

The Impact of Interpretive Messaging and Animal Handling on Visitors' Perceptions of Animal Welfare and Empathic Reactions

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Abstract

Zoos are increasingly turning to ambassador animal programs to address animal welfare issues and visitors' empathic responses. However, little is known, if or how, animal handling practices and interpretation impact attendees' perceptions of animal welfare and/or empathy. To evaluate these effects, eight ambassador animal program videos were created employing varying combinations of animal handling (traditional/free choice), interpretive messaging (traditional/empathy-based), and choice and control language (present/absent). Online questionnaires ($N=1,185$) were used to assess participants' environmental and empathic predispositions before viewing and perceptions of animal welfare and empathic reactions immediately after viewing a video. Results revealed that empathic reactions were moderately correlated with perceptions of animal welfare ($r = .53$, $p < .001$) and mean empathic responses were higher for free choice handling and empathic messaging videos versus traditional handling and messaging. Programming recommendations are discussed that can improve visitors' perceptions of animal care and elicit strong empathic reactions.

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Introduction

As concern for the well-being of animals in human care has grown, zoos, aquariums, and nature centers (henceforth, zoos) are recognizing the importance of visitors' perceptions of animal care and welfare at their facilities. Public concern regarding animal well-being has long influenced management and legislation of farm, laboratory, companion, and traded animals (Boogaard et al., 2008; Broom, 2017; Vanhonacker et al., 2008). Current literature reflects this trend is a key focus area for zoo management, as empirical studies are emerging that document visitors' perceptions of animal welfare (Carr, 2016; De la Fuente et al., 2017; Dietz et al., 2017). The purpose of the current study is to extend this line of research by exploring how different interpretive messages and animal handling practices may impact visitors' perceptions of animal welfare and other affective reactions.

Recent research suggests that zoo visitors' perceptions of animal welfare influence their experiences. For example, Ballantyne and Packer (2016) found that zoo visitors in the United States, United Kingdom, Canada, and South Africa, reported seeing animals that are well cared for was the top contributing factor to a satisfactory visit. Similarly, Roe et al. (2014) surveyed visitors' priority values given to zoo activities and found that 29% responded with concerns related to animal welfare.

Consequently, visitors that leave zoos with positive perceptions of animal welfare are more likely to return and also be more aware of and knowledgeable about wildlife conservation, which can inspire attitudinal change and pro-environmental behaviors (Anderson et al., 2003; Fernandez et al., 2009; Miller, 2012). These desired outcomes of a zoo visit are also reflected in organizational mission statements of many Association of Zoos and Aquariums (AZA) accredited zoos. Therefore, understanding and addressing visitors' perceptions of animal welfare are important considerations to the success of zoological institutions (Ballantyne et al., 2018; Luebke & Grajal, 2011; Patrick et al., 2007).

Visitor Perceptions of Animal Welfare

As a meaning-making process, perception is understood to be a multifaceted construct through which information is selected, organized, and interpreted. Psychologists are increasingly coming to view human emotions as directly tied to visual perception (e.g., Zadra & Clore, 2011). Individual perceptions are constructed through evoked memories, life experiences, emotions, and values combined with sensory information, thus shaping a person's experience and interpretation of an event (Ho, 2017; McDonald, 2012). Emotions and values are intertwined with perception and help a person make a judgment as to whether an event, action, or object is good or bad (Schacter et al., 2011). From this perspective, perception becomes deeply entangled with a person's

affective experience at a zoo, thus influencing their overall attitudes of the zoo and potentially their motivation for behavior change.

Prior studies examining visitors' perceptions of animal welfare tend to focus on charismatic megafauna such as elephants (Miller et al., 2018), tigers (Miller, 2012), jaguars (Godinez et al., 2013), and gorillas and other primates (Blaney & Wells, 2004; Nakamichi, 2007; Packer et al., 2018). Others have explored contextual factors relating to the habitat, such as size (Miller et al., 2018), general characteristics (Melfi et al., 2004; Reade & Waran, 1996), and enrichment items (Jacobson et al., 2017; Razal & Miller, 2019). Taken as a whole, these various studies reveal visitors' perceptions generally focus on three inter-related indicators of animal welfare: (1) the physical appearance of the animals (e.g., condition of coat/fur/skin, weight, appearance of physical injuries); (2) observed animal behaviors (e.g., alertness, energy level, mannerisms, interactions with other animals); and (3) habitat characteristics (e.g., size, natural environment, things to do).

Other studies have found visitors' judgments of animal welfare are based on personal subjective observations and pre-existing values and knowledge, which can diverge from empirically-based indicators of welfare for basic health and functioning, affective states, and ability to lead a natural life (Fraser, 2009). For example, Packer et al. (2018) found the criteria visitors use to judge the physical and emotional health of gorillas both converged and diverged from veterinary criteria. Visitors' perceptions converged with veterinary criteria regarding body condition and activity level but diverged based on the "pleasantness of the environment" and knowledge of their own pets (e.g., grooming, coat condition). This led to general misconceptions of the quality of care the animals were receiving. The authors concluded that a better understanding of what contributes to the gap between expert and non-expert judgments of animal welfare standards and practices at zoos could play a crucial role in developing educational programming.

Visitor Affective Experiences

Observing animals during a zoo experience has been found to elicit visitors' affective responses. Empirical studies that examined psychological constructs such as positive emotions (Myers et al., 2004), connectedness with nature (Howell et al., 2019), conservation caring (Skibins & Powell, 2013), and empathy (Luebke, 2018) have all demonstrated visitors' positive affective reactions to animals and suggest that affective engagement may be a key mediator in influencing visitors' pro-conservation behaviors. Moreover, zoo projects in the United States such as Measuring Empathy: Collaborative Assessment Project (MECAP) (Woodland Park Zoo, Point Defiance Zoo & Aquarium, & Seattle Aquarium, n.d) and the Advancing Conservation Through Empathy (ACE) for Wildlife Network (Woodland Park Zoo, n.d) have taken further steps in understanding and facilitating visitors' affective experiences and empathic feelings toward animals and nature. Project findings have identified several empathy best practices for interpretive presentations such as framing, perspective-taking, modeling, and activating imagination (Akerman, 2019; Young et al., 2018).

Interpretation is well suited to assist zoos in achieving empathy-related outcomes. As the purpose of interpretation is to deepen visitors' understanding and relationship to the resource, in this case, zoo animals, improving empathic responses and perceptions of animal welfare are logically aligned results. Several authors go so far as to advance that interpretive programs, that facilitate positive relationships with nature, are foundational to conservation initiatives (Wallach et al., 2018; Zylstra et al., 2014).

Empirical findings support the role of interpretation connecting visitors to nature, increasing empathy, and ultimately moving to pro-environmental behaviors. For example, Clayton et al. (2014) found the zoo context capable of facilitating a sense of connection to animals. Dunstan et al. (2016) report zoo programs and encounters with animals increased visitors' connection with animals and led to behavior change. Additionally, Di Fabio and Kenny (2021) found empathy was malleable and capable of being improved. Furthermore, they reported that increased empathy improved connectedness to nature.

Another compelling way zoos have facilitated visitors' positive affective experiences is by providing up-close and personal interactions with animals (Luebke et al., 2016). One of the most popular methods of creating this personal connection is the use of ambassador animal interpretive programs. Ambassador animal programs are the most common means of providing visitors up-close interactions with animals at zoos. Ambassador animals are trained by zoo staff to take part in public education programs in front of an audience. Most programs take place in a theater setting on zoo grounds in front of a crowd with a staff member providing interpretation. Ambassador animal programs are also used as outreach opportunities, as staff transport the animals and lead programming in public venues, including schools, businesses, and community organizations. Visitors in attendance often have an opportunity to touch or interact with the ambassador animal during the program. Having an up-close interaction with a live animal has long been shown to increase knowledge retention and change attitudes about the animal, the species, and the natural world as a whole (Morgan & Gramann, 1989; Povey, 2002; Povey & Rios, 2002; Sherwood et al., 1989).

Additionally, ambassador programs that employ interpretive best practices have been shown to be successful. For example, MacDonald (2015) found zoo visitors' increased recall and behavior performance following an interpretive animal program. Mellish et al. (2016) found interpretive animal shows were more effective than static exhibits for increasing knowledge and improving behavioral intentions. As a result, zoo ambassador animal programs are rapidly growing in number of animals, diversity of species, and strategic roles.

Finally, ambassador animal programs, in which zoo visitors can directly interact with an animal under the supervision of zoo staff, are a multi-faceted experience that can be used to drive empathy and positive perceptions of animal welfare. Drawing on interpretive practices (Beck & Cable, 2011; Beck et al., 2018), zoo staff can craft messages that target these outcomes. The combination of direct interaction with the animal coupled with interpretation has been shown to be effective in eliciting desired outcomes (Akerman, 2019; Dunstan et al., 2016; Young et al., 2018). However, little is known if, or how, particular animal handling practices and interpretive messages used

during these programs may impact perceptions of animal welfare and/or empathic reactions of visitors who attend.

Study Objectives

The primary objective of the study was to measure the effects of varying animal handling and interpretation practices on perceptions of animal welfare and empathic reactions. To systematically evaluate these relative effects and gain preliminary insights into live animal programs, an experimental design using video recordings was employed to control such factors as program delivery and random assignment of participants. Eight different videos were made of a live ambassador animal program employing varying combinations of animal handling and interpretive messaging. The focus of these different videos was on (1) how much choice and agency the ambassador animal was given during the program, (2) the use of empathic interpretive messaging, and (3) whether the zoo staff member explicitly described animal choice and control practices during the program.

Additionally, given that previous zoo-based research suggests visitors' pre-existing attitudes and predispositions toward animals and the environment impacts their zoo experiences (e.g., Luebke et al., 2016; Miller et al., 2018; Skibins & Powell, 2013), it was decided to assess participants' environmental and empathic predispositions before they viewed the videos.

Study Site

Woodland Park Zoo is an AZA-accredited zoo located in Seattle, Washington and has an annual visitation of approximately 1 million people. The grounds cover 92 acres and are divided into eight bioclimatic zones featuring more than 900 animals representing 250 species. Exhibits consist of outdoor naturalistic exhibits and indoor multispecies exhibits. Woodland Park Zoo also has an ambassador animal program featuring a variety of mammals, birds, and reptiles. Ambassador animals participate in a number of public events, such as keeper talks, educational programs, and community events. This study was conducted via an online questionnaire of people on Woodland Park Zoo's mailing list.

Methods

Video Presentation Development

Eight different videos were created to experimentally manipulate three dichotomous independent variables: animal handling practices (traditional/free choice handling), interpretive messaging (traditional/empathic), and choice and control language (present/absent) (see Table 1). Traditional handling involved removing the animal from their enclosure and holding the animal throughout the program. In the free choice handling, the presenter encouraged the animal to come out of their enclosure on their own and did

Table 1. Video Presentations.

Video condition	Animal handling	Messaging	Choice and control language
1	Traditional (TH)	Traditional (TM)	Absent
2	Traditional (TH)	Traditional (TM)	Present (CC)
3	Traditional (TH)	Empathic (EM)	Absent
4	Traditional (TH)	Empathic (EM)	Present (CC)
5	Free choice (FCH)	Traditional (TM)	Absent
6	Free choice (FCH)	Traditional (TM)	Present (CC)
7	Free choice (FCH)	Empathic (EM)	Absent
8	Free choice (FCH)	Empathic (EM)	Present (CC)

not hold nor touch the animal during the program. Traditional interpretive messaging discussed species' general natural history, whereas empathic interpretive messaging employed empathy messaging best practices (Akerman, 2019) such as, using the animal's name, telling a personal story about that animal, and emphasizing perspective-taking. When present, choice and control language discussed the welfare benefits of offering choices that allow animals to exert control over their environments.

Staged animal ambassador programs were video recorded in a controlled setting resulting in a 4-minute video for each experimental condition (eight total). Programs were recorded at Woodland Park Zoo and used animals from their ambassador animal collection. Each program was filmed away from the public using the same species and handler. The free choice handling videos featured a nine-banded armadillo (*Dasypus novemcinctus*, Figure 1), and traditional handling videos featured a Southern three-banded armadillo (*Tolypeutes matacus*, Figure 2). Two different species of armadillo were used in this study due to the limitations of the individual armadillos available for ambassador programming at Woodland Park Zoo and their comfort level and previous training with the different handling conditions. The individual animals chosen for this study and the different handling conditions came at the recommendation and oversight of animal welfare scientists at Woodland Park Zoo. In addition, given that armadillos are not typically a very popular animal to see at a zoo (Carr, 2016) or native to the Washington state area, it was felt that no systematic bias would be introduced into the study design by using two different species of armadillos.

Sampling Procedure

In September 2019, a pilot study was conducted ($N=287$) to test the validity and reliability of the questionnaire scales. The final questionnaire was administered online using SurveyGizmo and sent to Woodland Park Zoo's email contact list containing 102,320 addresses. The contact list was randomly divided into eight groups consisting of 12,790 email addresses. Each group was sent a questionnaire in November 2019 featuring one of the eight experimental conditions (Table 1). A reminder email was sent to each group in December 2019.



Figure 1. Nine-banded armadillo (*Dasypus novemcinctus*).
Source. Photo by Jeremy Dwyer-Lindgren.



Figure 2. Southern three-banded armadillo (*Tolypeutes matacus*).
Source. Photo by Dennis Dow.

Questionnaires assessed participants' environmental and empathic predispositions before viewing the video, and perceptions of animal welfare and empathic reactions immediately after viewing the video (see below for full descriptions of constructs). Data collection took place from November through December 2019.

Table 2. Questionnaire Scale Items.Perceptions of animal welfare (Cronbach $\alpha = .94$)

- The armadillo appears to be well cared for.
- The armadillo appears content.
- The armadillo appears healthy.
- The armadillo appears to have good physical well-being.
- The armadillo appears to have good mental well-being.
- The trainer treated the armadillo in a way that was safe for the animal.
- The program did not negatively impact the armadillo's physical well-being.
- The program did not negatively impact the armadillo's emotional well-being.

Empathic reactions (Cronbach $\alpha = .91$)

- I have a greater sense of my connection with the armadillo in the program.
- I felt awed by the armadillo in the program.
- I felt curiosity toward the armadillo in the program.
- I saw how amazing the armadillo in the program is.
- I felt respect for the armadillo in the program.
- I became more concerned about the well-being of armadillos in the wild.
- I was moved by my experience of watching the ambassador animal program.
- I was able to see things from the armadillo's point of view during the program.

Notes. All items scored on 1 to 7 scale, 1 = strongly disagree, 7 = strongly agree.

All respondents were over the age of 18 and agreed to a consent form at the beginning of the questionnaire. A total of 1,185 responses were received for a response rate of 1.16%.

Questionnaire Scales

Two existing scales were used to measure participants' environmental and empathic predispositions. The first scale was the Dispositional Empathy with Nature (DEN) scale (Tam, 2013), which consists of 10 items that measure peoples' dispositions to understand and share the emotional experience of nature and the ability to take the perspective of species in the natural world. The second scale was the Visitor Predisposition Scale (VPS) (Luebke et al., 2016) which is comprised of eight items that measure predispositions concerning participant interests and feelings about the animals, environment, and conservation behaviors. The scale was originally developed to assess visitors' prior level of interest and engagement related to a zoo's conservation mission of connecting people with animals, nature, and conservation. Both scales were scored on a 7-point scale ranging from 1 = Strongly Disagree to 7 = Strongly Agree.

After completing the two scales and watching the video, participants completed two additional scales designed to measure perceptions of animal welfare (PAW) and empathic reactions (ER) (Table 2). Again, items comprising both scales were scored on a 7-point scale ranging from 1 = Strongly Disagree to 7 = Strongly Agree. The PAW scale consisted of eight items concerning participants' perceptions of the physical and

emotional well-being of the animal. Items were developed from studies of visitors' perceptions of zoo animal welfare (Blaney & Wells, 2004; Godinez et al., 2013; Hacker & Miller, 2016; Melfi et al., 2004; Miller et al., 2018; Nakamichi, 2007; Packer et al., 2018; Razal & Miller, 2019; Reade & Waran, 1996).

The second scale was designed as a global measure of empathy using eight items. Empathy can be understood as a multidimensional construct representing cognitive, affective, and motivational components. Young et al. (2018) defines empathy as "a stimulated emotional state that relies on the ability to perceive, understand and care about the experiences or perspectives of another person or animal" (p. 329). Furthermore, empathy has been studied both as a negative emotional reaction of caring and concern for someone else undergoing undesirable experiences (Davis, 1983); and as empathic joy or a positive emotional reaction to understanding and vicariously sharing others' positive emotions (Morelli et al., 2015). Similar to previous research (Mast et al., 2018), this study operationalized empathic reactions to include a broad range of empathy-related elements including perspective-taking, empathic concern, connectedness with animals, awe, and curiosity.

Results

Sample Description

The sample was 20% male ($M_{\text{age}} = 52$) and 77% female ($M_{\text{age}} = 49$); 3% missing. The most common race/ethnicity selected was white/Caucasian 86%; the second most common was Asian American or Asian 6%. All others were less than 3%. Forty-one percent reported completing undergraduate studies, and 34% reported completing a graduate or professional degree. Fifty-one percent reported visiting a zoo three or more times per year, and 30% reported visiting a zoo one to two times per year.

Scale Reliability

A principal components factor analytic technique was first used to check for possible latent constructs or factors underlying the scales. Analyses indicated the four scales were all factor free, indicating the items were measuring a single construct in each case (DeVellis, 2012). Scales were also assessed for reliability using Cronbach's alpha scores. All scales were deemed reliable (Vaske, 2008). Item reliability analyses revealed no improvement to Cronbach's alpha scores for the scales when any item was removed. Therefore all items were retained for each. Mean scores, standard deviations, and Cronbach's alpha scores are reported respectively (all $N=1,177$): DEN (4.86 ± 1.24 , $\alpha=.92$), VPS (5.86 ± 0.77 , $\alpha=.84$), PAW (5.58 ± 1.08 , $\alpha=.94$), and ER (4.82 ± 1.06 , $\alpha=.91$).

Preliminary Correlational Analyses

As a preliminary step in the data analyses, zero-order correlations were first computed using the entire sample to explore the overall relationships among the scales (Table 3).

Table 3. Zero-Order Pearson Correlations.

	Visitor predisposition scale	Perceptions of animal welfare	Empathic reactions
Dispositional empathy w/nature scale	0.52	0.11	0.44
Visitor predisposition scale		0.10	0.32
Perceptions of animal welfare			0.53

Note. All correlation coefficients (r) are significant at $p < .001$.

Results revealed that the DEN was related to the VPS ($r = .52$) and ER ($r = .44$), but only slightly related to PAW ($r = .11$) (minimal = 0.10–0.243) (Vaske, 2008). Similarly, VPS was also related to ER ($r = .32$), but only slightly related to PAW ($r = .10$) (Vaske, 2008). A relationship was also found between PAW and ER ($r = .53$) suggesting a possible meaningful (substantial > 0.50) relationship between perceptions and empathy.

To further understand this observed relationship, partial correlational techniques were used to examine the relationship between the PAW and ER scales while statistically controlling for the effects of the DEN and VPS scales. When the DEN was held constant, the partial correlation between PAW and ER was .54 and when the VPS was held constant, the partial correlation was .53. When both scales were held constant together, the partial correlation was .54. Given there was little change in the partial correlations compared to the zero-order correlations, these results suggest that participants' predispositions were not significantly related to the relationship between visitors' perceptions of animal welfare and their empathic reactions.

Scale Performance Across Video Conditions

One-way ANOVAs with Scheffé post-hoc tests were performed to uncover differences in scale means across each video condition (Table 4). The alpha level was set at $p < .05$ for all analyses. No significant mean differences were found for DEN across video conditions ($F[7, 1,169] = 1.32, p > .05$). Significant mean differences across video conditions were found for VPS ($F(7, 1,169) = 4.27, p < .001$); with video conditions Free Choice Handling/Traditional Messaging/Choice and Control Language and Free Choice Handling/Empathic Messaging mean ratings significantly higher than Traditional Handling/Empathic Messaging/Choice and Control Language mean rating.

Significant mean differences across video conditions were also found for PAW ($F[7, 1,169] = 54.53, p < .001$); with all four mean ratings for the Free Choice Handling conditions significantly higher than the mean ratings for the four Traditional Handling conditions. Within the four Traditional Handling conditions, the mean rating for the Traditional Handling/Empathic Messaging/Choice and Control condition was significantly higher than the mean rating for the Traditional Handling/Traditional Messaging condition. Finally, significant mean differences across video conditions were found for ER ($F[7, 1,169] = 10.38, p < .001$); with all four mean ratings for the Free Choice

Table 4. Mean Ratings for Video Conditions.

Video condition (N)	Dispositional empathy w/ nature scale	Visitor predisposition scale	Perceptions of animal welfare	Empathic reactions
	<i>M ± SD</i>			
1. Traditional handling/ traditional messaging (192)	4.82 ± 1.22	5.72 ± 0.80 ^{a,c}	4.92 ± 1.10 ^{a,d}	4.45 ± 1.11 ^b
2. Traditional handling/ traditional messaging/choice and control language (195)	4.90 ± 1.22	5.84 ± 0.77 ^{a,c}	5.00 ± 1.13 ^a	4.55 ± 1.09 ^b
3. Traditional handling/ empathic messaging (161)	4.88 ± 1.28	5.91 ± 0.72 ^{a,c}	5.39 ± 1.06 ^a	4.89 ± 1.02 ^c
4. Traditional handling/ empathic messaging/choice and control language (173)	4.70 ± 1.32	5.67 ± 0.88 ^a	5.49 ± 0.91 ^{a,c}	4.75 ± 0.90 ^c
5. Free choice handling/ traditional messaging (130)	4.73 ± 1.11	5.90 ± 0.74 ^{a,c}	6.07 ± 0.75 ^b	5.03 ± 0.92 ^a
6. Free choice handling/ traditional messaging/choice and control language (102)	5.10 ± 1.24	6.05 ± 0.70 ^{b,c}	6.40 ± 0.57 ^b	5.15 ± 0.98 ^a
7. Free choice handling/ empathic messaging (109)	4.92 ± 1.31	6.03 ± 0.73 ^{b,c}	6.21 ± 0.80 ^b	5.04 ± 1.10 ^a
8. Free choice handling/ empathic messaging/choice and control language (115)	4.96 ± 1.20	5.98 ± 0.67 ^{a,c}	6.18 ± 0.72 ^b	5.16 ± 1.10 ^a
Overall (1,177)	4.86 ± 1.24	5.86 ± 0.77	5.58 ± 1.08	4.82 ± 1.06

Note. Dispositional empathy w/nature scale consisted of 10 items, all other scales consisted of 8 items. All scales scored on scale 1 = strongly disagree, 7 = strongly agree. Dependent variables are shown as columns headings. Their means are compared within columns. Within column means with different superscripts differ at $p < .05$.

Handling conditions significantly higher than the mean ratings for the Traditional Handling/Traditional Messaging and the Traditional Handling/Traditional Messaging/Choice and Control conditions.

Examination of both the PAW and ER mean ratings indicated a general trend such that video conditions with Free Choice Handling displayed higher mean ratings than the video conditions using Traditional Handling. Ratings for the Free Choice Handling conditions were collapsed across the four conditions and compared to the combined mean ratings of the four Traditional Handling conditions. As can be seen in Table 5, the combined Free Choice conditions mean ratings for PAW, ER, and VPS were significantly higher than the mean ratings for the combined Traditional Handling conditions. The effect sizes (Cohen’s *d*) for PAW and ER mean ratings were also high (minimal=0.20; typical=0.50; substantial > 0.80) (Vaske, 2008) suggesting meaningful differences between the video conditions.

Table 5. Mean Ratings for Animal Handling and Messaging Conditions.

	Traditional handling	Free choice handling	Significance of mean differences
	<i>M ± SD</i>		
Perceptions of animal welfare (PAW)	5.19 ± 1.08	6.20 ± 0.73	$t(1,175) = 17.70, p < .001$, Cohen's $d = 1.104$
Empathic reactions (ER)	4.65 ± 1.05	5.09 ± 1.03	$t(1,175) = 7.13, p < .001$, Cohen's $d = 0.427$
Dispositional empathy w/nature (DEN)	4.82 ± 1.26	4.92 ± 1.27	$t(1,175) = -1.23, p > .05$
Visitor predisposition (VPS)	5.79 ± 0.80	5.99 ± 0.71	$t(1,175) = -4.36, p < .001$, Cohen's $d = 0.254$
	Traditional messaging	Empathic messaging	Significance of mean differences
	<i>M ± SD</i>		
Perceptions of animal welfare (PAW)	5.43 ± 1.15	5.74 ± 0.97	$t(1,175) = 4.99, p < .001$, Cohen's $d = 0.292$
Empathic reactions (ER)	4.72 ± 1.08	4.94 ± 1.03	$t(1,175) = 3.50, p < .001$, Cohen's $d = 0.204$
Dispositional empathy w/nature (DEN)	4.87 ± 1.20	4.85 ± 1.28	$t(1,175) = -0.29, p > .05$
Visitor predisposition (VPS)	5.85 ± 0.77	5.88 ± 0.78	$t(1,175) = 0.57, p > .05$

There was no significant difference in the DEN mean ratings between the two combined conditions and the VPS mean ratings only had a small effect (Cohen's d of 0.254) on the type of animal handling.

The combined ratings of the four Empathic Messaging conditions were compared to the combined ratings of the four Traditional Messaging conditions. Results revealed the combined Empathic Messaging video conditions mean ratings for PAW and ER were significantly higher than the mean ratings for the combined Traditional Messaging conditions. The effect sizes (Cohen's d), however, were minimal (Vaske, 2008). DEN and VPS mean ratings did not significantly vary between the two combined conditions.

The combined ratings of the four Choice and Control Messaging conditions were compared to the combined ratings of the four conditions where the Choice and Control Messaging was absent. Results revealed the mean ratings for PAW ($t[1,014] = 0.41, p > .05$) and ER ($t[1,014] = 0.85, p > .05$) were not significantly different.

Lastly, conditions were collapsed based on traditional and empathic messaging (Table 6). For the Traditional Handling video conditions, PAW and ER mean ratings were significantly higher for the Empathic Messaging than for the Traditional Messaging conditions. DEN and VPS did not significantly vary. For the Free Choice

Table 6. Mean Ratings—Traditional Versus Empathic Messaging by Animal Handling Condition.

Animal handling practice	Traditional messaging	Empathic messaging	Significance of mean differences
	<i>M ± SD</i>		
Traditional handling			
Perceptions of animal welfare (PAW)	4.96 ± 1.11	5.44 ± 0.99	<i>t</i> (719) = 6.06, <i>p</i> < .001, Cohen's <i>d</i> = 0.455
Empathic reactions (ER)	4.50 ± 1.10	4.82 ± 0.96	<i>t</i> (719) = 4.15, <i>p</i> < .001, Cohen's <i>d</i> = 0.315
Dispositional empathy w/ nature (DEN)	4.86 ± 1.22	4.79 ± 1.30	<i>t</i> (719) = -0.74, <i>p</i> > .05
Visitor predisposition (VPS)	5.78 ± 0.79	5.79 ± 0.81	<i>t</i> (719) = 0.10, <i>p</i> > .05
Free choice handling			
Perceptions of animal welfare (PAW)	6.21 ± 0.70	6.19 ± 0.76	<i>t</i> (454) = -0.30, <i>p</i> > .05
Empathic reactions (ER)	5.08 ± 0.95	5.10 ± 1.11	<i>t</i> (454) = 0.21, <i>p</i> > .05
Dispositional empathy w/ nature (DEN)	4.89 ± 1.18	4.94 ± 1.26	<i>t</i> (454) = 0.43, <i>p</i> > .05
Visitor predisposition (VPS)	5.96 ± 0.73	6.01 ± 0.70	<i>t</i> (454) = 0.65, <i>p</i> > .05

video conditions, PAW, ER, DEN, and VPS mean ratings did not significantly vary based on the messaging condition.

Discussion

The main focus of this study was to examine in a controlled setting the relative impacts of different combinations of animal handling conditions and interpretive messaging in ambassador animal programs on visitors' perceptions of animal welfare (PAW) and empathic reactions (ER). In so doing, empirical support was sought to obtain preliminary insights into live animal programming that could improve visitors' perceptions of zoo animal care and elicit stronger empathic reactions. Positive perceptions of care and positive empathy have been shown to be key factors of a zoo visit (Ballantyne & Packer, 2016; Packer et al., 2018). Findings from this study tend to support these results from in-person zoo experiences.

An initial examination of the data found that participants' empathic reactions were positively correlated to their perceptions of animal welfare. Furthermore, follow up partial correlational analyses indicated that this relationship was independent of any predispositions the participants had regarding empathic feelings or attitudes toward animals or nature. Although these analyses cannot provide insight into the directional causal relationship between empathy and perceptions of welfare, results suggest that visitors' positive empathy, or what could be considered empathic joy (Morelli et al., 2015; Young et al., 2018), may be highly related to the perceived positive affective state or well-being of an animal.

Role of Animal Handling

The role of animal handling conditions had a larger effect on PAW and ER scores than did the role of interpretive messaging. This is not surprising, given the participants were viewing a video of a live animal presentation. As such, the condition and behaviors of the animal (in this case an armadillo) are front and center of the viewers' attention. The emergence of free choice handling as producing significantly higher PAW and ER scores suggests contemporary zoo visitors may be more highly attuned to conditions that align to and deliver high quality care and may be particularly salient for those who have strong predispositions concerning their interests and feelings about animals, the environment, and conservation behaviors. This bodes well for zoos in that they may be able to focus on situations or features that call attention to an animal's choice and control over their own behavior. In so doing, zoos can reaffirm visitors' positive perceptions of welfare and empathy.

Role of Interpretive Messaging

Videos that incorporated empathic messaging showed significantly higher PAW and ER scores than traditional messaging videos. However, effect sizes indicated the differences were smaller than the animal handling conditions. Talking about an animal's choice and control did not appear to have a significant impact on participants' perceptions and reactions. Further research is needed to understand how simply talking about choice and control may not be the same as actually seeing it in practice.

The type of animal handling condition also appeared to have a differential effect on interpretive messaging. For the Free Choice video conditions, PAW and ER mean ratings did not vary based on the messaging conditions (Empathic vs. Tradition Messaging). However, within traditional animal handling videos, empathic messaging produced higher PAW and ER scores compared to traditional messaging. Thus, when confronted with what may be less than preferred animal handling conditions, empathy-based interpretation can help ameliorate the effects of these conditions and produce the desired visitor-based outcomes. This would suggest that when zoos are forced to contend with exhibits and programming that do not align with contemporary expectations, empathy-based interpretation may bridge the gap with visitors and provide a positive conservation-oriented experience. Furthermore, when taken in combination with the smaller effect sizes of interpretive messaging, this would suggest that animal handling conditions have a stronger effect on PAW and ER, and as in this example, may override the impact of interpretation.

Limitations

There were some limitations that temper the findings of this study. A noticeable limitation was that video recordings were utilized instead of actual in-person animal programs. Although the contextual dynamics of viewing a video recording versus viewing

a live animal program are quite different, video recordings were chosen to experimentally control for some possible biases that may occur in an applied research setting and confound the interpretation of the results. A study by Miller et al. (2020) found viewing a video recording of a polar bear when compared with viewing a live polar bear face-to-face resulted in a lower probability of having a positive emotional experience and having less empathic concern toward the animal. Given the Miller et al. (2020) findings, it is somewhat suggestive that participants' reactions to the video recordings may have been more intense during an actual in-person ambassador animal program. Nevertheless, more research with live animal programs needs to be conducted to test this hypothesis.

Another limitation is the general demographics of the study. The demographics were highly skewed toward people who identified as educated (75% with a bachelor's degree or higher), white (86%), and women (77%). Although the sample was consistent with the general visitation patterns at Woodland Park Zoo, the skewed sample may limit generalizability to other zoos which may have a different demographic breakdown of visitors. Related to the potential of skewed demographics, the general response rate was low. Although non-response bias was not assessed, our response rate is consistent with previous email-based studies (Kelly & Skibins, 2021; Mann et al., 2018). Additionally, viewers needed to commit to watching a video of the program and completing the survey. This may have artificially skewed the sample. Future work could include non-response checks and collection protocols to seek more balanced demographics. Other limitations may be present due to the ambassador animal selected and level of interpretation. Previous studies show that visitors use a number of characteristics to form a connection to zoo animals (Skibins et al., 2017). Armadillos possess a smaller suite of relatable characteristics. The use of more charismatic species or those with morphological features similar to humans may produce different results. The quality and quantity of interpretation may also affect visitors' empathic responses. Although held consistent within treatment, future studies could explore varying interpretation in order to elicit stronger empathic responses.

Implications for Practice

Data from this study suggest that interpreters who use live animals during their presentations allow the animal to have as much free choice behavior as possible. When animals had free choice, visitors reported higher scores for empathy (related to the animal) and perceptions of animal welfare, both of which are key visitor-based outcomes for many zoos. Additionally, providing animals choice and control has been shown to have positive welfare outcomes (Whitham & Wielebnowski, 2013).

Interpretive content was also an important factor for visitors. Interpretive messaging that had empathy as a theme was more successful at generating the visitor-based outcomes of empathy and perceptions of animal welfare than messaging that focused on natural history. Within the theme of empathy, topics such as individualizing the animal and emphasizing perspective-taking were shown to be effective. Interpreters

could begin developing thematic programs, that incorporate universals, and tangibles and intangibles (Beck et al., 2018; Ham, 2013) around empathy and animal welfare to contribute to strategic objectives.

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Supplemental Material

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