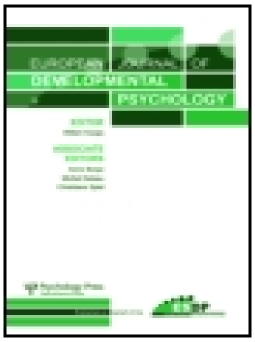

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Are the aesthetic preferences towards snake species already formed in pre-school aged children?

Jana Ptáčková[a], Eva Landová[b], Silvie Lišková[b], Aleš Kuběna[c] and Daniel Frynta[b]

[a]Faculty of Sciences, Department of Zoology, Charles University, Prague, Czech Republic; [b]Department of National IT System of Mental Health and Brain Monitoring, National Institute of Mental Health, Klecany, Czech Republic; [c]Faculty of Sciences, Department of Philosophy and History of Sciences, Charles University, Prague, Czech Republic

ABSTRACT

This study explores aesthetic preferences towards boa and python species among pre-school children and adults, and compares the ratings between the two groups. A set of snake photographs was presented (56 species) to children and adult respondents. The respondents were asked to select the five most preferred and five least preferred species. The children's agreement on which species were 'beautiful' and which were 'ugly' was statistically significant and a positive relationship between the mean ranks provided by children and adults was also found ($r = .54$, $P < .001$). Children preferred species with thick necks and inconspicuous heads, usually small species, harmless to children. Large pythons probably posed more danger to children than they did to adults during human evolution in African savannas and therefore we hypothesize that young children's aesthetic preferences were shaped by natural selection through interactions with dangerous snakes.

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KEYWORDS Cognition; aesthetic preferences; children; snake; colouration

Introduction

An appropriate reaction to animals enabled human ancestors to survive and increase their fitness. As a result, animals represent vital stimuli to us; we have been devoting an increased attention to animals over other stimuli (Lipp, Derakshan, Waters, & Logies, 2004; New, Cosmides, & Tooby, 2007). There is also evidence of the same processing efficiency (accuracy and speed) of animals and human faces (Rousselet, Macé, & Fabre-Thorpe, 2004). According to the 'biophilia' theory (Wilson, 1984), people also inherently tend to affiliate with other

CONTACT Eva Landová evalandova@seznam.cz

species. Moreover, humans likely possess an innate concept of structure within the animal world. Illiterate hunter-gatherers are able to name and categorize animal species in a very similar way as contemporary scientists (Berlin, 1992). Even three months old infants show category perception of animals (Eimas & Quinn, 1994). Moreover, four-year-old children already consider the internal properties of animals (e.g., the same bone structure, same type of brain, etc.) to be more important than the superficial ones (e.g., that they live in the same zoo) when deciding which animals belong to a specific taxon (Diesendruck, 2001). This subtle discrimination has been confirmed cross-culturally (Waxman, Medin, & Ross, 2007). Furthermore, Rhodes and Gelman (2009) demonstrate that just like adults, young children perceive animal categories as natural kinds (objective facts) instead of subjective conventions.

Humans are assumed to devote preferential attention to snakes over other objects, both adult respondents (e.g., Isbell, 2006; Öhman & Mineka, 2001; Soares, Lindström, Esteves, & Öhman, 2014) and children with little to no previous experience with real snakes (Hayakawa, Kawai, & Masataka, 2011; LoBue & DeLoache, 2008, 2011). However, this assumption has been criticized for methodological flaws by authors who brought evidence for an increased attention to animals in general (e.g., Lipp et al., 2004; New et al., 2007). Even 1–4-year-old children devote greater attention to both non-dangerous (hamsters, fish) and dangerous animals (snakes, spiders) than to inanimate toys (LoBue et al., 2013). Both children (Penkunas & Coss, 2013a, 2013b) and adults (Yorzinski, Penkunas, Platt, & Coss, 2014) detect dangerous animals (snakes and lions) faster than non-dangerous animals (lizards and antelopes). Nevertheless, snakes belong to the most feared animals both among adults (Arrindell, 2000; Davey, 1994) and children (DeLoache & LoBue, 2009; Morris, 1967; Prokop, Özel, & Uşak, 2009; Tomažič, 2011; but see Ballouard et al., 2013) and also present one of the most common causes of human phobias (Davey, 1995; Öhman & Mineka, 2003). The animal phobia observed among children enables a faster detection of the feared stimulus (Waters & Lipp, 2008) and triggers extreme behaviour that results in avoidance of the stimulus (King, Ollendick, Murphy, & Muris, 2000). Humans share this tendency to fear snakes with many primates, e.g., chimpanzees (Herzog & Burghardt, 1988), macaques (Cook & Mineka, 1989; Etting, Isbell, & Grote, 2014; Van Le et al., 2013, 2014), tarsiers (Gursky, 2005, 2006), or marmosets (Clara, Tommasi, & Rogers, 2008). Herzog and Burghardt (1988) explain ophidiophobia by the conditions of early humans in African savannas where it might have been difficult to quickly identify whether the encountered snake was venomous or not. Recently, large pythons still pose danger to people in rural Asia (De Lang, 2010) and Indonesia (Headland & Greene, 2011) and if there had not been iron weapons the number of fatalities would have been higher. Nowadays, children and women are more likely than men to die when attacked by a large constrictor.

Humans cross-culturally share not only the tendency to fear snakes, but also the aesthetic perception of snake species (Marešová, Krása, & Frynta, 2009). Landová, Marešová, Šimková, Cikánová, and Frynta (2012) reported that both of these emotions, i.e., fear of snakes and aesthetic perception of their beauty, can be evaluated independently from each other. Villagers from Papua New Guinea and Czech students ranked boa and python species according to the perceived beauty in a very similar way, irrespective of the fact that four of the tested species are distributed in Papua and people there are very likely experienced with them as much as with other snake species. Aesthetic preferences towards snakes shared by adults are interesting from an evolutionary, anthropological, and conservation point of view and bring up the question of whether they are formed during childhood or are perhaps innate. Even very young infants are known to prefer attractive animal faces to unattractive ones in a similar way that adults do (Quinn, Kelly, Lee, Pascalis, & Slater, 2008). Although preferences of animals change with age, snakes belong to the most 'hated' animals and this negative view of snakes becomes more evident as children get older (Morris, 1967). This is not surprising as snakes also present much greater danger for children than for adults (not only constrictor snakes, but also venomous snakes as the venom is more dangerous for children than adults because of children's smaller body size; Munro & Pearn, 1978). Thus, the aim of this study was to (1) quantify the preferences toward boas and pythons among pre-school children and adults and compare the two groups, and to (2) test the hypothesis that young children prefer smaller snakes compared to adults as the larger snakes pose greater danger to them.

Materials and methods

We chose boa and python species because they represent valid biological stimuli as they posed actual danger to humans and our primate ancestors (Headland & Greene, 2011). Moreover, they exhibit variance in their appearance and lack anthropomorphic features. There were 51 species and 5 subspecies of pythons and boas selected for the experiment (for a list, please see Table 1) covering 19 currently recognized genera with the only exception of Apodora (the single species *Apodora papuana* can be difficult to distinguish at first sight from *Liasis olivaceus*; the latter species was included). The species/subspecies were selected to cover the majority of natural variety in colouration and pattern within the taxa. The sample excludes other snake taxa in order to be able to reasonably compare related species.

To test beauty preferences, we used a standardized set of photographs. The majority of snakes were photographed under standardized light conditions with their bodies partially folded (cf. Frynta et al., 2011; Marešová & Frynta, 2008; Marešová et al., 2009). Some of the rare species' photographs were borrowed from books (Walls, 1998a, 1998b). We digitally set the pictures of snake bodies

Table 1. Arcsin-transformed mean ranks provided by children and adults (pooled blocks). Species are arranged according to the adults' preferences from the most to the least beautiful one; the lower the mean rank, the more preferred the species.

Species/subspecies	Children's mean ranks	Adults' mean ranks
*Python regius***	.721	.462
Epicrates cenchria	.648	.507
Python bivittatus	.663	.514
Python brongersmai	.796	.525
*Boa constrictor constrictor***	.855	.534
*Corallus caninus**	.781	.538
Eunectes murinus	.654	.541
*Broghammerus reticulatus***	1.014	.556
*Morelia viridis**	.600	.568
Eunectes noteus	.761	.581
*Gongylophis conicus***	.791	.599
*Acrantophis madagascariensis***	.904	.610
*Boa constrictor imperator**	.810	.645
Python molurus	.810	.648
Acrantophis dumerili	.804	.665
*Python sebae**	.820	.676
Aspidites ramsayi	.787	.685
Morelia boeleni	.995	.695
Python breitensteini	.843	.696
Candoia aspera	.825	.701
Lichanura trivirgata	.608	.726
Epicrates subflavus	.734	.737
Epicrates fordi	.948	.756
Gongylophis colubrinus	.806	.770
Liasis fuscus	.761	.778
Leiopython albertisii	.952	.779
Antaresia childreni	.884	.783
Gongylophis mueleri	.753	.786
Python anchietae	1.014	.789
*Charina bottae****	.403	.789
Epicrates anguilifer	.846	.792
Eryx miliaris	.732	.794
Aspidites melanocephalus	.735	.809
Corallus hortulanus	.729	.810
Sanzinia madagascariensis	.984	.837
Eryx tataricus	.814	.876
Boa constrictor occidentalis	.866	.883
Morelia spilota	.824	.893
Antaresia maculosa	.956	.896
*Epicrates maurus**	.760	.920
Broghammerus timoriensis	.868	.925
Epicrates striatus	.936	.926
Morelia amethistina	1.017	.928
Calabaria reinhardtii	.774	.930
Eryx jaculus	.809	.958
Liasis olivaceus	.968	.979
Candoia carinata	.896	.986
*Bothrochilus boa****	.742	.990
Eryx johni	.815	.999
Corallus cookii	.806	1.000
Epicrates gracilis	.082	1.018
*Corallus annulatus**	1.121	1.018
*Liasis mackloti**	.856	1.019
*Epicrates inornatus**	1.057	1.027
Candoia bibroni	.916	1.053
Liasis savuensis	.933	1.056

*Photographs presented in two copies (for details, please see methods).**species preferred more by adults than by children.***species preferred more by children than by adults.

on a black background, regardless their real size, and printed them in a 10 × 15 cm^2 format. The full set consisted of 56 standardized photographs of boas and pythons each representing a typical adult individual of its species. To allow the children to oversee and evaluate all species within a block at the same time (see below), we split the photographs into four separate blocks. Each of the blocks consisted of 14 unique species and two duplicates, which were included in other blocks as well. We added the duplicates so the blocks were more similar to each other, covering the wide morphological variability of the selected species. Moreover, we used the duplicates as controls to test whether the same species received similar ranks if included in different blocks. The ranks of the duplicates were fairly similar (Wilcoxon Matched Pair Test revealed that only *Epicrates inornatus* was ranked differently when evaluated in different blocks, $p < .001$). To avoid the problem of pre-determination of the last rank (zero degrees of freedom; see Frynta et al., 2011), one duplicate per block was removed before the analyses. Next, we calculated the mean ranks for each species. The remaining duplicates (including *E. inornatus*) were pooled.

Morphological traits of each species were measured from the photographs. Individual colours were extracted from the HSL colour-space using the Barvocuc software (for a detailed description of the extraction method the software uses, see Lišková, Landová, & Frynta, 2015) with the following angles defined for hues: red <350°, 26°; orange <26°, 45°; yellow <45°, 63°; green <63°, 170°; blue <170°, 270°; violet <270°, 315°; and rose <315°, 350°. No snakes possessed saturated red, orange, violet and rose colours: these hues corresponded to the brownish shades of the respective hues (reddish-brown, orange-brown, etc.). Presence of the blue hue corresponded to the iridescent-like glossy reflections on the snakes. Achromatic colours were defined from the HSL colour-space as follows: black (lightness <.25), white (lightness >.80), and gray (saturation <.20; see Lišková et al., 2015). The pattern complexity was defined as the proportion of contrasting patches on each picture, measured through an edge detection method (using Sobel operator, Sobel (1978); further referred to as edges). Moreover, standard deviations of lightness and saturation (further referred to as StD L and StD S, respectively), which reflect another aspect of the pattern complexity (change in lightness and saturation across the pictured snake), were included in the analyses despite their correlation with edges (StdL: $r^2 = 54\%$, StdS: $r^2 = 26\%$). Neck width (mm), maximum body width (mm) and the area of the photograph covered by the snake body (mm^2) were measured using the UTHSCSA ImageTool 3.0 (Wilcox, Dove, McDavid, & Greer, 2002). Quality of the photographs was evaluated by six independent respondents (coded 0 = medium quality, 1 = high quality). Ratio of the neck width to the maximum body width is further referred to as 'relative neck width.' Note that although the coiled position itself plays a crucial role in the detection of the snakes (Lobue & DeLoache, 2011), the influence of the body position (i.e., whether and how the snake body is folded) and intra-species variability on the respondents' preferences were tested in Marešová and Frynta (2008) and ruled out.

Our participants were undergraduate students of Charles University (15 males and 21 females; aged 21–33) and children from two nurseries (13 males and 26 females; aged 4–6). All of the adult respondents signed a written consent before participation. Parental approval was granted for each participating child. Because one of the authors was a part-time teacher in the nurseries during the course of the experiment, the children were familiar with the experimenter and participated in the project as a part of the lecture. Approval for this project was granted by the institutional ethical committee.

Photos of snakes have been successfully used in 'fear experiments' with children (e.g., LoBue & DeLoache, 2008; Waters & Lipp, 2008) and photographs proved to fully represent live snakes in both fear and beauty experiments (Landová et al., 2012). Four-year-old children are already able to recognize pictures as 2D representations of real objects (DeLoache & Burns, 1994), which is further facilitated by the frequent contact with pictorial stimuli (Bovet & Vauclair, 2000).

Each of the adult respondents evaluated all four blocks of photographs in a random order, one block at a time. Sixteen photographs were placed on a well-lit table in a random assemblage. The respondents were then instructed to sort the picture cards so that the 'most beautiful' species is on the top of the pack, the second 'most beautiful' is below, etc., until the last selected species at the bottom of the pack (see Marešová & Frynta, 2008 for more details). However, the children participants were unable to maintain attention necessary to rank all 16 species in a block. Thus, we modified the task for the children participants. The initial setting was similar to the adults' experiment, but we asked the children to rank the five most liked and five least liked species only. They were instructed: 'Please, pick up the most beautiful snake … then the second most beautiful …' up to the fifth one. The photos order was coded by numerals from 1 (the most beautiful one) to 5, further referred to as 'ranks'. Afterwards, the respondents repeated the task with the five least liked species, starting with the 'ugliest' one. These were coded by numerals from 16 (the 'ugliest') to 12. The six species that were not selected by the respondent were given a mean rank 8.5. All children respondents completed all four blocks in succession and they did not show any troubles when performing these modified tasks.

Agreement among the respondents was quantified by Kendall's coefficient of concordance as implemented in SPSS (Statistical Package for the Social Sciences), version 16.0. Prior to further analyses, the species ranks provided by individual respondents were divided by 16 and square-root arcsine-transformed to achieve a normal distribution and to increase the impact of the distribution tails, i.e., the species ranked as the most and least 'beautiful'. The variables showing a lognormal distribution (body area, neck width and maximum body width) were transformed by natural logarithm prior to the analyses. All

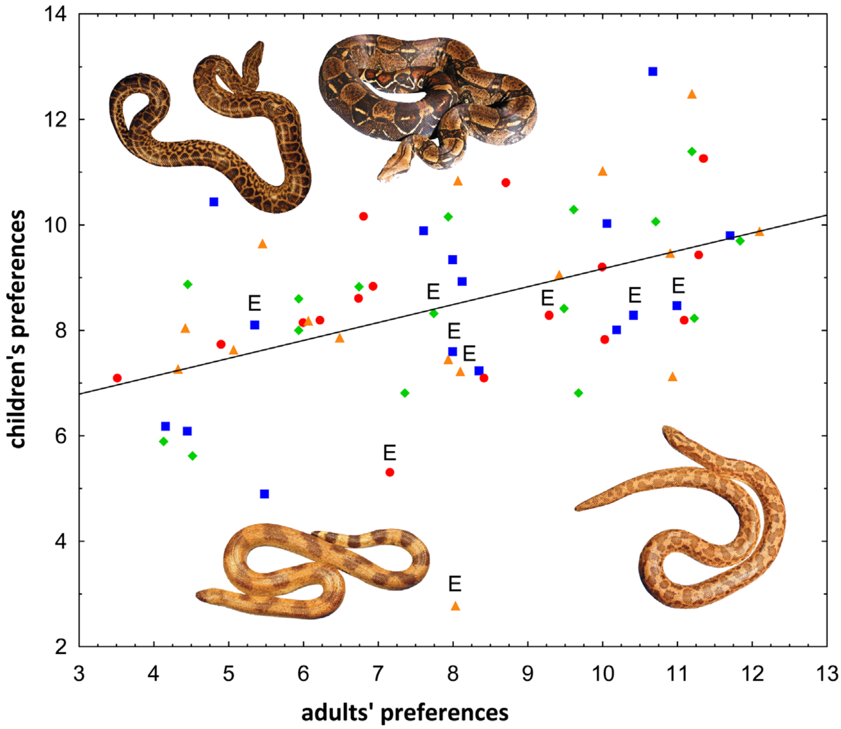

Figure 1. Relationship between beauty evaluation of adults and children. Axes show adults' and children's mean ranks of the species ($r^2 = .22$; $p < .001$); the lower number the more preferred species. Symbols and colours (■, ●, ▲, ◆) mark individual blocks of photographs. Photos above the fit line: *Eunectes noteus* and *Boa c.constrictor* – evaluated more positively by adults; below the line: *Eryx johni* and *Eryx jacculus* – preferred more by children. E – Sand boas (*Erycinae*). The outlier (C) is Rubber boa (*C. bottae*), which is preferred by children for its blue, glossy tint, but disliked by adults due to the absence of a distinct neck.

other calculations (MANOVA, Mann–Whitney U tests, Linear Models (LMs)) were performed in Statistica 6.0. (StatSoft, 2001).

Results

Congruence among the respondents

In order to quantify agreement among the respondents, we computed Kendall's coefficient of concordance (*W*; df = 15) separately for each combination of age and block. The results revealed that adult respondents agreed on which species were beautiful and which were ugly (*W* = .454, .380, .470, .408 for individual blocks of species, respectively; all $p < .001$). The congruence among children was also significant (*W* = .177, .103, .123, .225, all $p < .001$) and consequently, the

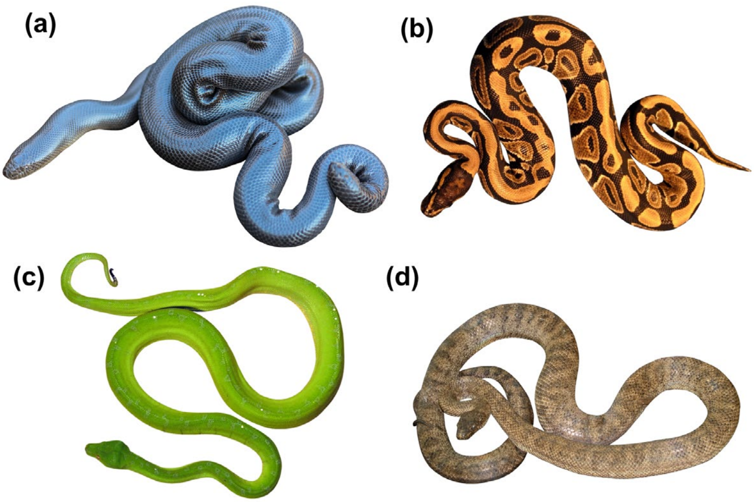

Figure 2. Illustration of snakes preferred or neglected by the children and adults: (a) Rubber boa (*C. bottae*), liked by children more than by adults for its blue, glossy tint (photo copyright Heather A. Stewart, used with a permission); (b) Ball python (*P. regius*), liked more by adults than by children; (c) Green tree python (*Morelia viridis*), liked by both children and adults; (d) Puerto Rican boa (*E. inornatus*), disliked by both children and adults.

mean preference ranks of each block covered comparable ranges of distribution, from approximately 4.6–12 (see Figure 1).

The effect of respondents' age and sex on their preferences

The species mean rank provided by adults and children can be seen in Table 1. Next, we performed a MANOVA to test the effects of respondents's age and sex. The preferences for snake species were marginally explained by age ($F_{54,18} = 2.73$; $p = .0109$) but not sex ($F_{54,18} = .73$; $p = .8151$) and their interactions ($F_{54,18} = 1.56$; $p = .1503$), which allowed us to pool the sexes in further analyses. Nevertheless, mean ranks provided by children and adults were significantly correlated in the pooled data ($n = 56$, $r_{\text{Spearman}} = .417$, $p = .001$; r_{Spearman} for particular blocks: .397, .450, .484 and .468; Figure 1).

To identify species that substantially contributed to the age differences, we performed Mann–Whitney *U* tests comparing the raw ranks of each species in children and adults; the levels of significance were Bonferroni-corrected. Among the 56 snake species, the children significantly differed in their preferences from adults in 7 cases. Children ranked *Charina bottae* and *Bothrochilus boa* better, whilst they ranked *Boa constrictor, Gongylophis conicus, Acrantophis madagascariensis, Broghammerus reticulatus,* and *Python regius* lower than the adults (see Figure 2). The analysis was based on the entire data-set including the pooled sexes. None of the Mann–Whitney *U* tests performed to assess the effect of sex yielded significant results for the ranks provided by the children, adults, or within the pooled data-set.

Explanation of relation between age differences and morphological traits of the species

The presence of colours (including gloss), pattern (edges, StD L, StD S), relative neck width, maximum body width, and quality of the photograph were adopted as explanatory variables in LMs to explain aesthetic preferences of adults and children. The full model explaining the adults' preferences accounted for 75.4% ($F_{8,47}$ = 18) of variance. The reduced model (70,3% of explained variance, $F_{6,49}$ = 19.35) included the colours green, gray, black and yellow, relative neck width, and Std L (lightness pattern, see above). Adults showed preferences towards animals of green and black colours ($F_{1,49}$ = 32.48, 12.85, respectively, both $p < .001$), with StD L (lightness pattern; $F_{1,49}$ = 61.16, $p < .001$) and with a relatively slim neck ($F_{1,49}$ = 5.01, p = .030). Grey-coloured species were disliked ($F_{1,49}$ = 32.48, $p < .001$) and the effect of yellow colour, present in minority of the snakes, was not significant. The presence of lightness pattern appeared to be the strongest predictor of adult preferences (accounted for 27% of variance in adult preferences). The reduced model explaining the children's preferences included green, purple, blue (glossy) and gray colours, StD L and maximum body width. The children preferred green snakes ($F_{1,49}$ = 10.18, p = .002) and snakes possessing glossy blue tint ($F_{1,49}$ = 21.19, $p < .001$). Similarly to the adults, they liked patterned snakes (Std L: $F_{1,49}$ = 16.09, $p < .001$) and disliked gray snakes ($F_{1,49}$ = 32.97, $p < .001$); but unlike adults, they preferred thinner snakes with lower maximum body width ($F_{1,49}$ = 8.66, p = .004). The effect of purple colour was not significant. The full and reduced models explained 65.1. and 60.8% of variance, respectively.

In order to interpret the differences, residuals of the regression of children to adults preferences were computed and further treated as a dependent variable in LMs. The full model (including the same predictors as the above models) revealed the effect of blue glossy colour, gray, black, and maximum body width on the residuals, and explained 65,5% of variance. According to the reduced model, which explained 56,9% of variance, the children preferred the blue glossy colour more than adults ($F_{1,50}$ = 17.37, $p < .001$) and disliked black snakes, which were preferred by adults ($F_{1,50}$ = 5.28, p = .026). The gray-coloured snakes were disliked by both age groups but children disliked them significantly more than adults did ($F_{1,50}$ = 14.23, $p < .001$). Moreover, children liked snakes with lower maximum body width ($F_{1,50}$ = 8.28, p = .006). The effect of purple colour could not be omitted from the reduced model but was revealed to be nonsignificant.

Discussion

Intra-group congruence, inter-group similarity and difference

Adult respondents are able to consistently rank quite a large number of species, even within a taxonomic group that shows limited variance of appearance (Marešová, Landová, & Frynta, 2009). In the present study, adults also reached a good congruence in their preferences. Agreement among pre-school children was much less pronounced but still significant in all four blocks. In light of the further evidence, such as very similar preferences of adults and children for the green colour of animals and a comparable range of mean ranks, we ascribe relatively low congruence among children to their limited abilities to perform the task (e.g., to look at all the pictures at the same time, or to maintain attention), rather than to the absence of a shared opinion on the snakes' beauty.

We found no relation of sex and the aesthetic preferences in any age group, although the sample was unbalanced as the large majority of the adult respondents were women. This could mask any possible effects of sex on human preferences towards snakes. However, this finding is in agreement with a study on adult preferences towards boas and pythons, in which no effect of sex on rankings was found (Marešová & Frynta, 2008). In contrast, sex differences have been repeatedly confirmed for colour preferences (e.g., Boyatzis & Varghese, 1994; Dittmar, 2001; Hurlbert, Ling, & Sweeting, 2003) and they also seem to be a ubiquitous element influencing human attitude to different taxonomic groups (Brown, 2002; Herzog, 2007; Herzog, Betchart, & Pittman, 1991). Particularly less attractive species tend to be evaluated relatively higher by males (Hills, 1993; Kellert, 1993).

Children and adults showed similar preferences towards snake species (Figure 1), although small systematic differences were revealed. The shared preference of green colour and dislike for gray-coloured snakes (low saturation) is in congruence with previous results showing that adults (Hemphill, 1996) and children (Boyatzis & Varghese, 1994) evaluate bright colours positively. It should be noted that children of this age already use colours symbolically, i.e., prefer particular ones to draw a positive figure and vice versa (Burkitt, Barrett, & Davis, 2003). According to Crozier (1997), green is one of the least favourite hues in children, which contradicts the results of this study. However, the majority of snakes included in the study possessed unsaturated shades of brown. Green was the only bright colour on the snakes included in the study in higher amount, thus, the children's preferences were likely a result of the animals' brightness. Also, both Crozier (1997) and Koleoso, Ehigie, and Akhigbe (2014) reported that achromatic colours, especially black, are less preferred by children, which is in agreement with our study, in which adults preferred black snakes more than the children did.

Aposematic colouration between beauty and fear

The contrasting (aposematic) colouration affects both the perception of beauty and fear in adult respondents. In king snakes, adult respondents ranked the highly colourful species possessing stripes of three colours (black, red, and either white or yellow) as both 'beautiful' and dangerous (Landová et al., 2012). However, when the evaluated set included pictures of one-coloured black snakes, these were evaluated as dangerous but not 'beautiful' and the correlation of ratings decreased. In contrast, unusually coloured species (such as the grey-banded king snake, *Lampropeltis alterna*, which possesses gray colour instead of yellow) were perceived as 'beautiful' but not dangerous. It is thus possible that the respondents' decisions are determined by factors which contribute to the evaluation of both emotions, but are not completely identical. Ranking of the aesthetic attractiveness of the species is not in principle connected to the perceived fear, which is, at least partially, evaluated separately.

Preference of children for harmless snakes

Presence of a pattern, in some cases highly structured and complex, seemed to be very important to both children and adults. The species with no pattern were evaluated lower, which is in agreement with human preferences for symmetry and high complexity of visual stimuli (Rentschler, Juttner, Unzicker, & Landis, 1999) and repetitive signals (Kenward, Wachtmeister, Ghirlanda, & Enquist, 2004). Similarly, the pattern complexity was found to be a significant factor determining the adults' preferences towards colourful passerine birds (Lišková et al., 2015). The adults demonstrably preferred snakes that had a relatively slim neck and thus distinctively defined head shape. In contrast, the children preferred thinner snakes with lower maximum body width. Such snakes usually also possess a less expressed shape of head, especially the sand boas (see Figure 1). This result is in agreement with the tested hypothesis and may have evolutionary relevance. The overall body width usually corresponds with the size of the snake. Although all the snakes were depicted on photographs of the same size regardless of the actual body size, the children's preference for small species and dislike for large ones is evident from the range of species that contributed to the age differences (for a list, please see the results). A few species of pythons and boas are large enough to ingest a child, but pose low threat to a full-grown adult, and we may speculate that young children tend to avoid large snake species, which is reflected in their low aesthetic preferences. Adult preference for 'proper snakes' with distinctive heads may be influenced by their ambivalent attitude towards large snakes as both predators (negative attitude) and prey (positive attitude; Greene, 1997) or by their symbolic meaning (Murphy & Henderson, 1997). Regardless of the attitude valence, human attention is attached to a subject with high emotional value more strongly than to a neutral subject and this attention is in turn reflected in the preference ranking.

Despite relatively low congruence among children and inverse preference for certain features of the snake's body shape, we found that a considerable component of aesthetic preferences is shared by both children and adults. It seems to support the theory that snakes/animals are exceptional aesthetic stimuli for humans and/or we develop the aesthetic preference towards them early during childhood. However, there is an alternative explanation that these preferences exist irrespective of the nature of evaluated objects. To distinguish between these hypotheses, sets of stimuli of contrasting biological relevance to humans should be used.

It was previously shown that the perception of beauty of snake species is highly consistent across distant cultures (Frynta et al., 2011; Marešová et al., 2009). Our results further support the theory that humans inherently share not only attachments to certain taxonomic groups, but also aesthetic preferences towards different animals on a finer taxonomic scale. Such a simple fact may have considerable implications. Affective factors play an important role in the conservation of biodiversity (Marešová & Frynta, 2008; Metrick & Weitzman, 1996, 1998; Samples, Dixon, & Gowen, 1986), and we are more willing to protect and invest in species that we like (Gunnthorsdottir, 2001; Martín-López, Montes, & Benayas, 2007). Concerning the studied boid snakes, the number of individuals of particular species kept in zoos worldwide highly correlates with human preferences, but not with the specie's rarity or conservation status (Marešová & Frynta, 2008). Our preferences are likely to shape the composition of the future biota, and thus should be further explored and considered in educational and conservational decisions.

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Disclosure statement

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