OPEN ACCESS

EURASIA Journal of Mathematics Science and Technology Education
ISSN: 1305-8223 (online) 1305-8215 (print)
2017 13(9):6069-6077
DOI: 10.12973/eurasia.2017.01000a

Animals in Dangerous Postures Enhance Learning, but Decrease Willingness to Protect Animals

Pavol Prokop
Department of Biology, Faculty of Education, Trnava University, Priemyselná 4, 918 43, Trnava, Slovakia
Institute of Zoology, Slovak Academy of Sciences, Dúbravská cesta 9, 845 06 Bratislava, Slovakia
Jana Fančovičová
Department of Biology, Faculty of Education, Trnava University, Priemyselná 4, 918 43, Trnava, Slovakia

Received 23 February 2017 ▪ Revised 18 July 2017 ▪ Accepted 2 August 2017

ABSTRACT
Animals are the most prevalent subjects for photographs in science textbooks. Many of them are potentially dangerous to humans, and visual exposure to potential threat can influence learning outcomes as well as emotional attachment to these animals. We experimentally investigated the influence of animal posture (aggressive-looking *vs.* neutral-looking) on 10 – 13-year-old pupils' information retention and willingness to support the protection of these animals. We found that information placed below aggressive-looking animals was retained significantly better than information placed below neutral-looking animals. Survival-relevant information was retained better than survival-irrelevant information. Willingness to protect aggressive-looking animals was lower than willingness to protect neutral-looking animals. This suggests that aggressive-looking pictures receive stronger attention, but do not distract pupils from learning. Aggressive animals may have a negative influence on animal conservation efforts.

Keywords: animals, adaptive memory, pupils, pictures

INTRODUCTION

Textbooks are the primary resources in pupils' learning (Tolman, Hardy, & Sudweeks, 1998) and photographs constitute a major aspect of school science texts (Pozzer & Roth, 2003; Roth, Bowen, & McGinn, 1999). Photographs in textbooks make the learning material more attractive and interesting (Male, 2007; Rubens, 2000) and induce a better mood, alertness and calmness with pupils (Lenzner, Schnotz, & Müller, 2013). Indeed, pupils generally learn better from text and pictures than from text alone (Levie & Lentz, 1982; Levin, Anglin, & Carney, 1987).

Animals are the most prevalent subjects of the photographs in science textbooks (Link-Pérez, Dollo, Weber, & Schussler, 2010). This can be explained by the natural affinity of humans to animals. Historically, animals have been important sources for the human diet, but also pose a physical danger (Treves & Palmqvist, 2007). This is why animals receive increased attention by humans (the animate monitoring hypothesis, see New, Cosmides, & Tooby, 2007). Indeed, animals are visually preferred by two-day-old babies more than non-biological targets (Simion et al. 2008) and are detected more rapidly than plants (Balas & Momsen, 2014). Predatory animals are detected faster than flowers or mushrooms (LoBue & DeLoache, 2008; Öhman, Flykt, & Esteves, 2001) and tracked by the eyes for a longer time than non-predatory animals (Penkunas & Coss, 2013; Yorzinski, Penkunas, Platt, &

Correspondence: Pavol Prokop, *Department of Biology, Faculty of Education, Trnava University, Priemyselná 4, 918 43, Trnava, Slovakia.*
pavol.prokop@savba.sk

State of the literature

- Animals are frequently the subjects of photographs in science textbooks.
- Fear elicited by animals may influence both cognitive and emotional processes.
- Fear may distract pupils from learning.

Contribution of this paper to the literature

- Some information about aggressive-looking animals was retained better than information about neutral-looking animals.
- Survival-relevant information was retained better than survival-irrelevant information.
- Willingness to protect aggressive-looking animals was lower than willingness to protect neutral-looking animals.

Coss, 2014). Observations by children and adults revealed that physical interaction with live animals was more frequent than with toys (LoBue, Bloom Pickard, Sherman, Axford, & DeLoache, 2013). This evidence suggests that humans have an innate preference for animals and predatory animals in particular receive stronger attention.

Pictures in textbooks have not only a cognitive, but also an affective influence on learning (Carney & Levin, 2002; Lenzner, Schnotz, & Müller, 2013; Levie & Lentz, 1982). By means of looking at textbook pictures, increased pupil interest may enhance willingness to learn, and activate cognitive strategies that lead to more effective learning (Schraw & Lehman, 2001; Vollmeyer & Rheinberg, 2006). Most of the research was carried out on "positive" aspects, e.g. on enhancing mood (Lenzner et al., 2013). Animals are special, however, as some of them may pose a danger to humans. Perceived danger increases fear and fear memories are deeply stored in the brain (Johansen, Cain, Ostroff, & LeDoux, 2011; McGaugh, 2000). Indeed, Chapman, Johannes, Poppenk, Moscovitch and Anderson (2013) revealed that items scoring high in fear are remembered better than neutral items. Štefaniková and Prokop (2015) found that information concerning dangerous animals was retained better than information about non-dangerous animals in all probability because retaining survival-relevant information is ultimately more advantageous than retaining survival-irrelevant information (Nairne, 2010; Nairne, Thompson, & Pandeirada, 2007).

It has been speculated that danger from animals is elicited by certain harmful shapes, such as teeth, claws or spikes (Štefaniková & Prokop, 2015; Souchet & Aubret, 2016). Presentation of animals in science textbooks may contain these aggressive cues, but it is not clear whether these cues influence learning. On the one hand, fear may enhance learning (e.g., Chapman et al. (2013), but on the other hand, if aggressive pictures attract more attention, it can be argued that they also distract the pupil from learning (Sanchez & Wiley, 2006). Furthermore, visual exposure to colour photographs of animals positively influenced the willingness to protect them (Štefaniková & Prokop, 2013). Willingness to protect animals is, however, influenced by their perceived aesthetic value (Gunnthorsdottir, 2001; Knight, 2008; Prokop & Fančovičová, 2013a; Soga, Gaston, Yamaura, Kurisu, & Hanaki, 2016) and perceived fear (Prokop & Fančovičová, 2010; Johansson, Sjöström, Karlsson, & Brännlund, 2012). It is again not clear how dangerous cues may influence willingness to protect animals.

In the present study, we presented various colourful pictures of animals to pupils and investigated whether aggressive-looking animals influence 1) information retention about them and 2) willingness to support animal protection compared with the control, neutral-looking animals.

MATERIALS AND METHODS

Participants

A convenience sample of 150 pupils was used in this research, but the final sample comprised 91 pupils (48 females) who completed both test and retest. These pupils were fifth and sixth graders from three higher primary schools and seven classes. The age of the pupils was 10 – 13 years (M = 11.23, SE = 0.08, n = 91). Participants were unaware of our hypotheses.

(a) (b)

Figure 1. An example of the spotted hyena as an animal presented in a) aggressive and b) neutral posture

Species Selection

Animals which pose a potential danger to humans were used in this research: dingo (*Canis lupus dingo*), common lancehead (*Bothrops atrox*), fossa *(Cryptoprocta ferox),* Indian red scorpion (*Hottentotta tamulus*), spotted hyena (*Crocuta crocuta*), snow leopard (*Panthera uncia*), common hippopotamus (*Hippopotamus amphibius*), collared peccary (*Tayassu tajacu*), wolverine (*Gulo gulo*) and hamadryas baboon (*Papio hamadryas*). Pictures of all these species were found in both aggressive (or at least with visible weapons dangerous to humans such as teeth) and a neutral posture with Google (**Figure 1a**, & **1b**). The pictures had a similar size, contrast, brightness and all had removed the background. We chose species that do not occur in Slovakia to avoid previous experience and familiarity of the participants with the presented animals.

Procedure

Participants were randomly divided into two groups (A and B). Both groups were shown species in both aggressive and neutral postures in both the test and retest. If, for example, a participant in Group A was shown the fossa in a neutral posture, participants in Group B were shown the fossa in an aggressive posture. Both test and retest were administered online and participants filled out the questionnaire during biology lessons.

In the test (first trial), participants were asked basic demographic information such as grade, gender, age and name. There was a need to do this research non-anonymously, because participants of this age frequently lose their ID numbers and, moreover, if the ID number is required for the next trial, they could have the suspicion that they were going to be examined again. The participant's name was the only way to pair data from the test and retest. The participants were then shown a series of 10 pictures. Each picture contained one animal (a frog, reptile, bird and mammal) which was presented individually for 1 min. Over this time, the participants rated their perceived fear (How dangerous would you consider this animal?) on a 10-point scale (1 = not at all dangerous, 10 = extremely dangerous) and the willingness to protect the animal (Do you think that this species should be protected by laws?) (yes or no). The reliability was acceptable (Cronbach's alpha = 0.64 and 0.74, respectively). Ratings of perceived danger and willingness to protect animals were applied only once (in the test, not in the retest). Some basic information regarding the name of the animal, its occurrence, food habits and danger to humans then appeared on the slide below the picture. This information was standardized to a similar length of text and there were only four types of information mentioned above. Participants were instructed to read this information.

Table 1. Results of Linear Mixed Model (MIXED) with repeated measures on an average memory score

Main effects	**df**	**F**	**p**
Intercept	1,107	5.21	.024
1. Type of animal	1,1356	11.63	.001
2. Gender	1,72	0.12	.73
3. Type of question	3,1356	58.3	.001
4. Age (covariate)	1,108	0.09	.76
Interaction terms			
1 × 2	1,1356	0.29	.59
1 × 3	3,1356	9.26	.001
2 × 3	3,1356	3.63	.05
1 × 2 × 3	3,1356	1.74	.16

After the ratings of all 10 animals was completed, a surprise memory test appeared. Each of the 10 slides contained only a picture with an animal, but instead of the text with information, four open-ended questions regarding the animal name, occurrence, food and dangerousness to humans appeared. To examine which items had passed into long-term memory, the retest (second trial) was administered one week later and contained the same four questions regarding 10 animal species. Similar procedure can be found elsewhere (e.g., Barrett & Broesch, 2012; Prokop & Fančovičová, 2014). The participants were then debriefed and dismissed.

The participant's responses were coded as correct (2 points), partly correct (some information missing, 1 point) and incorrect/do not know (0 points). Example: Where does the animal [collared peccary] occur? Both North and South America (correct); South America *or* North America (partly correct); Asia, Africa, or do not know (incorrect). Average scores were calculated for animals presented in aggressive and neutral postures separately.

Statistical Analyses

Linear Mixed Model (MIXED) with repeated measures was used to examine the obtained data. The participant's ID and the group of participants (A or B) were treated as random factors. These variables showed no influence on the dependent variables (Wald Z = -1.38 and 1.43, p = .17 and .15, respectively). Test – retest measures were treated as repeated measures. The participant's sex, the type of presented animal (aggressive vs. neutral posture) and the type of question (naming, occurrence, food and danger) were defined as categorical predictors and age was a covariate. Since females may perceive animals somewhat differently than males (see Herzog 2007 for discussion), we included gender into statistical analyses. Scores from four questions were dependent variables. Test memory scores were significantly higher than retest memory scores (Wald Z = 26.04, p < .001). No significant interactions between test-retest scores and other variables appeared, thus this variable was not further examined. Statistical analyses were performed with IBM SPSS ver. 22.

RESULTS

The Influence of Animal Appearance on Information Retention

The results of the Linear Mixed Model on memory scores (mean scores of four knowledge questions) are shown in **Table 1**. Aggressive-looking animals received higher memory scores compared with neutral-looking animals (analysis of contrasts, t = 3.36, p = .001).

The type of question also influenced memory scores; the highest scores were received for items regarding danger and food, while the lowest scores were received for naming of animals and occurrence. These patterns were very consistent in both test and re-test (**Figure 2a**, & **2b**).

The interaction term Type of animal × Type of question suggests that pupils received higher memory scores from questions regarding animal dangerousness and food particularly when an animal looked dangerous

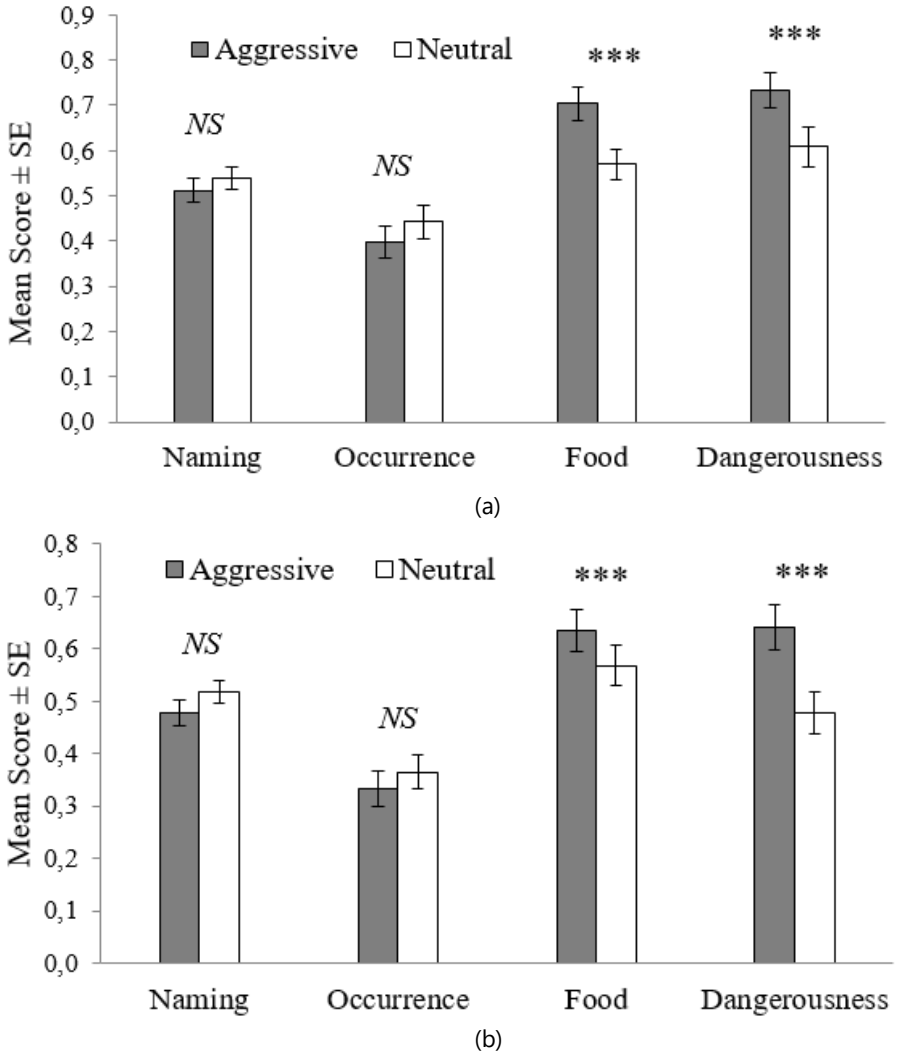

Figure 2. Differences in memory scores based on four questions in test (a) and retest (b). *** p < .001, NS = not statistically significant

(**Figure 2a**, & **2b**). The remaining two questions (naming and occurrence) received similar memory scores irrespective of the type of animal.

The interaction term Gender × Type of question suggests that females retained more information regarding animal danger than males, but males scored higher in questions regarding animal occurrence.

Animal Danger and Willingness to Support Animal Protection

Animals presented in aggressive postures were subjectively rated by pupils in a test as more dangerous than animals in neutral postures (M = 5.29, SE = 0.08 vs. M = 4.21, SE = 0.1, both $n_1 = n_2 = 91$, t- test, t = 8.79, df= 180, p < .001). This result provides some support for the validity of the selected stimuli. Pupils were less willing to protect animals presented in aggressive postures compared with animals in neutral postures (M = 0.58, SE = 0.03 vs. M = 0.69, SE = 0.03, $n_1 = n_2 = 91$, t- test, t = 2.3, df = 180, p = .022).

DISCUSSION

This study investigated the influences of aggressive animal postures on pupil's learning outcomes and their willingness to protect these animals. We found that aggressive-looking animals significantly influenced both these variables. Pupils retained more information about aggressive-looking animals than about neutral-looking animals, but were less likely to support protection of aggressive-looking animals compared with neutral-looking animals.

Information Retention Concerning Aggressive-Looking Animals

The same animal species produced different information retention scores in pupils, because more information about aggressive-looking individuals was retained than about neutral- looking individuals. These results are in agreement with previous research (Štefaniková & Prokop, 2013, 2015). Certain neural processes which are activated in fear-learning (Chapman et al., 2013; Johansen et al., 2011; McGaugh, 2000) would at least partly influence these results. Both pupils and adults, for example, detected the photos of snakes displaying a striking posture faster than the photos of resting snakes (Masataka, Hayakawa, & Kawai, 2011). It can be suggested that aggressive-looking pictures could attract more attention (Penkunas & Coss, 2013; Yorzinski et al., 2014) and stimulated situational interest enhanced information retention (Harp & Mayer, 1997; Hidi & Baird, 1988; Schraw & Lehman, 2001). This possibility can be further investigated by combining an eye-tracking technique with self-reports regarding interest in particular animals. Importantly, pictures with aggressive-looking animals do not appear to distract pupils from learning (Sanchez & Wiley, 2006) as higher information retention scores were obtained compared with neutral-looking animals.

The type of question significantly influenced information retention. Questions about dangerousness and food, in particular, received higher scores than questions regarding the naming of animals and their diet. These results are, again, compatible with previous research on both animals (Barrett & Broesch, 2012; Štefaniková & Prokop, 2013, 2015) and plants (Prokop & Fančovičová, 2014; Prokop et al., 2016), suggesting that survival-relevant information is retained better than survival-irrelevant information (e.g., Nairne, 2010; Nairne & Pandeirada, 2010; Nairne, Pandeirada, Gregory, & Van Arsdall, 2009). This is, however, true particularly for dangerousness, not for an animal's diet. Although previous research also found that scores for diet were higher than scores for occurrence and naming (Barrett & Broesch, 2012), it is not fully clear why the score for diet was similarly high as scores for danger. Finally, it is also not fully clear why the score for diet was better retained compared with naming and occurrence, but it suggests that not all information is better retained under an aggressive-looking condition.

Gender differences in information retention were weak, similarly as in earlier research (Štefaniková & Prokop, 2013, 2015). Females, however, manifested better information retention regarding animal danger than males. It is possible that females overperceive the danger posed by animals, because of their higher vulnerability of being killed by a dangerous predator (Prokop & Fančovičová, 2013b; Treves & Naughton-Treves, 1999). Males, in contrast, scored higher in questions regarding animal occurrence than females. This can be explained by the higher interest on the part of males in less popular animals such as snails, bats, and rats (Bjerke & Østdahl, 2004) and exotic wild animals (Lindemann-Matthies, 2005).

Willingness to Support Animal Protection

Lower willingness to support animal protection correlates (among other things) with their perceived aesthetic value (Ceríaco, 2012; Gunnthorsdottir, 2001; Knight, 2008; Prokop & Fančovičová, 2013a). Although this variable was not specifically examined in this study, aggressive-looking animals are in all probability perceived as less appealing than the same, but neutral-looking animals. This has important implications for environmental conservation and conservation programmes; aggressive-looking animals may receive lower public support ultimately because their presence may activate fear-motivated behaviour after exposure to danger (Öhman et al., 2001). We further recommend critical evaluation of natural history films about predators and their impact on an individual's motivation to protect them. It is possible that less pleasant, predatory scenes, can have a negative influence on environmental conservation efforts.

In conclusion, differences, not only between-species but also within-species, influence the perception of animals by pupils. We demonstrated that pictures with aggressive-looking animals are associated with better information retention, but the same pictures have a negative influence on willingness to support animal protection. This information is potentially important for teachers and developers of learning material who may alter the appearance of animals in textbook pictures. It is not actually clear as to whether our findings can be applied exclusively on pupils who are more vulnerable to predation threat, and could therefore be more sensitive to aggression cues than adults. Additional, cross-age research in this field is necessary before a final conclusion can be reached.

ACKNOWLEDGEMENTS

We would like to thank all the volunteers who participated in this research. Soňa Štefaniková helped with data collection. David Livingstone improved the English. This research was supported by the university grant no. 2/TU/2017 and 5/TU/2017 and KEGA no. 001PU-4/2017.

REFERENCES

Balas, B., & Momsen, J. L. (2014). Attention "blinks" differently for plants and animals. *CBE-Life Sciences Education*, *13*(3), 437-443.

Barrett, H. C., & Broesch, J. (2012). Prepared social learning about dangerous animals in children. *Evolution and Human Behavior*, *33*(5), 499-508.

Bjerke, T., & Østdahl, T. (2004). Animal-related attitudes and activities in an urban population. *Anthrozoös*, *17*(2), 109-129.

Carney, R. N., & Levin, J. R. (2002). Pictorial illustrations still improve students' learning from text. *Educational Psychology Review*, *14*(1), 5-26.

Ceríaco, L. M. (2012). Human attitudes towards herpetofauna: The influence of folklore and negative values on the conservation of amphibians and reptiles in Portugal. *Journal of Ethnobiology and Ethnomedicine*, *8*(1), 8.

Gunnthorsdottir, A. (2001). Physical attractiveness of an animal species as a decision factor for its preservation. *Anthrozoös*, *14*(4), 204-215.

Harp, S. F., & Mayer, R. E. (1997). The role of interest in learning from scientific text and illustrations: On the distinction between emotional interest and cognitive interest. *Journal of Educational Psychology*, *89*(1), 92-102.

Herzog, H. A. (2007). Gender differences in human–animal interactions: A review. *Anthrozoös*, *20*(1), 7-21.

Hidi, S., & Baird, W. (1988). Strategies for increasing text-based interest and students' recall of expository texts. *Reading Research Quarterly, 23*(4), 465-483.

Chapman, H. A., Johannes, K., Poppenk, J. L., Moscovitch, M., & Anderson, A. K. (2013). Evidence for the differential salience of disgust and fear in episodic memory. *Journal of Experimental Psychology: General*, *142*(4), 1100-1112.

Johansen, J. P., Cain, C. K., Ostroff, L. E., & LeDoux, J. E. (2011). Molecular mechanisms of fear learning and memory. *Cell*, *147*(3), 509-524.

Johansson, M., Sjöström, M., Karlsson, J., & Brännlund, R. (2012). Is human fear affecting public willingness to pay for the management and conservation of large carnivores?. *Society & Natural Resources*, *25*(6), 610-620.

Knight, A. J. (2008). "Bats, snakes and spiders, Oh my!" How aesthetic and negativistic attitudes, and other concepts predict support for species protection. *Journal of Environmental Psychology*, *28*(1), 94-103.

Leivas Pozzer, L., & Roth, W. M. (2003). Prevalence, function, and structure of photographs in high school biology textbooks. *Journal of Research in Science Teaching*, *40*(10), 1089-1114.

Lenzner, A., Schnotz, W., & Müller, A. (2013). The role of decorative pictures in learning. *Instructional Science*, *41*(5), 811-831.

Levie, W. H., & Lentz, R. (1982). Effects of text illustrations: A review of research. *ECTJ*, *30*(4), 195-232.

Levin, J. R. (1987). On empirically validating functions of pictures in prose. In: Willows, D.M. and Houghton, H.A., Eds., *The Psychology of Illustration: Basic Research*. Springer, New York, 51-85.

Lindemann-Matthies, P. (2005). 'Loveable'mammals and 'lifeless' plants: how children's interest in common local organisms can be enhanced through observation of nature. *International Journal of Science Education*, *27*(6), 655-677.

Link-Pérez, M. A., Dollo, V. H., Weber, K. M., & Schussler, E. E. (2010). What's in a Name: Differential labelling of plant and animal photographs in two nationally syndicated elementary science textbook series. *International Journal of Science Education*, *32*(9), 1227-1242.

Link-Pérez, M. A., Dollo, V. H., Weber, K. M., & Schussler, E. E. (2010). What's in a name: Differential labelling of plant and animal photographs in two nationally syndicated elementary science textbook series. *International Journal of Science Education*, *32*(9), 1227-1242.

LoBue, V., & DeLoache, J. S. (2008). Detecting the snake in the grass: Attention to fear-relevant stimuli by adults and young children. *Psychological Science*, *19*(3), 284-289.

LoBue, V., Bloom Pickard, M., Sherman, K., Axford, C., & DeLoache, J. S. (2013). Young children's interest in live animals. *British Journal of Developmental Psychology*, *31*(1), 57-69.

Masataka, N., Hayakawa, S., & Kawai, N. (2010). Human young children as well as adults demonstrate 'superior'rapid snake detection when typical striking posture is displayed by the snake. *PLoS One*, *5*(11), e15122.

McGaugh, J. L. (2000). Memory--a century of consolidation. *Science*, *287*(5451), 248-251.

Nairne, J. S. (2010). Adaptive memory: Evolutionary constraints on remembering. *Psychology of Learning and Motivation*, *53*, 1-32.

Nairne, J. S., & Pandeirada, J. N. (2010). Adaptive memory: Ancestral priorities and the mnemonic value of survival processing. *Cognitive Psychology*, *61*(1), 1-22.

Nairne, J. S., Pandeirada, J. N., Gregory, K. J., & Van Arsdall, J. E. (2009). Adaptive memory: Fitness relevance and the hunter-gatherer mind. *Psychological Science*, *20*(6), 740-746.

Nairne, J. S., Thompson, S. R., & Pandeirada, J. N. (2007). Adaptive memory: survival processing enhances retention. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *33*(2), 263-273.

New, J., Cosmides, L., & Tooby, J. (2007). Category-specific attention for animals reflects ancestral priorities, not expertise. *Proceedings of the National Academy of Sciences*, *104*(42), 16598-16603.

Öhman, A., Flykt, A., & Esteves, F. (2001). Emotion drives attention: detecting the snake in the grass. *Journal of Experimental Psychology: General*, *130*(3), 466-478.

Penkunas, M. J., & Coss, R. G. (2013). Rapid detection of visually provocative animals by preschool children and adults. *Journal of Experimental Child Psychology*, *114*(4), 522-536.

Prokop, P., & Fančovičová, J. (2010). Perceived body condition is associated with fear of a large carnivore predator in humans. *Annales Zoologici Fennici, 47*(6), 417-425.

Prokop, P., & Fančovičová, J. (2013a). Does colour matter? The influence of animal warning colouration in human emotions and willingness to protect them. *Animal Conservation, 16*(4), 458-466.

Prokop, P., & Fančovičová, J. (2013b). Self-protection versus disease avoidance. *Journal of Individual Differences, 34*(1), 15-23.

Prokop, P., & Fančovičová, J. (2014). Seeing coloured fruits: Utilization of the theory of adaptive memory in teaching botany. *Journal of Biological Education, 48*(3), 127-132.

Roth, W. M., Bowen, G. M., & McGinn, M. K. (1999). Differences in graph-related practices between high school biology textbooks and scientific ecology journals. *Journal of Research in Science Teaching*, *36*(9), 977-1019.

Rubens, P. (2002). *Science and technical writing: A manual of style*. Routledge, New York & London.

Sanchez, C. A., & Wiley, J. (2006). An examination of the seductive details effect in terms of working memory capacity. *Memory & Cognition*, *34*(2), 344-355.

Schraw, G., & Lehman, S. (2001). Situational interest: A review of the literature and directions for future research. *Educational Psychology Review*, *13*(1), 23-52.

Simion, F., Regolin, L., & Bulf, H. (2008). A predisposition for biological motion in the newborn baby. *Proceedings of the National Academy of Sciences*, *105*(2), 809-813.

Soga, M., Gaston, K. J., Yamaura, Y., Kurisu, K., & Hanaki, K. (2016). Both direct and vicarious experiences of nature affect children's willingness to conserve biodiversity. *International Journal of Environmental Research and Public Health*, *13*(6), 529.

Souchet, J., & Aubret, F. (2016). Revisiting the fear of snakes in children: the role of aposematic signalling. *Scientific reports*, *6*, 37619.

Štefaniková, S., & Prokop, P. (2015). Do we believe pictures more or spoken words? How specific information affects how students learn about animals. *Eurasia Journal of Mathematics, Science & Technology Education*, *11*(4), 725-733.

Tolman, M. N., Hardy, G. R., & Sudweeks, R. R. (1998). Current science textbook use in the United States. *Science and Children*, *35*(8), 22-25.

Treves, A., & Naughton-Treves, L. (1999). Risk and opportunity for humans coexisting with large carnivores. *Journal of Human Evolution*, *36*(3), 275-282.

Treves, A., & Palmqvist, P. (2007). Reconstructing hominin interactions with mammalian carnivores (6.0–1.8 Ma). In: Nekaris, K. A. I. & Gursky, S. L. (Eds.), *Primate anti-predator strategies*. Springer, New York, USA, 355-381.

Vollmeyer, R., & Rheinberg, F. (2006). Motivational effects on self-regulated learning with different tasks. *Educational Psychology Review*, *18*(3), 239-253.

Yorzinski, J. L., Penkunas, M. J., Platt, M. L., & Coss, R. G. (2014). Dangerous animals capture and maintain attention in humans. *Evolutionary Psychology*, *12*(3), 534-548.