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Engaging Zoo Visitors at Chimpanzee (*Pan troglodytes*) Exhibits Promotes Positive Attitudes Toward Chimpanzees and Conservation

Lesley E. Craig and Sarah-Jane Vick

Department of Psychology, University of Stirling, Stirling, UK

ABSTRACT

Understanding how visitor engagement with interpretation impacts on their attitudes to conservation is necessary to develop effective zoo-based conservation education. We examined whether facilitating an emotional connection between a visitor and an individual chimpanzee (*Pan troglodytes*) was more successful at enhancing attitudes than standard zoo interpretation. Attitudes were assessed post visit using a 12-item questionnaire on predisposition toward nature, attitudes to chimpanzees, and conservation. Visitors at two chimpanzee exhibits were allocated to an emotion enhancement condition ($n = 227$) or a control condition ($n = 203$). At one exhibit, visitors were also allocated to an interactive task (location) without emotional enhancement ($n = 69$). Participants were also recruited to an online control condition ($n = 216$). Principal component analyses identified two components labeled as Naturalistic, which refers to interest and affection for wildlife and nature, and Humanistic, which refers to interest and affection for individual animals or species with anthropomorphic characteristics. At one exhibit, both Naturalistic and Humanistic attitudes were significantly more positive following the emotion enhancement condition than for the control condition. At the other exhibit, Naturalistic and Humanistic components did not differ between conditions, and there was no overall difference between online and on-site conditions. While emotional enhancement may be effective in promoting pro-conservation attitudes, this is dependent on contextual factors (e.g., exhibit design and interpretation). Attitudes were also influenced by stable visitor characteristics (pet ownership and zoo membership) and are therefore likely to prove difficult to change, at least during a single zoo visit. Visitor and animal characteristics, and the interpretation of the exhibit all shape the visitor experience; understanding these interactions is important in facilitating effective zoo conservation education.

KEYWORDS

Attitudes; conservation; emotion; exhibit interpretation; human–animal interaction; zoo visitor

As human populations continue to grow, the impact on wildlife and their habitats has dramatically increased. The main threats to biodiversity are attributable to human activity

CONTACT Lesley E. Craig lesleyelizabeth.craig@stir.ac.uk Department of Psychology, University of Stirling, Cottrell Building, 3B100, Stirling FK9 4LA, UK

and climate change (Semper-Pascual et al., 2018). Conservation is complex and often involves a holistic approach using both *in-situ* and *ex-situ* techniques: for example, long term collaborations between zoos, engaged in captive breeding programs and/or housing animals in zoos for research and public awareness (e.g., Myers et al., 2004; Powell & Bullock, 2014), and field-conservation projects (Breuer et al., 2018). An increased awareness of how humans' impact on the environment has led to the emergence of the field of conservation psychology, which aims to improve understanding of human behaviors and attitudes and promote care for nature (Clayton & Myers, 2009).

Zoos often have a legal requirement to promote education and awareness to the conservation of biodiversity (e.g., European Union Council Zoo Directive, 1999/22EC). Adherence to professional standards for both the provision and evaluation of conservation education is also required for accreditation by relevant zoo organizations (e.g., Conservation Education Standards, European Association of Zoos and Aquariums, 2016). Given this context, educating visitors about biodiversity and promoting conservation awareness is a key priority for many zoos (Roe et al., 2014), although it is more difficult to assess whether zoos are also effectively monitoring the impact of their conservation education efforts. However, there is growing evidence that zoos can have a positive impact on visitors' conservation awareness. For example, zoo visitors' understanding of biodiversity increased between pre-visit (70%) and post-visit (75%), as did their ability to identify actions to help protect biodiversity (e.g., recycling phones; 51% pre-visit to 59% post-visit; Moss et al., 2015).

However, there is limited research on the factors that determine the impact of a zoo experience on visitor behavior and attitudes (Lukas & Ross, 2014; Marino et al., 2010). Characteristics of the visitor (gender, age, or personality), characteristics of the animals (species, or levels of activity), and the interpretation available at an exhibit are all likely to shape the visitor experience and their engagement with conservation education (Fraser et al., 2009; Roe & McConney, 2015). Most zoo visitors state their motivation for visiting as being for either recreation or entertainment rather than identifying learning as a primary goal (Ballantyne & Packer, 2016; Reade & Waran, 1996), indicating that emotional experience rather than knowledge acquisition is likely to be a key component of zoo visitor engagement (Powell & Bullock, 2014).

The emotional experience of zoo visitors can be an important factor in positively influencing conservation learning (Falk & Gillespie, 2009; Myers et al., 2004; Smith et al., 2008). For example, higher levels of enjoyment of events at an aquarium were associated with visitors' enhanced recall of information about species conservation (Adelman et al., 2000). In support of the hypothesized link between emotional experience and conservation attitudes and behavior, Swanagan (2000) reported that zoo visitors were more likely to donate to elephant conservation if the experience of watching the elephants was perceived as emotionally engaging.

Zoo visitor emotional responses vary according to species, activity level of the animal, and the visitor–animal connection (Myers et al., 2004). Myers et al. (2004) asked zoo visitors to rate their emotional responses (e.g., respect or fear) and found more positive emotion and a stronger sense of connection to a gorilla than an okapi, with almost no emotional response or connection to a snake. These results provide some support for the "similarity principle," which proposes that humans attend more to animals who they consider to be like themselves, (Colleony et al., 2017; Plous, 1993). The enhanced emotional response and stronger sense of connection to the gorilla also supports the

use of charismatic flagship species, commonly large bodied mammals, to support conservation efforts (Howell et al., 2019; Skibins et al., 2017)

A positive sense of connection to nature is also associated with more pro-environmental attitudes, motivation to engage in sustainable behaviors, and increased concern about anthropogenic factors (Nisbet et al., 2009). In the zoo context, Powell and Bullock (2014) found that visitors' predispositions toward nature and conservation correlated with stronger emotional connections at three exhibits (tigers, African wild dogs, and hyenas). Emotional responses were also enhanced by the provision of enrichment to stimulate the carnivores' natural behaviors (Powell & Bullock, 2014). However, because all measures were collected post visit and there was no control condition, it remains unclear whether perceived emotional connection serves to enhance conservation mindedness or vice versa. Overall, previous evidence suggests that a zoo visit can increase awareness of conservation issues (Hayward & Rothenberg, 2004) and that emotional responses to animals also influence conservation learning and attitudes (Luebke et al., 2016; Myers et al., 2004; Powell & Bullock, 2014; Swanagan, 2000).

Participant characteristics are also likely to shape both visitor experiences and potential impact on their conservation attitudes. There is considerable variation in people's knowledge of and attitudes toward animals and the environment. For example, in a large scale survey of adults in the USA, Kellert (1979) described seven distinct categories; in decreasing prevalence these were Humanistic (interest/affection for individual animals e.g., pets), Moralistic (opposition to cruelty of animals), Negativistic (avoidance of animals due to fear or indifference), Utilitarian (concern for the practical value of animals and their habitats), Ecologistic (concern for the interrelations between wildlife and their habitats), Naturalistic (interest/affection for wildlife), and Dominionistic (interest in controlling animals). The prevalence of these different attitudes was also found to differ between genders (Kellert & Berry, 1987), and zoo visitor studies have also reported stronger emotional responses in females than males (Myers et al., 2004; Powell & Bullock, 2014). Age effects have also been reported: for example, zoo visitors over 50 years old performed better than younger visitors on post visit knowledge tasks (Lukas & Ross, 2005).

Other factors such as the experience of pet keeping in childhood may lead to more positive and empathetic attitudes to animals and humans in early adulthood (Paul & Serpell, 1993), although the relationship between demographic variables and attitudes reported was small. Personality may also be important because it influences beliefs, values, attitudes, knowledge, and emotion. For example, Milfont and Sibley (2012) assessed the "Big Five" dimensions (Neuroticism, Extraversion, Agreeableness, Conscientiousness, and Openness; Costa & McCrae, 1992) and found that Agreeableness and Conscientiousness were positively associated with environmental engagement and pro-environmental attitudes.

This study examined whether promoting an emotional connection influenced visitor attitudes and behavior. We predicted that a connection to an individual chimpanzee would enhance positive attitudes to conservation and chimpanzees, when compared with a control condition at the same exhibit, and that zoo visitors overall would have more positive attitudes than an online control group. Participants' characteristics, including gender, age, personality, and pet owning, were also considered. Finally, we evaluated the convergent validity of our questionnaire measure in relation to relevant behavior and intentions by examining whether visitor attitudes were associated with current or

potential affiliation with conservation organizations or willingness to make a hypothetical donation to a conservation cause.

Methods

This study adheres to the ethical standards of The British Psychological Society (2009), and ethical approval was granted by the University of Stirling's Psychology Ethics Committee and by the research coordinators at the two facilities. Specifically, informed consent was sought; all participants were provided with information regarding the requirements and duration of participation and informed of their right to withdraw at any stage.

Participants

A total of 715 participants (293 females and 422 males) aged between 18 and 70 years were recruited. Participants were visitors to Blair Drummond Safari Park's (BDSP) Chimpanzee Island boat tour ($n = 302$, 116 females and 186 males, age $M = 41.3$, $SD = 16.1$) and visitors to Budongo Trail at Edinburgh Zoo (BTEZ; $n = 197$, 81 female and 116 males, age; $M = 29.2$, $SD = 12.3$). Between two and four visitors on a given boat tour at BDSP (July 2013 – September 2013) and approximately every third visitor at BTEZ (November 2013 – March 2014) were approached and invited to participate in a short study, approximately 10 min in duration. Online participants ($n = 216$, 96 female and 120 males, age; $M = 27.1$, $SD = 10.2$) were recruited via advertisements on the university website and via social media (January 2014 – April 2014), seeking participants for an online study investigating attitudes to chimpanzees and conservation. The age category of participants (18–25, 26–35, 36–45, 46–55, 56–65, 66+) was estimated by the researcher at both exhibits but online participants entered their own age.

Locations

Blair Drummond Safari Park (BDSP): There are five chimpanzees (1 male) housed at BDSP, in two off-exhibit indoor areas ($180m^2 \times 100m^2$) with outdoor access to an island (approximately 400 m in circumference). Visitors can take a 20-min boat trip around the island to view the chimpanzees. Interpretation providing basic information (e.g., natural habitat and diet) is available to view while waiting at the landing stage. During the tour, keepers deliver a short presentation explaining species characteristics, current threats to chimpanzee conservation, and basic demographic information on the group including some details of their individual histories.

Budongo Trail at Edinburgh Zoo (BTEZ): There are three interconnected indoor enclosures (each 120 m^2) and access to an outdoor enclosure (1832 m^2). Each of the enclosures has viewing windows where visitors can observe 18 chimpanzees (eight males). Within the visitor area, voluntary educational officers are often present and the interpretation available includes interactive and touch displays, including information about chimpanzees and their conservation, with visitors also encouraged to donate to a partner field site.

Procedure

Online: Participants completed a 12-item questionnaire on their attitudes to conservation and chimpanzees and were also asked to indicate their dominant personality trait and pet-owning status. To examine the relationship between attitudes and behavior, online participants ($n = 216$) were also asked about their membership status for the zoo and other conservation organizations, and whether they would consider joining such organizations in the future.

BDSP: After the keeper presentation, participants in the Control condition ($n = 141$) were asked to complete the same 12-item attitudes questionnaire as Online participants. Participants allocated to the Emotion Enhancement condition ($n = 161$) were shown a laminated card with a list of attributes associated with the "Big Five" traits (Costa & McCrae, 1992). Visitors were asked to identify which of the following best described their own dominant personality trait: Neuroticism (Vulnerable, Anxious), Extraversion (Excitable, Sociable), Agreeableness (Affectionate, Trusting), Conscientiousness, (Organized, Thoughtful), or Openness to Experience (Curious, Adventurous). Participants were then assigned an individual chimpanzee that was the same gender and scored highly on their selected trait (previously assessed using the Hominoid Personality Inventory, Weiss et al., 2007; Herrelko, 2011; Unpublished data obtained from BDSP, 2013). Participants were provided with a laminated A4 card with a clear frontal photograph, with the personality trait labeled for an individual chimpanzee (e.g., "Agreeableness: Your chimpanzee is called Rosie, she is affectionate and trusting – just like you!"). Participants were asked to observe their allocated chimpanzee for up to five minutes and fill in a simple data sheet to record behavior (such as grooming, playing, resting, or eating), they then completed the questionnaire.

BTEZ: Participants in the Emotion Enhancement condition ($n = 66$) and Control condition ($n = 62$) followed the same procedure as those described at BDSP, but a third condition was added to control for the influence of participation in an interactive task while in the exhibit. Participants allocated to the Location condition ($n = 69$) were asked to record the location of all visible chimpanzees on a schematic diagram of their enclosures. BTEZ participants ($n = 413$) were also asked if they were current zoo or other conservation organization members and whether they were motivated to join in the future. Finally, a behavioral measure was introduced following questionnaire completion for a subset of BTEZ visitors ($n = 126$). Three buckets were placed on the floor and participants could donate between £5 and £10 to chimpanzee conservation or Scottish wildcat conservation (which was an active campaign at BTEZ during data collection) or donate to neither, and each participant was given a tennis ball to indicate their choice of donation.

Materials: Questionnaire

A short 12-item Likert scale questionnaire was adapted from two scales used to measure zoo visitor attitudes (Lukas & Ross, 2005) and sense of connectedness to nature (Nisbet et al., 2009). The Lukas and Ross (2005) questionnaire comprised 28 items, which loaded onto six factors (Naturalistic, Ecologistic, Moralistic, Negativistic, Utilitarian, Dominionistic, and Humanistic), based on similarity to Kellert's (1979) classifications. Seven items were selected which seemed to be most appropriate to assess attitudes to chimpanzees.

Nisbet et al.'s (2009) 30-item scale assesses three factors relating to perceived relationship to the natural world; affective, cognitive, and physical. As the primary aim of the current study was to explore emotional connection, three items were adapted from the affective component, and one each from the cognitive and experiential components. Participants rated their level of agreement or disagreement with each of the statements on a 5-point Likert scale (5 = Strongly Agree, 4 = Agree, 3 = Neither Disagree nor Agree, 2 = Disagree, 1= Strongly Disagree); six of the items were positive and six were negative in relation to animals and conservation (see Table 1).

Statistical Analysis

All negative items were reverse scored to facilitate interpretation of components. Principle component analysis was used to identify a reduced number of uncorrelated variables, and the mean scores for those items loading on to each of the extracted components were calculated, to simplify the interpretation of scores in relation to the Likert scale used by participants. Actual (online participants) and estimated (zoo visitor) ages were grouped into three categories: 18–25, 26–45, and over 45 years old.

Nonparametric analyses were chosen because the data did not meet the assumptions of normality and samples sizes were often unequal. Kruskal–Wallis *H* tests were used to examine differences in the distribution of scores across conditions, age groups, and personality traits, with post-hoc pairwise comparisons conducted using Mann–Whitney *U* tests with Bonferroni correction. Mann–Whitney *U* tests were also used to identify differences in relation to gender and pet-owning status.

For BTEZ and online participants, we also examined whether self-reported attitudes were consistent with related behaviors and intentions. Kruskal–Wallis *H* tests were used to compare ratings between current, potential, and non-members of the zoo, and this was repeated in relation to other conservation organizations. A chi-square test was

Table 1. Questionnaire on attitudes to chimpanzees and conservation, with a summary of PCA (varimax) two component solution. The highest component loading for each item is highlighted in bold.

Questionnaire Item	Mean Score (*SD*)	Naturalistic	Humanistic
I take an interest in wildlife wherever I am[a]	4.04 (0.79)	**0.710**	0.298
I support the use of animals for experimental medical research that benefits humans*[b]	3.85 (0.83)	**0.703**	–0.80
I always think about how my actions affect the environment[a]	3.82 (0.81)	**0.671**	0.096
I would prefer to watch a documentary about chimpanzees in the wild than see them in the zoo*[b]	3.79 (0.87)	**0.647**	–0.055
Some species are just meant to die out or become extinct*[a]	3.83 (0.85)	**0.355**	0.247
I am confused about what is good and what is bad for the environment*[b]	3.34 (1.14)	–0.099	**0.652**
I am very interested in learning about the social lives of chimpanzee groups[b]	4.25 (0.75)	0.211	**0.638**
I think zoos can play an important role in education and conservation[b]	4.31 (0.70)	0.151	**0.591**
I dislike the smell of chimpanzees*[b]	3.73 (1.20)	–0.058	**0.464**
I am very aware of environmental issues[a]	3.90 (0.73)	0.393	**0.430**
I do not think chimpanzees are entertaining to watch*[b]	4.10 (1.04)	0.031	**0.267**
I think a lot about the suffering of animals[a]	3.35 (0.88)	0.081	**0.208**

*Indicates reflected items.
[a]from Nisbet et al. (2009)
[b]from Lukas and Ross (2005).

used to examine the frequency of choices on the donation task. Finally, we used a Mann–Whitney *U* test to compare the ratings of participants who chose to make a donation on the behavioral task with those who did not. Effect sizes were calculated as Cohen's *d* (Cohen, 2008), with 0.2, 0.5, and 0.8 considered as small, medium, and large effect sizes, respectively. All analysis was conducted in SPSS version 25.

Results

Principle Component Analysis (PCA)

Given the exploratory nature of the analyses, a PCA with orthogonal rotation (varimax) was conducted on the 12 items from the questionnaire. The Kaiser–Meyer–Olkin (KMO) measure (0.70) verified the sampling adequacy and all KMO values for individual items were > 0.56 and considered acceptable (> 0.5; Field, 2009). Bartlett's test of sphericity ($\chi^2_{(66)} = 1028.329$, $p < 0.001$) indicated correlations between items were acceptable. A Parallel Analysis indicated the first three components (explaining 43.9% of the variance) had eigenvalues that exceeded chance levels, but a scree plot suggested only the first two components be retained (component 1; 22.3%, component 2; 11.8%, together explaining a total of 34.2% of variance).

The interpretation of item loadings for the two-and three-component solutions indicated a two-component solution was the most appropriate (Table 1). The two components were labeled in relation to broad similarities to Kellert's (1979) classification of attitudes to animals and the environment. Component 1 resembled Naturalistic attitudes, which refers to interest and affection for wildlife and nature, and Component 2 resembled Humanistic attitudes, which refers to interest and affection for individual animals: for example, pets, and animals that have anthropomorphic characteristics, such as chimpanzees.

Condition

There was no overall effect of online versus on-site data collection on the Naturalistic component (both $Mdn = 4.00$, $IQR = 3.60–4.20$; $Z = 0.95$, $n = 715$, $p = 0.343$, $d = 0.07$). However, the distribution of scores on this component differed between conditions ($H_{(5)} = 16.22$, $n = 715$, $p = 0.006$, $d = 0.25$; see Figure 1). Post-hoc comparisons indicated that BDSP scores were higher in the Emotion condition ($Mdn = 4.00$. $IQR = 3.60–4.40$) than in the Control condition ($Mdn = 3.80$, $IQR = 3.40–4.00$; $Z = 3.50$, $n = 302$, $p < 0.007$, $d = 0.41$). Scores were also higher in the Location condition at BTEZ ($Mdn = 4.00$, IQ range 3.60–4.20) than for the Control condition at BDSP ($Z = 3.05$, $n = 210$, $p = 0.035$, $d = 0.43$).

For the Humanistic component, there was no overall difference between Online ($Mdn = 3.83$, $IQR = 3.50–4.13$) versus on-site participants ($Mdn = 3.83$, $IQR = 3.50–4.17$; $Z = 1.74$, $n = 715$, $p = 0.082$, $d = 0.13$). However, there was a significant difference in scores across conditions ($H_{(5)} = 34.57$, $n = 715$, $p < 0.001$, $d = 0.42$; see Figure 2). At BDSP, Control scores were lower ($Mdn = 3.67$, $IQR = 3.33–4.00$) than the Emotion condition ($Mdn = 3.83$, $IQR = 3.67–4.17$; $Z = 4.42$, $n = 302$, $p = 0.001$, $d = 0.53$). BDSP Control scores were also lower than all three conditions at BTEZ: Control ($Mdn = 3.83$, $IQR = 3.50–4.17$; $Z = 3.22$, $n = 203$, $p = 0.02$, $d = 0.46$); Location ($Mdn = 4.00$, $IQR = 3.67–4.33$; $Z = 4.42$, $n = 210$,

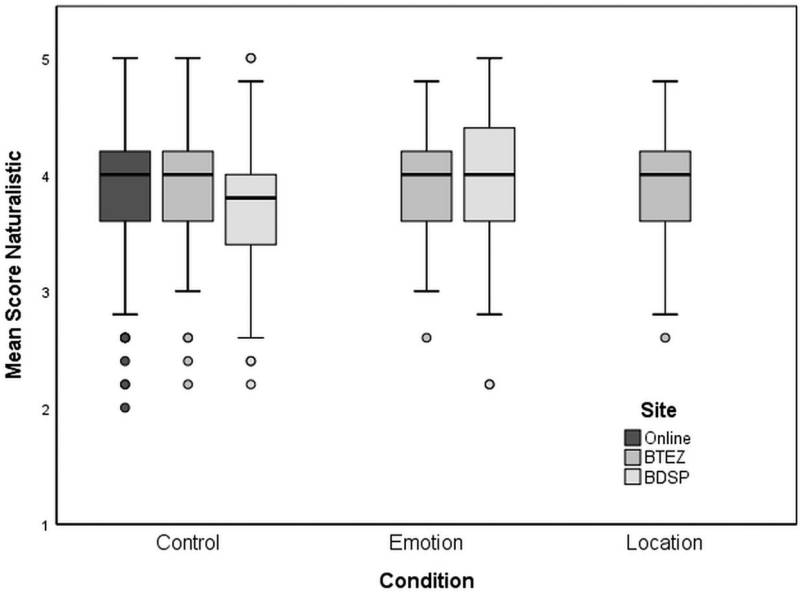

Figure 1. Box plot illustrating the mean scores for each condition for Naturalistic attitudes. The median line shows the mid-point of the data, the whiskers represent the *SD*, and the small circles indicate outliers.

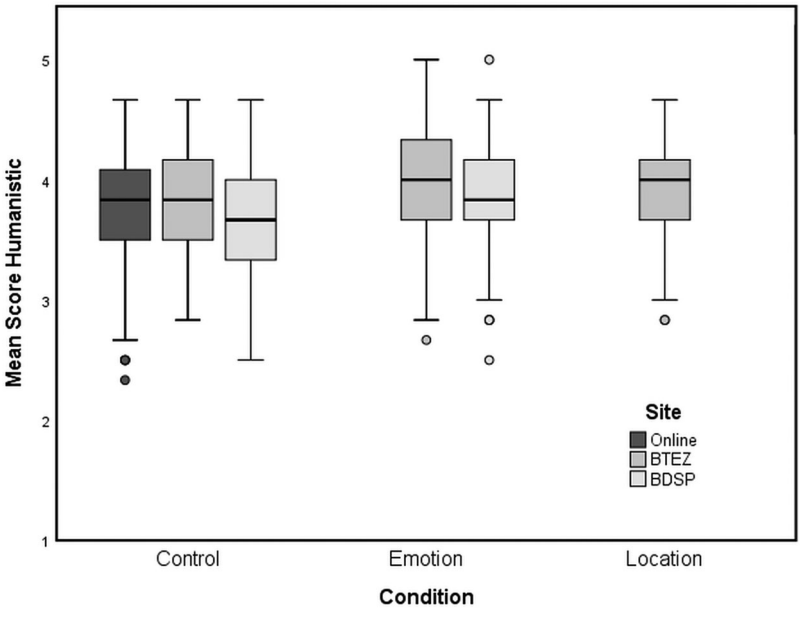

Figure 2. Box plot illustrating the mean scores for each condition for Humanistic attitudes. The median line shows the mid-point of the data, the whiskers represent the *SD*, and the small circles indicate outliers.

$p < 0.001$, $d = 0.64$); Emotion ($Mdn = 4.00$, $IQR = 3.67–4.33$; $Z = 4.18$, $n = 207$, $p < 0.001$, $d = 0.61$). There was no difference between the three conditions at BTEZ ($ps > 0.05$).

Participants' Characteristics

Ratings on the Naturalistic component were higher for those with pets than without ($Z = 4.69$, $n = 713$, $p < 0.001$, $d = 0.36$), but were not influenced by gender ($Z = 0.714$, $n = 715$, $p = 0.475$, $d = 0.05$), age ($H_{(2)} = 4.24$, $n = 711$, $p = 0.120$, $d = 0.11$) or dominant personality dimension ($H_{(4)} = 7.84$, $n = 715$, $p = 0.097$, $d = 0.15$; see Table 2). Similarly, those with pets generally had higher ratings on the Humanistic component than those without ($Z = 3.34$, $n = 713$, $p = 0.001$, $d = 0.25$), but there was no influence of gender ($Z = 1.53$, $n = 715$, $p = 0.125$, $d = 0.12$), age ($H_{(2)} = 0.06$, $n = 711$, $p = 0.972$, $d = 0.11$) or personality dimension ($H_{(4)} = 4.06$, $n = 715$, $p = 0.398$, $d = 0.02$).

Behavior and Intentions

There was an association between zoo membership status ratings (either member, not a member, or consider joining) for both the Naturalistic ($H_{(2)} = 7.53$, $n = 413$, $p = 0.023$, $d = 0.23$) and Humanistic components ($H_{(2)} = 7.34$, $n = 413$, $p = 0.026$, $d = 0.23$; see Table 2). Being a zoo member was associated with higher ratings on the Naturalistic component than non-members ($Z = 2.60$, $n = 378$, $p = 0.028$, $d = 0.27$), while considering becoming a member was not ($Z = 1.34$, $n = 307$, $p = 0.180$, $d = 0.15$). Similarly, for the Humanistic component, zoo members differed from non-zoo members ($Z = 2.69$, $n = 378$, $p = 0.021$, $d = 0.28$), but potential and non-members did not differ ($Z = 0.91$, $n = 307$, $p = 1.00$, $d = 0.10$). In contrast, membership status for other conservation organizations was not

Table 2. Median scores on Naturalistic and Humanistic components according to gender, age, personality, pet owning, and organization membership status.

	Category (*n*)	Naturalistic *Mdn (IQR)*	Humanistic *Mdn* (*IQR*)
Gender	Male (422)	4.00 (3.60–4.20)	3.83 (3.50–4.17)
	Female (293)	4.00 (3.60–4.20)	3.83 (3.50–4.17)
Age	18–25 (264)	4.00 (3.60–4.20)	3.83 (3.50–4.17)
	26–45 (257)	4.00 (3.60–4.20)	3.83 (3.50–4.17)
	45+ (190)	4.00 (3.60–4.20)	3.83 (3.50–4.17)
Personality	Extraversion (278)	4.00 (3.60–4.20)	3.83 (3.50–4.17)
	Conscientiousness (157)	4.00 (3.60–4.20)	3.83 (3.50–4.17)
	Agreeableness (132)	4.00 (3.40–4.20)	3.83 (3.54–4.17)
	Openness (88)	3.90 (3.60–4.00)	3.83 (3.50–4.17)
	Neuroticism (60)	4.00 (3.65–4.40)	3.83 (3.50–4.33)
Pet Owner	Yes (250)	4.00 (3.60–4.40)	3.92 (3.50–4.17)
	No (463)	4.00 (3.60–4.20)	3.83 (3.50–4.00)
Zoo Member	Yes (106)	4.00 (3.60–4.40)	4.00 (3.67–4.33)
	Maybe (35)	4.00 (3.40–4.40)	3.83 (3.33–4.17)
	No (272)	4.00 (3.60–4.20)	3.83 (3.50–4.17)
Other Member	Yes (90)	4.00 (3.60–4.20)	3.83 (3.50–4.21)
	Maybe (111)	4.00 (3.60–4.20)	3.83 (3.50–4.17)
	No (212)	4.00 (3.60–4.20)	3.83 (3.50–4.17)
Donation[a]	Yes (104)	4.00 (3.80–4.20)	4.00 (3.67–4.33)
	No (22)	4.00 (3.55–4.25)	3.67 (3.50–4.04)

[a]Indicates those who donated to either chimpanzee or Scottish wildcat conservation.

associated with ratings on either the Naturalistic ($H_{(2)} = 1.18$, $n = 413$, $p = 0.556$, $d = 0.09$) or Humanistic component ($H_{(2)} = 0.19$, $n = 413$, $p = 0.943$, $d = 0.13$).

A majority of visitors (BTEZ only) chose to make a donation toward chimpanzee conservation ($n = 93$, 74%), compared with Scottish wildcat conservation ($n = 11$, 9%) or not making any donation ($n = 22$, 17%; $\chi^2_{(2)} = 94.33$, $n = 126$, $p < 0.001$, $d = 3.45$). However, there was no difference in the likelihood of participants choosing to donate to chimpanzee conservation across the three conditions Control (63%), Location (74%) and Emotion (83%; $\chi^2_{(2)} = 3.94$, $p = 0.140$, $d = 0.37$).

Finally, those who chose to make a donation to either cause had higher ratings on the Humanistic component than those who did not make any donation ($Z = 2.04$, $n = 126$, $p = 0.041$, $d = 0.37$), but there was no difference for the Naturalistic component ($Z = 1.18$, $n = 126$, $p = 0.239$, $d = 0.21$).

Discussion

We identified two components reflecting Naturalistic and Humanistic attitudes toward chimpanzees and conservation (Kellert, 1979). Our measure selected a few items from two longer questionnaires one specific to zoo visitors and attitudes toward great apes, also interpreted in relation to Kellert's (1979) classification (Lukas & Ross, 2005), and the other assessing connectedness to nature, including cognitive, physical and affective aspects (Nisbet et al., 2009). Our results are broadly consistent with those of Kellert (1979) and Lukas and Ross (2005) in identifying Naturalistic as the most prevalent attitude, and one which describes a general interest and affection for wildlife and nature. Our Humanistic component reflects affection for individual animals (Kellert, 1979; Lukas & Ross, 2005) and maps onto affective aspects of our relationships to nature (Nisbet et al., 2009). Lukas and Ross (2005) did not identify Humanistic attitudes, despite including items they expected to load onto this component. For example, the item on whether chimpanzees are entertaining to watch loaded onto their Dominionistic component, but this item loaded onto the Humanistic component in our analysis. Individual items did not always consistently load onto the same factors as in the previous studies using the full measures. For example, two similar items on environmental awareness and self-efficacy in taking actions, adapted from Nisbet et al.'s (2009) affective component, loaded on to different components in our analysis. The development and use of standardized measures in evaluating visitor attitudes would facilitate direct comparisons, but these should not be too onerous so as to negatively impact the visitor experience.

The primary aim of this study was to explore whether facilitating an enhanced emotional engagement in zoo visitors could influence their attitudes toward chimpanzees and conservation. While previous research has suggested emotional responses to animals could be an important factor in enhancing zoo visitor conservation attitudes, as far as we are aware our study is the first to have attempted to directly manipulate the level of emotional connection at the zoo. The basis for the emotion enhancement condition was the "similarity principle," which suggests similarity positively influences attitudes and perception of species, and can strengthen emotional bonds and create a sense of identity with them (Gunnthorsdottir, 2001; Jacobs, 2009; Plous, 1993). Additionally, assigning a name to an animal has been shown to improve knowledge retention (Newberry et al., 2017). Our results indicate that while promoting a sense of connection to

an individual chimpanzee resulted in significantly more positive Naturalistic and Humanistic attitudes at BDSP, there were no differences between conditions at BTEZ and there was no overall difference between online and on-site conditions. The results from BDSP support previous research that suggests a trip to the zoo can enhance conservation attitudes (Moss et al., 2015), and emotional responses toward animals are likely to be a key factor in conservation learning (Hayward & Rothenberg, 2004; Luebke et al., 2016; Luebke & Matiasek, 2013; Myers et al., 2004; Myers & Saunders, 2002; Powell & Bullock, 2014).

At BTEZ, the lack of differences between conditions for either component indicates either that their visitors generally have more positive attitudes to chimpanzees and conservation than at BDSP, or the Control condition at BTEZ is already effective in promoting positive attitudes. Increased animal activity has been found to enhance positive visitor experiences in zoos (Altman, 1998; Anderson et al., 2003), and it is feasible that the size and social composition of the two chimpanzee groups resulted in visitors experiencing different levels of animal activity. The overall pattern of results across all conditions suggests that enhancing a sense of emotional connection is likely to be most effective in targeting individuals who do not already have strongly positive attitudes, and the effect size is moderate. However, a within-participant design, using pre and post visit assessments (e.g., Moss et al., 2017), would be required to ascertain whether between site differences are due to visitors' baseline attitudes, variation in animal activity, the relative efficacy of interpretation at the exhibits, or a combination of these factors. Nonetheless, differences between the two sites highlight the importance of considering the generalizability of evaluation outcomes from a single zoo to other facilities, which differ on several such dimensions.

Previous research suggests zoo visitors may be predisposed to have more affection and care for animals than the wider public (Kellert & Wilson, 1993). However, we did not find the expected difference in attitudes between online and zoo visitors. Individuals choosing to participate in an online survey on the topic of conservation may have positive attitudes toward animals and nature. Moreover, strong positive attitudes toward animals may also be associated with negative attitudes toward keeping wild animals in captivity (Pierce & Bekoff, 2018) and therefore impact on the likelihood of visiting a zoo. The inclusion of a measure of online participants' attitudes toward visiting zoos would be valuable in examining this issue.

In terms of participant characteristics, pet ownership was expected to have a positive effect on Humanistic attitudes, given that this attitude is characterized by an interest and affection for individual animals, such as pets, and with anthropomorphic features, such as chimpanzees (Kellert & Berry, 1987). However, our results indicate that pet ownership was also positively associated with Naturalistic attitudes (interest and affection for wildlife and nature). Although the effect sizes were small, these differences are consistent with findings that early childhood experiences with pets can help maintain a connection with nature (Paul & Serpell, 1993). In contrast, we found no gender or age differences in scores on either component. Some zoo visitor studies have found stronger emotional responses in females than male visitors (Myers et al., 2004; Powell & Bullock, 2014), but gender effects are not consistently considered in zoo visitor learning and attitudes. Similarly, while age influenced knowledge about great apes and conservation in zoo visitors (Lukas & Ross, 2005), it may be less important in determining emotional responses to zoo animals (Johnston, 1998; Powell & Bullock, 2014). While personality dimensions such as

Agreeableness and Conscientiousness may be important for understanding environmental engagement (Milfont & Sibley, 2012), we found no relationship between our more crudely assessed personality categories and participant attitudes. Zoo membership status, but not membership status of other conservation organizations, had a positive but small influence on attitudes. This is not surprising as zoo member conservation attitudes are generally positively skewed (Godinez & Fernandez, 2019), but it is worth noting that those who indicated a willingness to consider joining did not differ from non-members, again highlighting a difference between self-reported intentions and behavioral measures (Marcinkowski & Reid, 2019).

Most participants preferred to make a hypothetical donation toward chimpanzee conservation, suggesting that visiting the chimpanzee exhibit fostered positive attitudes toward the species. Charismatic animals, such as chimpanzees, have been shown to positively influence donations irrespective of their conservation status (Colleony et al., 2017). Although there was no difference in the likelihood of donating to chimpanzees between conditions (emotion, location, standard), this finding is consistent with the lack of effect of these same conditions on attitude scores at this exhibit. Interestingly, those who donated to either cause scored higher on the Humanistic component than those who did not donate, and the effect size was moderate, suggesting that Humanistic values may influence individual responses to conservation appeals. The lack of association between donation and scores on the Naturalistic component highlights a key challenge in the evaluation of zoo conservation education: general self-reported attitudes toward conservation may not be closely associated with specific behaviors such as donation (e.g., Marcinkowski & Reid, 2019).

In line with several previous studies, our results indicate that both visitor characteristics and experiences at the exhibit can influence self-reported attitudes to animals and conservation (Milfont & Sibley, 2012; Paul & Serpell, 1993; Powell & Bullock, 2014). It is important to note that none of the experimental or control conditions directly targeted attitudes to conservation for example, we did not include information about chimpanzee conservation status, or identify pro-conservation actions (e.g., Pearson et al., 2014). More integrated approaches are likely to be necessary to influence visitor behavior, providing opportunities to learn about animals that are clearly linked to conservation goals, including the promotion of everyday actions that reduce our impact on the environment (Ballantyne et al., 2007; Ballantyne et al., 2018; Ballantyne & Packer, 2005).

Conclusion

Zoo experiences which promote a sense of connection with animals can enhance attitudes to conservation. Facilitating emotional engagement with an individual chimpanzee led to more positive attitudes to conservation, although the effect was limited to one of the exhibits, indicating the value of cross-site studies to identify contextual factors. Stable individual characteristics (pet ownership and zoo membership) also influenced attitudes to chimpanzees and conservation, suggesting it may be difficult to change visitor attitudes and behaviors via brief interventions. Given the multiple factors shaping zoo visitor experiences and motivation to engage in learning, further research is needed to

inform best practice and maximize the potential benefits of zoo conservation education efforts.

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ORCID

Lesley E. Craig http://orcid.org/0000-0003-4547-339X
Sarah-Jane Vick http://orcid.org/0000-0001-8741-9653

References

Adelman, L. M., Falk, J. H., & James, S. (2000). Impact of National Aquarium in Baltimore on visitors' conservation attitudes, behavior, and knowledge. *Curator: The Museum Journal*, *43*(1), 33–61. https://doi.org/10.1111/j.2151-6952.2000.tb01158.x

Altman, J. D. (1998). Animal activity and visitor learning at the zoo. *Anthrozoös*, *11*(1), 12–21. https://doi.org/10.1080/08927936.1998.11425083

Anderson, U. S., Kelling, A. S., Pressley-Keough, R., Bloomsmith, M. A., & Maple, T. L. (2003). Enhancing the zoo visitor's experience by public animal training and oral interpretation at an otter exhibit. *Environment and Behavior*, *35*(6), 826–841. https://doi.org/10.1177/0013916503254746

Ballantyne, R., & Packer, J. (2005). Promoting environmentally sustainable attitudes and behaviour through free-choice learning experiences: What is the state of the game? *Environmental Education Research*, *11*(3), 281–295. https://doi.org/10.1080/13504620500081145

Ballantyne, R., & Packer, J. (2016). Visitors' perceptions of the conservation education role of zoos and aquariums: Implications for the provision of learning experiences. *Visitor Studies*, *19*(2), 193–210. https://doi.org/10.1080/10645578.2016.1220185

Ballantyne, R., Packer, J., Hughes, K., & Dierking, L. (2007). Conservation learning in wildlife tourism settings: Lessons from research in zoos and aquariums. *Environmental Education Research*, *13*(3), 367–383. https://doi.org/10.1080/13504620701430604

Ballantyne, R., Packer, J., Hughes, K., & Gill, C. (2018). Post-visit reinforcement of zoo conservation messages: The design and testing of an action resource website. *Visitor Studies*, *21*(1), 98–120. https://doi.org/10.1080/10645578.2018.1503871

Breuer, T., Manguette, M., & Groenenberg, M. (2018). Gorilla *Gorilla* spp conservation – from zoos to the field and back: Examples from the Mbeli Bai study. *International Zoo Yearbook*, *52*(1), 137–149. https://doi.org/10.1111/izy.12181

The British Psychological Society. (2009). Code of ethics and conduct. *The British Psychological Society*. Retrieved from: https://www.bps.org.uk/newsand-policy/bps-code-ethics-and-conduct

Clayton, S., & Myers, G. (2009). *Conservation psychology: Understanding and promoting human care for nature*. Wiley-Blackwell.

Cohen, B. (2008). *Explaining psychological statistics* (3rd ed.). John Wiley.

Colleony, A., Clayton, S., Couvet, D., Saint, M., & Prévot, A. (2017). Human preferences for species conservation: Animal charisma trumps endangered status. *Biological Conservation*, *206*, 263–269. https://doi.org/10.1016/j.biocon.2016.11.035

Costa, P. T., & McCrae, R. R. (1992). Four ways five factors are basic. *Personality and Individual Differences*, *13*(6), 653–665. https://doi.org/10.1016/0191-8869(92)90236-I

EAZA Conservation Education Standards September. (2016). Retrieved from: https://www.eaza.net/assets/Uploads/Standards-and-policies/EAZA-ConservationEducation-Standards-2016-09.pdf

European Union Council Zoo Directive. (1999/22EC). Retrieved from: https://ec.europa.eu/environment/nature/pdf/EU_Zoos_Directive_Good_Practices.pdf

Falk, J. H., & Gillespie, K. L. (2009). Investigating the role of emotion in Science Center visitor learning. *Visitor Studies*, *12*(2), 112–132. https://doi.org/10.1080/10645570903203414

Field, A. P. (2009). *Discovering statistics using SPSS* (pp. 640–642). Sage.

Fraser, J., Bicknell, J., Sickler, J., & Taylor, A. (2009). What information do zoo & aquarium visitors want on animal identification labels? *Journal of Interpretation Research*, *14*(2), 7–18. https://doi.org/10.1177/109258720901400202

Godinez, A. M., & Fernandez, D. (2019). What is the zoo experience? How zoos impact a visitor's behaviors, perceptions, and conservation efforts. *Frontiers in Psychology*, *10*, 1–8. https://doi.org/10.3389/fpsyg.2019.01746

Gunnthorsdottir, A. (2001). Physical attractiveness of an animal species as a decision factor for its preservation. *Anthrozoös*, *14*(4), 204–215. https://doi.org/10.2752/089279301786999355

Hayward, J., & Rothenberg, M. (2004). Measuring success in the "Congo Gorilla Forest" conservation exhibition. *Curator: The Museum Journal*, *47*(3), 261–282. https://doi.org/10.1111/j.2151-6952.2004.tb00125.x

Herrelko, E. S. (2011). An assessment of the development of a cognitive research programme and introductions in zoo-housed chimpanzees [unpublished PhD thesis]. The University of Stirling, Stirling, UK. Retrieved from: https://dspace.stir.ac.uk/handle/1893/3654#.W3lRXPlKjIU

Howell, T. J., McLeod, E. M., & Coleman, G. J. (2019). When zoo visitors "connect" with a zoo animal, what does that mean? *Zoo Biology*, *38*(6), 461–470. https://doi.org/10.1002/zoo.21509

Jacobs, M. H. (2009). Why do we like or dislike animals? *Human Dimensions of Wildlife*, *14*(1), 1–11. https://doi.org/10.1080/10871200802545765

Johnston, R. J. (1998). Exogenous factors and visitor behaviour: A regression analysis of exhibit viewing time. *Environment and Behavior*, *30*(3), 322–347. https://doi.org/10.1177/001391659803000304

Kellert, S. R. (1979). *Public attitudes toward critical wildlife and natural habitat issues, Phase I. U.S.* Fish and Wildlife Service.

Kellert, S. R., & Berry, J. K. (1987). Attitudes, knowledge and behaviours towards wildlife as affected by gender. *Wildlife Society Bulletin*, *15*, 363–371.

Kellert, S. R., & Wilson, E. O. (1993). *The biophilia hypothesis*. Island Press.

Luebke, J. F., & Matiasek, J. (2013). An exploratory study of zoo visitors exhibit experiences and reactions. *Zoo Biology*, *32*(4), 407–416. https://doi.org/10.1002/zoo.21071

Luebke, J. F., Watters, J. V., Packer, J., Miller, L. J., & Powell, D. M. (2016). Zoo visitors' affective responses to observing animal behaviors. *Visitor Studies*, *19*(1), 60–76. https://doi.org/10.1080/10645578.2016.1144028

Lukas, K. E., & Ross, S. R. (2005). Zoo visitor knowledge and attitudes toward gorillas and chimpanzees. *Journal of Environmental Education*, *36*, 33–48.

Lukas, K. E., & Ross, S. R. (2014). Naturalistic exhibits may be more effective than traditional exhibits at improving zoo-visitor attitudes toward African apes. *Anthrozoös*, *27*(3), 435–455. https://doi.org/10.2752/175303714X14023922797904

Marcinkowski, T., & Reid, A. (2019). Reviews of research on the attitude–behavior relationship and their implications for future environmental education research. *Environmental Education Research*, *25*(4), 459–471. https://doi.org/10.1080/13504622.2019.1634237

Marino, L., Lilienfeld, S. O., Malamud, R., Nobis, N., & Broglio, R. (2010). Do zoos and aquariums promote attitude change in visitors? A critical evaluation of the American zoo and aquarium study. *Society & Animals*, *18*(2), 126–138. https://doi.org/10.1163/156853010X491980

Milfont, T. L., & Sibley, C. G. (2012). The Big Five personality traits and environmental engagement: Associations at the individual and societal level. *Journal of Environmental Psychology*, *32*(2), 187–195. https://doi.org/10.1016/j.jenvp.2011.12.006

Moss, A., Jensen, E., & Gusset, M. (2015). Evaluating the contribution of zoos and aquariums to Aichi Biodiversity Target 1. *Conservation Biology*, *29*(2), 537–544. https://doi.org/10.1111/cobi.12383

Moss, A., Jensen, E., & Gusset, M. (2017). Impact of a global biodiversity education campaign on zoo and aquarium visitors. *Frontiers in Ecology and the Environment*, *15*(5), 243–247. https://doi.org/10.1002/fee.1493

Myers Jr., O. E., & Saunders, C. D. (2002). Animals as links to developing caring relationships with the natural world. In P. H. Kahn Jr & S. R. Kellert (Eds.), *Children and nature: Psychological, sociocultural and evolutionary investigations* (pp. 153–178). MIT Press.

Myers Jr., O. E., Saunders, C. D., & Birjulin, A. A. (2004). Emotional dimensions of watching zoo animals: An experience sampling study building on insights from psychology. *Curator: The Museum Journal*, *47*(3), 299–321. https://doi.org/10.1111/j.2151-6952.2004.tb00127.x

Newberry, M. G., Fuhrman, N. E., & Morgan, A. C. (2017). Naming "animal ambassadors" in an educational presentation: Effects on learner knowledge retention. *Applied Environmental Education and Communication*, *389*, 1–11.

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The nature relatedness scale: Linking individuals' connection with nature to environmental concern and behaviour. *Environment and Behavior*, *41*(5), 715–740. https://doi.org/10.1177/0013916508318748

Paul, E. S., & Serpell, J. (1993). Childhood pet keeping and humane attitudes in young adulthood. *Animal Welfare*, *2*, 321–337.

Pearson, E. L., Lowry, R., Dorrian, J., & Litchfield, C. A. (2014). Evaluating the conservation impact of an innovative zoo-based educational campaign: 'Don't Palm Us Off' for orang-utan conservation. *Zoo Biology*, *33*(3), 184–196. https://doi.org/10.1002/zoo.21120

Pierce, J., & Bekoff, M. (2018). A post-zoo future: Why welfare fails animals in zoos. *Journal of Applied Animal Welfare Science*, *21*(sup1), 43–48. https://doi.org/10.1080/10888705.2018.1513838

Plous, S. (1993). Psychological mechanisms in the human use of animals. *Journal of Social Issues*, *49*(1), 11–52. https://doi.org/10.1111/j.1540-4560.1993.tb00907.x

Powell, D. M., & Bullock, E. V. W. (2014). Evaluation of factors affecting emotional responses in zoo visitors and the impact of emotion on conservation mindedness. *Anthrozoös*, *27*(3), 389–405. https://doi.org/10.2752/175303714X13903827488042

Reade, L. S., & Waran, N. K. (1996). The modern zoo: How do people perceive zoo animals? *Applied Animal Behaviour Science*, *47*(1-2), 109–118. https://doi.org/10.1016/0168-1591(95)01014-9

Roe, K., & McConney, A. (2015). Do zoo visitors come to learn? An internationally comparative, mixed-methods study. *Environmental Education Research*, *21*(6), 865–884. https://doi.org/10.1080/13504622.2014.940282

Roe, K., McConney, A., & Mansfield, C. F. (2014). The role of zoos in modern society – A comparison of zoos' reported priorities and what visitors believe they should be. *Anthrozoös*, *27*(4), 529–541. https://doi.org/10.2752/089279314X14072268687808

Semper-Pascual, A., Macchi, L., Sabatini, F., Decarre, J., Baumann, M., Blendinger, P. D., & Kuemmerle, T. (2018). Mapping extinction debt highlights conservation opportunities for birds and mammals in the South American Chaco. *Journal of Applied Ecology*, *55*(3), 1218–1229. https://doi.org/10.1111/1365-2664.13074

Skibins, J. C., Dunstan, E., & Pahlow, K. (2017). Exploring the influence of charismatic characteristics on flagship outcomes in zoo visitors. *Human Dimensions of Wildlife*, *22*(2), 157–171. https://doi.org/10.1080/10871209.2016.1276233

Smith, L., Weiler, B., & Ham, S. (2008). Measuring emotion at the zoo. *Journal of the International Zoo Educators Association*, *44*, 26–31.

Swanagan, J. S. (2000). Factors influencing zoo visitors' conservation attitudes and behavior. *The Journal of Environmental Education*, *31*(4), 26–31. https://doi.org/10.1080/00958960009598648

Weiss, A., King, J., & Hopkins, W. (2007). A cross-setting study of chimpanzee (Pan troglodytes) personality structure and development: Zoological parks and Yerkes National Primate Research Center. *American Journal of Primatology*, *69*(11), 1264–1277. https://doi.org/10.1002/ajp.20428