper insights into the data (combined effects of two or more independent variables on the dependent variable). Nonsignificant interactions were removed from the models. The age of the participants was not included in the models as its effect was not significant. We used post hoc tests to explore specific differences in compassionate responses and willingness to protect across the different combat outcomes, and to examine differences in perceived fear levels between the animal stimuli presented. Post hoc tests were conducted using the Bonferroni method. All statistical tests were performed using the Jamovi project[61].

	X^2	df	*P*
Predator/Prey	0.285	1	0.594
Picture (Fear)	81.856	1	< 0.001
Taxonomy	225.947	1	< 0.001
Winner	250.939	1	< 0.001
Gender	17.388	1	< 0.001
General Compassion	4.999	1	0.025
Predator/Prey × Gender	7.924	1	0.005
Predator/Prey × Winner	62.352	1	< 0.001

Table 2. Results of GLMM on compassion toward predator and prey.

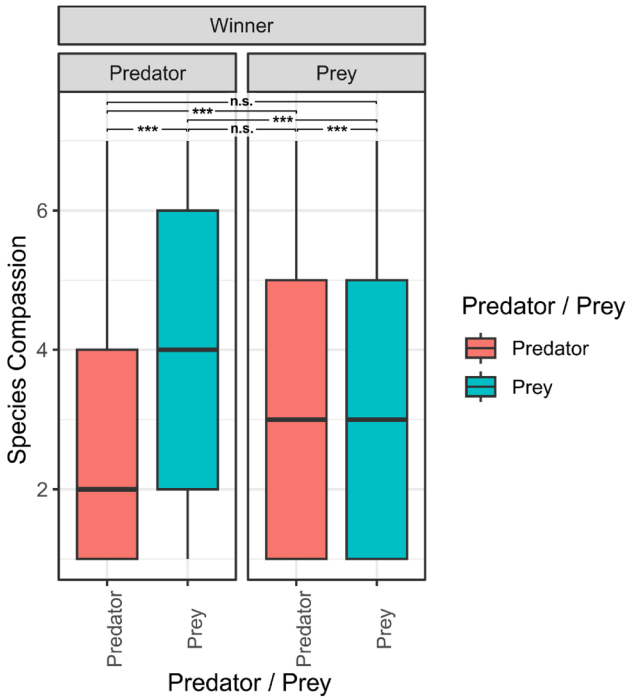

Fig. 1. Compassion toward predators and prey with respect to winners and losses.

Results

Fear of predators and prey based on picture ratings

Participants showed greater fear of predators (median = 5, ± 95% CI, 4.94, 4.79) than of prey (median = 2, ± 95% CI, 2.67, 2.52); (GLMM, $\chi 2 = 1633.62$, df = 1, $P < 0.001$) (supplementary Table 1). Women showed significantly greater fear of animals than men (median = 4, ± 95% CI, 3.78, 3.94 and median = 3, ± 95% CI, 3.35, 3.56, respectively); (GLMM, $\chi 2 = 7.0$, df = 1, $P = 0.008$).

Compassion for predators and prey

Fear of the two snake species was strongly correlated (Spearman's $r = 0.87$, $P < 0.001$, $N = 225$). There was no significant influence of predators (vs. prey) on compassion towards predators and prey scores (GLMM, $\chi 2 = 0.29$, df = 1, $P = 0.59$, Table 2, see Supplementary Table 2 for more results). Greater fear of animals was significantly associated with lower compassion toward predators and prey scores (GLMM, $\chi 2 = 81.86$, df = 1, $P < 0.001$). Mammals received higher compassion toward predators and prey scores than reptiles, and prey winners received significantly higher scores than predator winners (Table 2). Videos scored by women received significantly higher compassion scores than videos scored by men (GLMM, $\chi 2 = 17.39$, df = 1, $P < 0.001$). General compassion was positively and significantly associated with compassion toward predators and prey (GLMM, $\chi 2 = 4.99$, df = 1, $P < 0.05$). Two important interaction terms emerged (Table 2). First, predator victories received lower compassion scores than predator losses (post hoc test, $P < 0.001$), and prey received higher compassion scores when they lost than when they won (post hoc test, $P < 0.001$). (Fig. 1). Second, women exhibited significantly greater compassion for prey compared to men (post hoc test, $P < 0.001$), whereas no significant gender difference was observed in compassion for predators (post hoc test, $P = 0.17$). (Fig. 2).

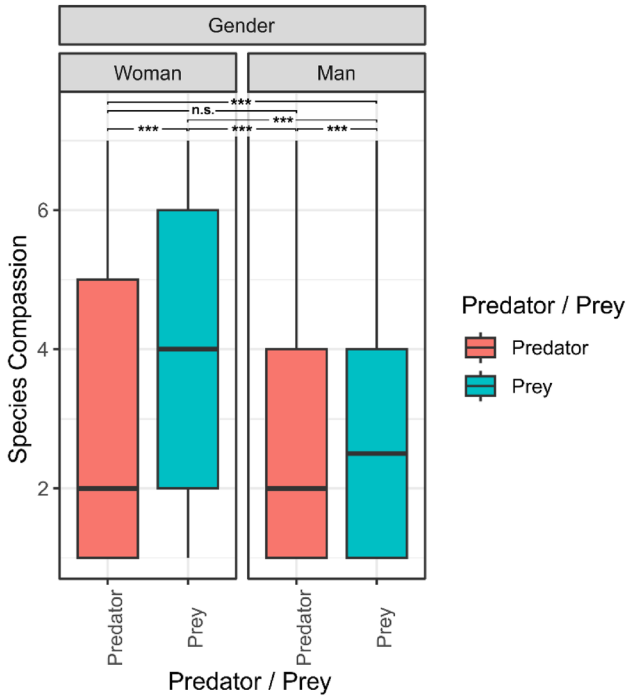

Fig. 2. Compassion toward predators and prey with respect to participant gender.

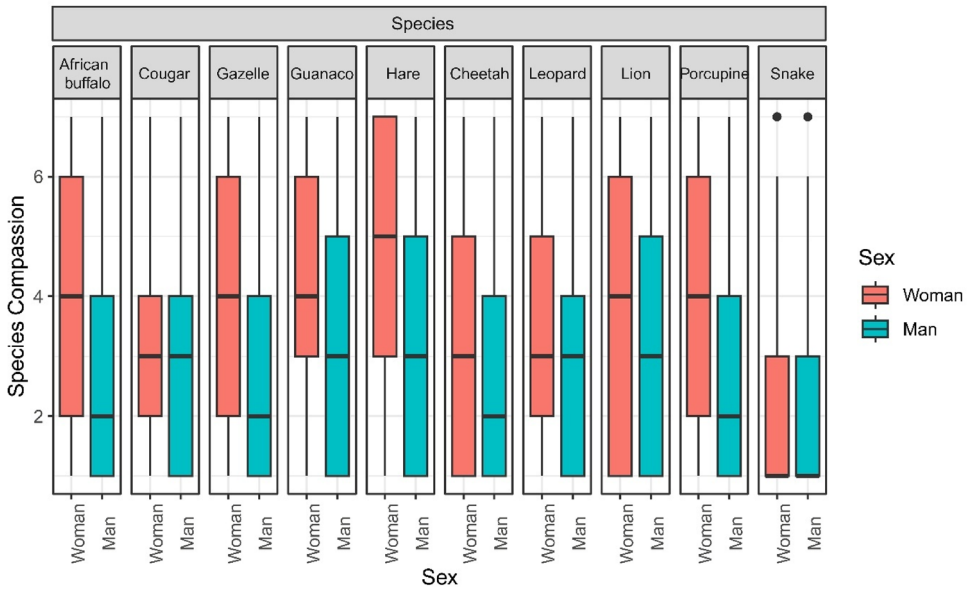

Fig. 3. Differences in compassion with respect to species and gender.

Compassion for snakes and mammals

Additional GLMM with species and participant gender showed that both variables significantly influenced compassion scores (GLMM, $\chi 2 = 328.5$ and 21.4, df = 9 and 1, both $P < 0.001$, respectively) (Fig. 3, see Supplementary Table 3 for more results). Post hoc comparisons showed that snakes received significantly lower compassion scores compared to all other species (all $P < 0.001$). Videos scored by women received significantly higher compassion scores than videos scored by men. Women rated predator compassion similarly to males, but prey received higher compassion ratings by women than by men (GLMM, $\chi 2 = 64.3$, df = 9, $P < 0.001$). Other details regarding each animal scores can be found in Supplementary Table 4.

	X^2	df	*P*
Predator/Prey	351.52	1	< 0.001
Gender	1.28	1	0.258
Picture (Fear)	14.17	1	< 0.001
Taxonomy	267.26	1	< 0.001
Winner	8.3	1	0.004
Species Compassion	169.92	1	< 0.001
General Compassion	1.3	1	0.254

Table 3. GLMM on WTP predators and prey.

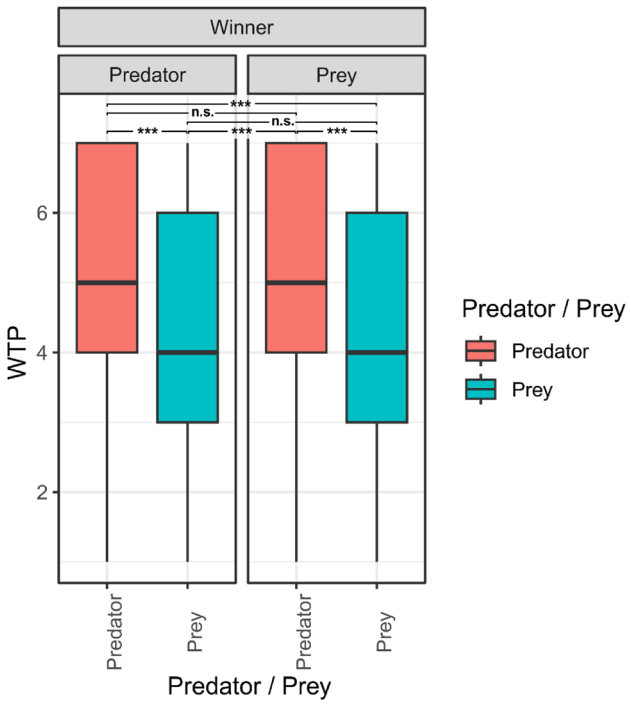

Fig. 4. WTP predators and prey with respect to winners and losses.

Willingness to protect predators and prey

Participants showed significantly higher WTP predators than prey (GLMM, $\chi 2 = 351.52$, df = 1, $P < 0.001$) regardless of whether the prey or predator was victorious or not (Table 3; Fig. 4, Supplementary Table 5). Higher fear ratings were associated with a higher WTP (GLMM, $\chi 2 = 14.17$, df = 1, $P < 0.001$, Supplementary Fig 0.1). Because this result was unexpected, we further analyzed the correlations between WTP and fear of specific species to better interpret the finding. As expected, fear of all predators, except for the lion, showed a slight negative correlation with WTP. All other correlations were positive (Supplementary Fig. 2). Furthermore, participants showed significantly higher WTP for mammals compared to snakes (Table 3). Compassion for animals in videos positively and significantly influenced WTP animals (GLMM, $\chi 2 = 169.02$, df = 1, $P < 0.001$), but general compassion and gender did not influence WTP animals (Table 3; Fig. 5).

Willingness to protect snakes and mammals

An additional GLMM showed a significant effect of species (GLMM, $\chi 2 = 784.12$, df = 9, $P < 0.001$), but not gender (GLMM, $\chi 2 = 3.49$, df = 1, $P = 0.062$), on WTP scores (Fig. 6). Lion received the highest median WTP scores, followed by cheetah. On the contrary, the hare scored the lowest, followed by snakes. Post hoc comparisons showed that hares and snakes received significantly lower compassion scores compared to all other species (all $P < 0.001$). The only exception was a nonsignificant difference between a hare and guanaco ($P = 1.0$). The interaction term (GLMM, $\chi 2 = 76.64$, df = 9, $P < 0.001$), means that women showed higher WTP prey than men (Fig. 6). Other details regarding each animal scores can be found in Supplementary Tables 6 and 7.

Discussion

The aim of the present study was to investigate how different characteristics such as gender, compassion towards conspecifics, and fear of predators influence compassion and willingness to protect (WTP) towards animals.

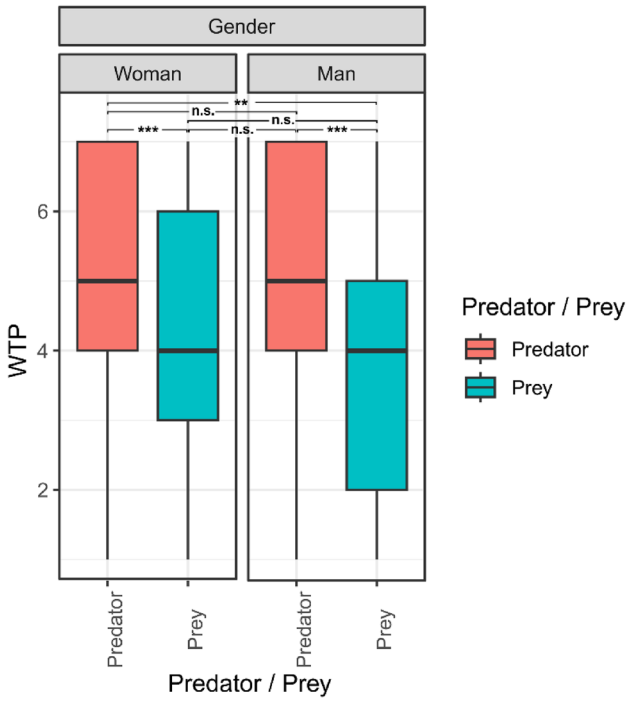

Fig. 5. WTP of predators and prey with respect to participant gender.

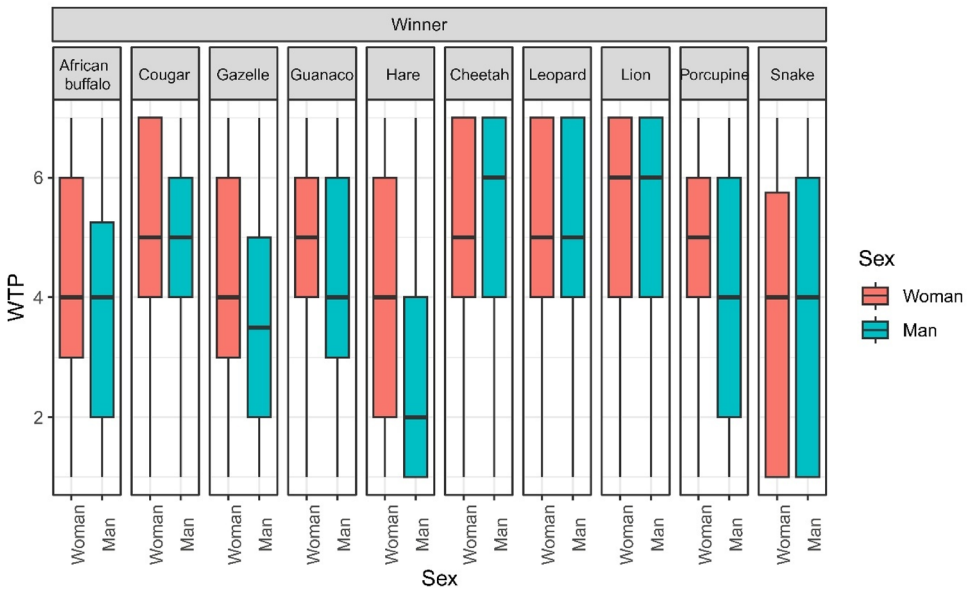

Fig. 6. Differences in WTP of predators and prey with respect to species and gender.

This influence was studied depending on the animals' taxonomy, their status (predator vs. prey), and the result of their interaction in a fight (victorious vs. non-victorious). As far as we know, this is the first study to examine how the outcomes of predator-prey interactions influence compassionate responses and WTP animals. The differences we observed in fear, compassion, and willingness to protect predators and prey offer notable insights into how humans perceive animals. For example, the low levels of compassion shown toward snakes, and the negative link between fear and the willingness to protect predators, could pose challenges for the conservation of these frequently persecuted species. The results can be easily summarised.

First, we found that predator losses generated significantly more compassion than predator victories. This suggests that people may sympathise with predators when they are perceived as vulnerable or struggling, rather than when they succeed in hunting[57,58]. Compassion for the prey was also higher when the prey lost than when it won, indicating a persistent emotional bias favoring animals that lose. Perhaps the emotional bias favouring prey

over predators arises from the significant cost difference between the two. When a prey is caught, it loses its life, whereas a predator that misses its prey experiences temporary hunger. Although both outcomes have survival implications, the loss of life for the prey is generally more severe than the missed opportunity for the predator. This disparity may contribute to the observed bias toward empathy in favour of prey.

Second, self-perceived fear of an animal was negatively associated with compassion towards predators and prey, i.e., adults who are the most fearful toward animals feel the least compassion toward them. This finding is consistent with previous research showing that species perceived as threatening or dangerous tend to receive less empathy from humans[37,39]. Interestingly, snakes, which are often considered a prototypical fear-inducing stimulus[7,9,35], received the lowest compassion scores regardless of their role in the videos. The low compassion for snakes can be attributed to two main factors: (1) an evolutionary fear of them as predators throughout human history[2] and/or (2) their significant phylogenetic distance from humans, which leads to a higher preference for mammals[43,46,62]. Furthermore, in Slovakia, where this study took place, people are much more likely to encounter snakes than apex predators like lions or pumas. This likely strengthens the impact of direct experiences and cultural narratives in shaping negative views and lower levels of compassion toward snakes. Snakes are unique creatures, and their portrayals in the media should be tailored to address the specific emotional biases they evoke, rather than applying the same standards used for large mammalian predators.

Third, WTP animals were positively associated with fear of animals, further supporting the idea that human emotions, particularly fear, play a crucial role in conservation attitudes[22,29,30,32]. However, most research has shown a negative association between fear and WTP. Although the overall correlation between WTP and fear was positive, it is noteworthy that the associations were negative for all predators except the lion. The strong charisma of the lion likely drives WTP despite the presence of fear[22]. Interestingly, while the compassion for predators and prey in the videos positively influenced WTP of these animals, the general levels of compassion did not. The lack of influence of general compassion on WTP suggests that conservation attitudes are driven by immediate emotional responses to specific species rather than an individual's overall empathetic disposition. These results also imply that compassion depends on empathy. Large predators induce ambivalent emotional and cognitive responses, since admiration for their intelligence is often mixed with fear of their aggression[20,63]. Thus, large, charismatic predators such as lions may be seen as more deserving of protection, possibly due to their perceived ecological importance or symbolic status in wildlife conservation mediated by personal admiration, rather than non-charismatic animals like snakes. The low WTP scores for rabbits, despite their perceived innocence[13], might be influenced by their common role as a food source, which could lead people to value them differently than non-hunted species. It's also likely that participants in this study were more exposed to information about the conservation threats facing large predators, through media or education, than they were about snakes or rabbits. This greater awareness of the vulnerability of apex predators may have contributed to their higher WTP scores. Conservation campaigns could benefit from emphasising the ecological importance of less charismatic species in changing public attitudes.

Fourth, the differences in compassion between the genders were more pronounced for prey than for predators, suggesting that women may be particularly sensitive to the suffering of prey animals. This finding is consistent with previous research showing that women tend to express greater empathy towards animals and are generally more supportive of conservation initiatives[52,53]. Women's greater compassion for prey may reflect evolutionary pressures that have promoted greater empathy and care in women[64,65]. Furthermore, women's increased fear of predators may stem from their historically lower survival rates during predatory attacks compared to men[66], which may increase their identification with the vulnerability of prey.

Several limitations of the present study can be identified, suggesting avenues for future research. In particular, our investigation is based on self-reported measures of compassion and willingness to pay (WTP), rather than direct behavioural observations. Future studies could benefit from incorporating more direct indicators of these constructs. However, evidence shows a link between individuals' stated willingness to pay and willingness to protect living organisms[39], as well as its connection to their actual support for conservation initiatives in real life[67]. We therefore assume that willingness to protect is a reliable tool for estimating actual support for conservation initiatives[68]. In addition, participants perceived prey/predator interactions through video stimuli, raising questions about whether similar responses would be observed with real-life observations. However, practical and ethical constraints make it challenging to carry out such experiments. For example, comparing reactions to a bullfight in person versus on television highlights the potential impact of observation mode on emotional responses. Furthermore, it would be valuable for future research to explore how relationships identified in adults are established during childhood.

To conclude, we have shown that people are emotionally engaged in physical interactions between large predators and prey, but this does not necessarily translate into conservation motivation. Media portrayals must address emotional biases, such as fear and negative perceptions of less charismatic species, such as snakes, to foster greater support for biodiversity protection. Given that predator losses elicited greater compassion, wildlife documentaries and social media content may unintentionally reinforce sympathy for predators only when they are perceived as vulnerable. Including depictions of predators facing starvation or experiencing the loss of their young as a result of predation by heterospecifics could help balance emotional responses toward dangerous animals. This approach can foster greater public support for biodiversity protection, even for less charismatic species such as snakes.

Data availability

Data is provided within the supplementary information files.

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Author contributions

P.P., J.B., Z.P., M.Z. and P.F. designed the study, J.B. performed the experiment, P.P., P.B and G.T. wrote the manuscript. P.P. and M.Z. performed statistical analyses, M.Z. visualized the results, P.F. obtained funding for publication.

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Declarations

Competing interests

The authors declare no competing interests.

Ethics declarations

This research was approved by the ethics committee of the Faculty of Natural Sciences, Comenius University (Licence no. ECH19036). All methods were performed in accordance with the relevant guidelines and

regulations, including the Declaration of Helsinki. Informed consent was obtained from all participants involved in the study.

Additional information

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