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Factors Influencing the Development of Human–Animal Relationships at SeaWorld Entertainment Parks

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Abstract

While the existence of human–animal relationships dates back thousands of years, the effects of these bonds on animal well-being have only recently been examined in detail. The existing literature demonstrates that factors such as familiar human caregivers and persistent, predictable care may, for example, lower an animal's fear response and improve overall welfare. The goal of the present study was to analyse how a range of variables, including age, sex, animal species, and previous bonds with a pet could influence the development of human–animal bonds between caregivers and animals at six affiliated zoological facilities. The present study is a survey of 201 animal caregivers focusing on their perception of the bonds shared between themselves and an animal with which they work and any experience with bonds they have with a companion animal at home. All respondents, regardless of the existence of a human–animal bond, also indicated their level of agreement with a series of general statements about human–animal relationships and their effects on animal management and welfare. The present study demonstrates that the type of animal species has a significant effect on the development of bonds between animals and their human caregivers, with a greater percentage of bonds developed between people and other mammalian species, and the smaller percentage of bonds between people and fish or reptiles. Personal identifiers, such as age, sex, or the number of years in the profession, did not have any significant correlation to bond development. In addition, having pets was also not a predictor of caregiver–animal bonds, though previous experiences with animal bonds did indicate a tendency to develop a bond. Overall, surveyed caregivers agreed with positive statements about human–animal relationships and their role in promoting better welfare for animals. Understanding the bonds shared by animal caregivers and the animals for which they are responsible is essential to fostering workplaces that consider the importance of the relationship between humans and animals, and the tangible benefits a positively perceived bond can have for both.

Key Words: human–animal bonds, human–animal interactions, animal welfare, animal care, zoos, aquariums, caregivers

Introduction

Development of Human–Animal Bonds

Human–animal bonds have been documented for much of modern human history, with the first known examples of human–animal relationships dating back to domestication of the wolf (*Canis lupus*) several thousand years ago (Serpell, 1996). Such human–animal relationships are believed to develop when a person directs a behaviour at an animal, or vice versa, in a series of repeated interactions over time. With increased repetitions of these interactions, both human and animal become better able to predict the other's behaviour and react in an appropriate manner (Waiblinger et al., 2006; Hosey & Melfi, 2012; Martin & Melfi, 2016). Depending on the nature of the interactions, human–animal relationships can be positive, negative, or neutral (Waiblinger et al., 2006; Carlstead, 2009; Hosey & Melfi, 2014). If a relationship is perceived as positive by both human and animal, then it may, over time, develop into a bond—a mutually beneficial and dynamic relationship between the two individuals (Hosey & Melfi, 2012).

Several criteria must be met before a relationship can be considered a bond. These criteria include the following: (1) the relationship must be between one person and one animal, (2) the relationship must be reciprocal, (3) interaction

must be persistent, and (4) the relationship must promote improved well-being for both parties (Russow, 2002). Many animal keepers and care staff have long recognised the importance of good human–animal relationships; however, it is only recently that research on human–animal interactions, relationships, and bonds—and their effects on animal welfare—have surfaced in the peer-reviewed literature. This delay in research concerning the effect that human–animal relationships have on animal welfare is surprising considering that these relationships have been well-documented in both farm animals (Hemsworth et al., 1981; Waiblinger et al., 2006; Hemsworth & Coleman, 2011) and in zoological facilities (Ward & Melfi, 2015; Patel et al., 2019). Studies on animal behavioural patterns have attempted to identify and explain the effects of different types of human–animal relationships (Hosey, 2013; Hosey et al., 2018; Carlstead et al., 2019) utilising survey methods, including questionnaires—most commonly the Lexington Attachment to Pets Scale (LAPS) (Carlstead, 2009; Hosey & Melfi, 2012; Hosey et al., 2018). However, standardised methods of measuring human–animal relationships are not abundant in the existing literature (Patel et al., 2019) nor is there a standardised method for utilising the existing questionnaires to identify these relationships, their reciprocity, or their effect on bond development (Russow, 2002).

Human–Animal Bonds in Zoos and Aquariums

Studies have investigated human–animal bonds in non-zoo animals in a variety of contexts: between humans and their pet dogs (Payne et al., 2016); between shelter staff and shelter dogs (Bergamasco et al., 2010); in agriculture, between farmers, ranchers, and their animals (Hemsworth et al., 1989; Jago et al., 1999; Rushen et al., 1999; Boivin et al., 2000; Hemsworth, 2003; Carlstead, 2009; Hosey & Melfi, 2012); and between laboratory animals and their caregivers (Bayne, 2002; Rennie & Buchanan-Smith, 2006). However, such studies rarely clearly identify the human–animal bond, which makes it challenging to connect the existence of the bond with the potential benefits for animal welfare. Nonetheless, the aforementioned studies do provide evidence that repeated interactions between a person and an animal may increase the well-being of both individuals (Bergamasco et al., 2010). Hosey & Melfi (2012) discovered that keepers do establish keeper–animal bonds with the zoo animals for which they are responsible, and these bonds can be created across a wide range of taxa (see also Birke et al., 2019; Cerrone, 2019). It is notable that in Hosey & Melfi's (2012) research, these bonds were most prevalent with mammals and less so for reptiles or birds (Cerrone, 2019). This is not dissimilar to the concept of "animal charisma" wherein animals that are more similar to humans in terms of their bio-behavioural traits, such as primates, felines, canines, elephants, and other mammals, are looked upon more favourably than animals that are not as similar, such as rodents, amphibians, and fish (Skibins et al., 2017). Understanding the bonds that develop between caretakers and the animals for which they are responsible, and the factors influencing the development of these bonds, may help animal care facilities to foster an environment where mutually beneficial human–animal bonds can be fostered. This could, in turn, lead to improved husbandry and animal welfare (Alba et al., 2017).

Different groups of people (e.g., animal care staff vs visitors) interact and relate with animals in varying ways that can elicit different responses from each animal. These different responses include a reduced fear response with familiar, uniformed keepers when compared with unfamiliar, non-uniformed keepers in several species, including elephants, giraffes, and tapirs (Martin & Melfi, 2016). Similarly, Wielebnowski et al. (2002) observed that clouded leopards' (*Neofelis nebulosa*) faecal corticoid metabolite levels, a physiological indicator of stress, were higher when the number of unfamiliar keepers increased; conversely, when primary keepers spent more time with the leopards, their faecal corticoid metabolite levels decreased. The study concluded that the clouded leopards recognised individuals despite all keepers wearing the same uniform (Wielebnowski et al., 2002) and, indeed, it can be inferred that the leopards were more comfortable and less stressed in the presence of human caretakers with whom they were more familiar. For this species, fewer keepers per animal may lead to both greater predictability for the animal and greater quality of care (i.e., sufficient interaction). Both factors combine to directly result in an overall improvement in the animal's welfare (Mellen, 1991; Wielebnowski et al., 2002).

In contrast, some studies explored the condition which may occur whereby animals display wary, threatening, or aggressive behaviour towards their keepers (Thompson, 1989; Mitchell et al., 1991; Hosey & Melfi, 2012). Mitchell et al. (1991) reported a significantly higher number of threats from primates towards zoo visitors compared to keepers and observers. Carlstead et al. (2019) used extensive keeper surveys to determine the relationship between the strength of keeper–elephant bonds (KEB) and twice-monthly serum cortisol in African (*Loxodonta africana*) and Asian (*Elephas maximus*) elephants. Significant associations between strong KEB and lower cortisol concentrations, a presumptive indicator of positive welfare, were identified.

Welsh et al. (2022) used a modified LAPS to measure the strength of perceived human–animal bonds between trainers and both dolphins and companion animals in their care. Most respondents perceived themselves to have a bond with a dolphin, although LAPS scores for attachment to dolphins were significantly lower than for companion animals. LAPS scores for trainers were comparable to those for keepers of zoo animals, reflecting a strong attachment to the dolphins with which they work.

Furthermore, human–animal bonds provide benefits for the humans working with animals. The bonds between humans and their pets have been suggested to result in improved mental health, decreased stress, relief for the symptoms of anxiety and PTSD, and overall improved quality of life (Beetz et al., 2012). These mental health effects of human–animal interactions and bonds have been well-studied in companion and therapy animals but are not well-studied in animal care workplaces where humans and animals interact in a professional context such as in zoos and aquariums. Barcelos et al. (2020) created a framework for understanding how activities associated with dog ownership relate to human well-being. It includes 58 dog–human-related activities. This framework links activities with their specific hedonic well-being, life satisfaction, and eudaimonic well-being outcomes. Most activities were reported to improve well-being such as human–dog tactile interaction increasing an owner's self-esteem, and only a minority were mainly associated with negative outcomes such as frustration around destroying an object. Many activities listed in this framework, such as playing with the dog, training, and providing for the dog, could be translated into the types of activities animal care staff are involved in on a daily or regular basis. It could therefore be proposed that these types and/or other relevant activities could also contribute to and improve human well-being in zoos and aquariums.

Overall, these studies provide evidence that while strong human–animal bonds provide mutual benefits to both the caregivers and animals, there is a need for deeper study and further understanding of these effects for animals and their caregivers within zoo and aquarium contexts.

Variables Influencing Human–Animal Bonds in Zoos and Aquariums

As evidenced by the above-mentioned studies, individual animal welfare within these various *ex situ* environments varies, in part, based on caretaker interactions, with positive interactions creating strong human–animal bonds and, subsequently, improving animal welfare. These studies have also demonstrated that several zoological species can identify and bond with individual keepers, thus validating that human–animal bonds can and do exist between a diverse range of species far beyond the traditionally studied domesticated farm animals, pets, and laboratory animals. Positive human–animal interactions, developed through consistency and familiarity between humans and animals, have been highlighted by Cole & Fraser (2017) who found that the attitudes and personalities of keepers and the keepers' knowledge and experience had direct impacts on animal welfare. In their paper, the authors suggest that bringing attention to these human factors will ultimately help to improve and promote optimal animal welfare in zoos and aquariums.

To further understand the variables underlying the creation of caregiver–animal bonds and how those bonds can promote better animal welfare, in the present study, the potential factors and attitudes that influence their formation are investigated. Specifically, our study aims to identify the predictors for caregiver–animal bonds among zoological caregivers using a detailed and previously developed questionnaire adapted for zoo animals. We also hope to better understand the subjective viewpoints of animal caregivers towards human–animal bonds in a professional context and how this may differ from their perspective on the bonds shared with companion animals. By understanding how bonds between humans and animals develop and the drivers which influence the bonds within the context of zoos and aquariums, we hope that caregivers and facilities can become more effective at promoting the development of such bonds. It is hoped that the presence of good quality human–animal bonds will contribute to higher overall welfare for both the animals and the people who care for them.

Methods

Participants

The present study relied on survey analysis to investigate correspondences between categorical variables (i.e., survey questions) and the perceived bond between participants (e.g., zoological caregivers) and the primary species with which they work. The survey was distributed to 201 participants, a group which included caregivers, park managers, veterinarians, and designated animal trainers—as well as those with multiple roles—working at six affiliated zoological institutions owned by SeaWorld Parks & Entertainment, including SeaWorld San Diego ($n = 91$), SeaWorld San Antonio ($n = 28$), SeaWorld Aquatica™ ($n = 1$), Busch Gardens Williamsburg ($n = 1$), SeaWorld Orlando ($n = 34$), and Discovery Cove® Orlando ($n = 44$); two were unidentifiable as they labelled their facility as SeaWorld Parks and SeaWorld Parks-SWST. Data were collected in 2020, and

demographics included sex, age, years of experience, and owning a pet.

A total of 201 participants returned the survey, of which 127 (63.18%) were female, 69 (34.33%) were male, and five participants (2.49%) preferred not to say. The participants were, overall, an experienced group, with many of them (n = 108; 54.3%) having worked more than 10 y in zoological institutions. For the remainder of the group, 23.1% worked from 6 to 10 y (n = 46), 21.1% from 1 to 5 y (n = 42), and 1.5% (n = 3) had less than 1 y of experience.

A questionnaire was designed to gather each participant's opinions and attitudes concerning the importance of a human–animal relationship and/or bond for animal management. In addition, if participants had developed either a human–animal relationship or bond, the survey asked questions about their relationship with specific animals both within the work environment and outside of the work environment (e.g., with a pet).

The following terms used within the survey were defined as follows:

- *Human–Animal Relationship* – A relationship which develops from a history of interactions between the same two individuals so that both human and animal come to be able to predict aspects of each other's behaviour.

- *Human–Animal Bond* – A persistent, positive reciprocal relationship that promotes an increase in well-being for both parties.

Measures

To better understand the survey structure, the questions were structured covering three main sections:

1. *Human–Animal Relationships & Bonds* – This section contained questions regarding the participant (e.g., sex, age).

2. *Bonds* – This section contained questions designed to determine with which animal(s) the participant had contact within the zoological institution (e.g., which species [taxa] do you currently work with?).

3. *Animal Companion* – This section contained questions designed to understand how the participant interacts with the companion animal (e.g., I play with my pet quite often).

The first section, titled "Human–Animal Relationships & Bonds," asked general questions concerning the respondents' views on human–animal relationships and the ability of these relationships to influence their level of care and animal welfare. Respondents were also asked basic personal information (e.g., sex, age), their professional role, the number of years working, with which species they worked and had most knowledge and expertise regarding, and the experience they have with one specific animal, including the type of contact with such animal, frequency of contact, and how—if a perceived bond exists—it may mutually benefit the caregiver and animal. For respondents who did not feel a shared bond with an animal, the respective follow-up questions could remain blank.

Respondents were also asked to rate general statements regarding the importance of human–animal relationships in animal management based on a scale from Strongly Agree to Strongly Disagree. Examples of statements included the following:

- An emotional relationship between myself and the animal can impair my ability to put their welfare first.

- The relationship I have with the animal in my care provides me with special insight into their needs.

The second section of the survey, titled "Bonds," went into greater detail about the strength of existing bonds between both caregiver and species at the park, as well as an existing bond between the caregiver and a companion animal outside of work (i.e., a pet). For respondents who did not feel a shared bond with an animal, either at work or elsewhere, the respective follow-up section could be skipped. However, all respondents were required to answer questions pertaining to their relevant demographics that could be deemed personal, including sex, age group, years in profession, years owning their pet (as applicable), and their opinion of the professional appropriateness of human–animal bonds.

The third section, "Animal Companion," was broken into two portions (A & B). In Portion A, respondents who identified a bond with a specific animal at work could rate a series of statements from Strongly Agree to Strongly Disagree. Examples of questions included the following:

- I believe that loving this animal helps me stay healthy.

- I consider this animal to be a friend.

In Portion B, respondents who identified a bond with a personal companion animal outside of work could rate a series of statements from

Strongly Agree to Strongly Disagree. Examples of questions included the following:

- I consider my pet to be a friend.
- I feel that my pet is a part of my family.

The data from the surveys were then compiled into a spreadsheet for analysis.

Statistical Analysis

The goals of the analysis were to describe the types of human–animal bonds formed and to determine what factors influenced their establishment. To accomplish this, we first performed an Exploratory Data Analysis (EDA) of the variables (questionnaire answers) to verify data consistency and distribution. Next, the demographics of each respondent, including the sex, age class, time working at a zoological facility, pet, and animal species, were determined. A Multiple Correspondence Analysis (MCA) was then used to identify the most relevant questions for categorizing participants by answers and associations between survey questions. Finally, chi-square tests were performed to examine the relationship between animal species and development of a bond, sex, age, time working in a zoological institution, and owning a pet.

The Hierarchical Clustering on Principal Components (HCPC) of the MCA dimensional results was then performed to identify if any group and participant clustering could be detected within the answers. Finally, a sentiment analysis was used to reveal the main emotions and sentiments contained within the answers to open-ended questions. The sentiment analysis is a computational method for natural language processing and text mining that has been widely used to quantify the emotional valence in large datasets (Liu, 2020). Although sentiment analysis is not a hypothesis testing method, its use provides a description of the main emotional attributes within open-ended questions. The answers were evaluated using the sentiment lexicon to identify the affective states related to each topic. All analyses were done in *R* language, an environment for statistical computing (Version 4.1.2; R Foundation for Statistical Computing), and packages 'FactoMineR' (Le et al., 2008) for MCA and 'Syuzhet' (Jockers, 2015) for sentiment analysis. Significance was set at $p \leq 0.05$.

Results

Due to the highly varied contribution numbers between parks—only one in some, a couple undetermined, and many in other parks—no sex ratio and or age class ratio could be established to determine any bias. Of the 201 respondents, 153 (76%) said that they had a bond with a specific animal at a SeaWorld Park, and 46 (24%) said they did not. The correlation—or lack thereof—between each variable and the existence of human–animal bonds (HABs) are broken down below.

Sex

No significant difference between male ($n = 69$) and female ($n = 127$) respondents in the developments of HABs was detected. Although not significant, females indicated that they develop a bond more often than males ($n = 99$; $\chi^2 = 2.1546$, $df = 1$, $p = 0.1421$). Finally, the proportion of females responding to the questionnaire was significantly higher than expected ($\chi^2 = 17.163$, $df = 1$, $p = 0.0001$).

Age Classes

Ages were divided into the following categories: below 30 y, 30 to 50 y, and over 50 y. The most prevalent age group was 30 to 50 y ($n = 117$ participants; 58.79%), followed by less than 30 y ($n = 60$; 30.15%) and more than 50 y ($n = 22$; 11.06%). Age classes had an unequal distribution ($\chi^2 = 67.758$, GL = 2, $p = 0.0001$). While the 30 to 50 y group was overrepresented, age group did not affect the likelihood of developing a bond with the animals under their care ($\chi^2 = 3.6327$, $df = 5$, $p = 0.16261$).

Time Working at a Zoological Facility

The proportion of participants who successfully established a bond was significantly higher with experience ($\chi^2 = 55.600$, GL = 3, $p = 0.0001$). The time that the caregiver had been working at a SeaWorld Park location did not indicate the presence or absence of a bond with the animals ($\chi^2 = 0.3182$, $df = 5$, $p = 0.9566$)—that is, bonds are expected more than 80% independently of the group.

Pets

The data were analysed to determine if owning a pet was predictive of forming a HAB. Of the 201 respondents, 173 (86%) stated they have a pet, and 24 (14%) stated they do not. Of the 173 respondents with pets, 133 (77%) formed a HAB with an animal at a SeaWorld Park. However, currently having a pet did not have an effect on developing a bond with an animal ($\chi^2 = 0.03845$, $df = 3$, $p = 0.8446$). Of the 24 respondents without a pet, the majority ($n = 19$; 79%) still formed a HAB with an animal at their SeaWorld Park.

Animal Species

There was a significant relationship between bond formation and animal species ($n = 201$; $\chi^2 = 107.36$, $df = 6$, $p < 0.001$). Caregivers exhibited a tendency to develop a bond regardless of

animal species (Table 1). However, the HABs were mainly influenced by participants who reported caring for marine mammals (n = 95; 98.95%), birds (n = 26; 96.29%), and fish (n = 15; 71.42%). Participants who did not report a bond with a species with which they work (n = 37; 74%) presumably did not establish HABs.

Opinions on Human–Animal Relationships and Bonds

Regardless of whether a caregiver developed a bond with an animal, there was an overall positive attitude towards the importance of developing bonds for both animal welfare and animal care purposes. For example, 54% of respondents strongly disagreed and 30% disagreed with the statement, "An emotional relationship between myself and the animal can impair my ability to put their welfare first." Additionally, 53% of respondents strongly agreed and another 35% agreed with the statement, "The relationship I have with the animal in my care provides me with special insight into their needs." Respondents also overwhelmingly agreed (91%) that their colleagues have developed a bond with an animal, and 83% of respondents disagreed that animal care professionals are "too busy to develop a bond with the animal in their care." Overall, most caregivers indicated that a HAB does not impair animal management or the well-being of the animal but, rather, helps improve animal welfare. For individuals who expressed having a HAB, the bond also provided reciprocal/mutual improvement of their well-being. Of the respondents who had a HAB, 95% agreed with the statement, "Working with this animal adds to my happiness." Even though all participants stated that they found it appropriate to develop a bond with the animals under their care, 52% disagreed that they did not consider the "animals under their care their friends," and 85% of the respondents considered their pets as friends.

Multiple Correspondence Analysis

Given the number of variables (questions) and possible combinations, an MCA was performed to reduce the number of variables (i.e., questions), selecting only those that were more relevant for interpreting the data. The MCA analysis identified 27 questions that had significant dimensions that were used to define groups of respondents identified by the statistics in Table 2 (i.e., HCPC).

Animals at Work

The behaviour of respondents towards animals within their care is reflected by the way the respondents answered each of the animal bond questions (Table 2). For example, wanting to talk about and show pictures of their animals indicates a close association with their animals. In addition, they overwhelmingly agree (77%) that close contact with animals contributes to their own well-being. And in contrast with pets, professionals appeared not to be interested in establishing the same level of connections as they would with a pet by answering that they strongly disagreed with the statement, "I confide in this animal" (43%), and that they strongly disagreed that they considered the animal to be their "best friend" (42%). The professional relationship with the animal at work includes a majority agreement with the statement that animals deserve as much respect as humans do (Agree = 28%; Strongly Agree = 39%).

Companion Animals

Like animals at work, the relationship with companion animals or pets is also shared with others through showing pictures of the companion animal; 75% strongly agree with this statement. Companion animals were also reported to improve human welfare through feelings of happiness and health benefits. Our survey participants have a personal relationship with their

Table 1. Number of human–animal bonds by species

Species	Bond	No bond	Total
Terrestrial mammal	3	0	3
Marine mammal	95	1	96
Fish	15	6	21
Reptile	2	1	3
Bird	26	1	27
Cephalopod	1	0	1
No species reported	13	37	50
Total	155	46	201

Table 2. Questions identified by Multiple Correspondence Analysis (MCA) as significant for defining the variation among participants in the Human–Animal Relationship survey. All results were significant at the $p < 0.005$ level.

Question	Strongly disagree (%)	Disagree (%)	Agree (%)	Strongly agree (%)	Null (%)
Animals at work					
I often talk to other people about this animal.	4	7	30	37	21
This animal and I have a very close relationship.	6	8	35	28	22
I consider this animal to be a great companion.	12	19	23	22	23
This animal makes me feel happy.	1	1	24	53	22
Working with this animal adds to my happiness.	1	2	20	55	21
I consider this animal to be a friend.	18	20	25	13	23
Quite often I confide in this animal.	43	21	12	2	22
Quite often, my feelings towards people are affected by the way they react to this animal.	30	17	24	7	22
I enjoy showing other people pictures of this animal.	4	3	27	44	21
I think this animal is just an animal.	24	30	13	10	22
I feel that this animal is a part of my family.	23	17	25	11	23
Animals deserve as much respect as humans do.	2	9	28	39	22
I believe this animal is my best friend.	42	22	10	1	23
Companion animals					
My pet understands me.	9	23	34	16	17
I believe that loving my pet helps me stay healthy.	1	5	27	48	17
Owning a pet adds to my happiness.	1	1	10	71	17
I would do almost anything to take care of my pet.	0	2	19	60	18
I play with my pet quite often.	1	5	14	62	18
I think my pet is just a pet.	38	26	14	4	18
I believe my pet is my best friend.	30	21	18	11	19
Quite often I confide in my pet.	26	24	19	11	19
My pet knows when I'm feeling bad.	8	18	31	24	18
Pets deserve as much respect as humans do.	2	9	30	41	18

companion animal, and many did not feel their companion was "just a pet" (Disagree = 26%; Strongly Disagree = 38%), although participants largely did not agree that their pet was a "best friend" (Disagree = 21%; Strongly Disagree = 30%). Strong agreement with statements such as they would "do anything to take care of my pet" (60%) and "play often" (62%) indicated that the welfare of their companion animal was important. Despite these close connections, no consensus among participants was found for the question of pets understanding their owner.

Hierarchical Clustering on Principal Components

Three dimensional clusters were detected within answers to questions identified by the MCA analysis (Figure 1). The first cluster was characterised by participants who have a companion animal and have a personal relationship with it. They enjoyed sharing the relationship with others by showing pictures, did almost anything for their pet, strongly disagreed about not being attached to their pet, reported feelings of happiness, interacted by talking to it, and considered their pet to be a great companion. Regarding animals at work, the same respondents also felt happy interacting

with them and considered that the animals in their care deserve as much respect as humans.

The second cluster was characterised by participants who did not indicate they had a companion animal. These participants indicated that they had minimal interactions with the animals at work, with no feelings of happiness while interacting with them. These participants did not report a close relationship. However, this group agreed that the animals deserve as much respect as humans and strongly disagreed that "the animals are part of their families."

The third cluster was characterised primarily by fish and reptiles professionals with companion animals. These participants disagreed that their companion animal could understand when they were feeling bad, were divided about showing pictures of their pet, and few felt that showing these pictures provided any joy. These participants did not talk about their pet very often, and the feelings of this group were not affected by the way people reacted to their pet. However, a personal relationship with their companion animal was observed in this cluster by the participants considering their pet to be part of the family. These participants were neutral about whether colleagues had an animal bond and if judgements about an animal's welfare could be impaired by having an emotional relationship with the animal.

Sentiment Analysis

Benefits of Human–Animal Bonds for the Respondents—A sentiment analysis found that the overall perception of bonds was positive. The

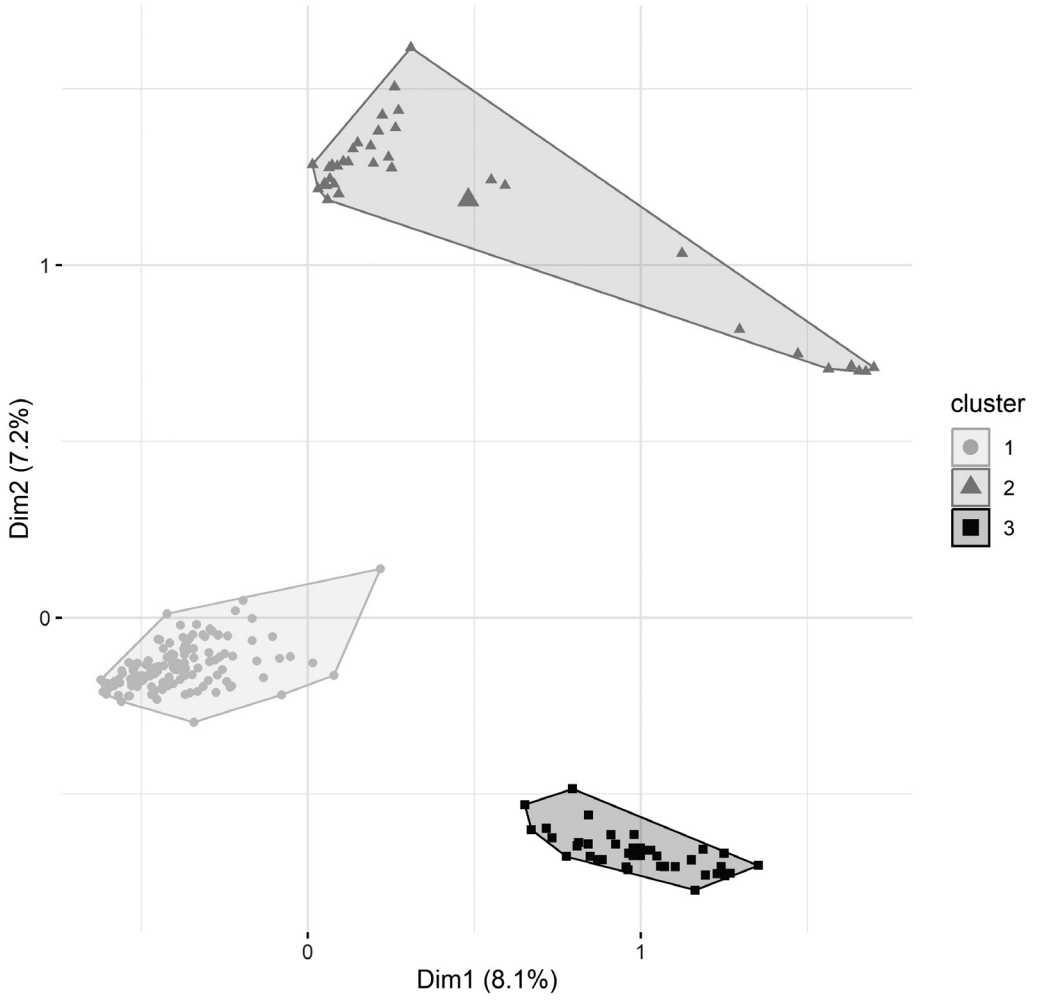

Figure 1. Dimensional clusters detected within the answers to questions identified by the MCA analysis

emotion for Question D revealed trust, joy, and anticipation. Negative sentiment was observed in answers with fear-related words (e.g., danger, hurt, spook, aggressive, grieve). Participants shared a wide variety of comments reflecting their perceptions of a bond. Impressions of sentiments shared included their ability to understand the needs and behaviours of individuals better before they present a danger to themselves or others in their environment; built a bond based on trust as to not hurt or spook the animals; as well as animals brought smiles to the caregivers' faces, made days more enjoyable, and helped them heal and look forward to their future.

Perceived Benefits of Human–Animal Bonds for the Animals—The most observed sentiment in animals by participants was trust followed by anticipation. These participants described feelings which indicated a positive relationship with their animals. They identified feeling "joy" while interacting with their animals by the sentiment analysis, which is supported by the general tone of the answers provided for questions relating to "happiness." The sentiment analysis highlighted that being trusted by the animal was one of the main aspects of the HAB. Participants shared a wide variety of comments reflecting their perceptions of a bond. Paraphrased sentiments shared included the perceived ability to perform difficult husbandry behaviours without trouble; to notice slight behavioural changes that may stem from a health issue; and that the interactions provided enrichment to their lives, made the animals more comfortable, or made the animals more successful in training sessions. Caregivers also reported having observed outward signs of the animals having fun, being excited to interact with them, and finding the relationship enriching.

Discussion

Across the board, the animal caregivers surveyed in the present study expressed positive attitudes towards human–animal relationships and bonds and the benefits that they both have on animal care. Moreover, the respondents' indication that these bonds benefited their own happiness and well-being in addition to the animal's well-being is further evidence of not only the existence of human and animal bonds but also reciprocity in bond formation. This aligns with previously reported mutual benefits for animal and care staff (e.g., Bergamasco et al., 2010; Carlstead et al., 2019). Overall, this study contributes to an evidence base which supports that strong HABs provide mutual benefits to both the keepers and animals living in professional care facilities (e.g., please see Brando, 2010, 2012, 2022; Brando et al., 2018; Allard & Bashaw, 2019; Burghardt, 2020; Gibson, 2020; Hosey & Melfi, 2020).

In accordance with the results of a similar study conducted with elephants and their caregivers (Carlstead et al., 2019), neither caregiver sex nor age had any effect on the development of a bond. In addition, previous experience developing a HAB with a companion animal was not necessary for bond development. While studies in zoos and aquariums with animal care staff are lacking, a few studies have found that animal charisma could have a positive impact on attitudes towards conservation and animal welfare efforts, suggesting that humans are predisposed to liking species on the basis of shared bio-behavioural traits (Batt, 2009) and that charisma trumps conservation status (Colléony et al., 2017). However, our study shows that bonds can be developed with a wide variety of species, including those not typically considered to be charismatic.

It is worth nothing that for our analyses no specific attention was given to (1) sex differences, (2) tasks staff are involved in with animals in their care, (3) the participant's job role as most participants were animal caregivers and not managers or veterinarians, or (4) time that care staff had with animals. Future studies would benefit from more specific, in-depth, and longitudinal research on how bonds are formed, time budgets, types of behaviours and interactions contributing to a bond, and effects of personality of both care staff and animals on bond formations.

Time Spent with Animals

Previous work with turtles (Alba et al., 2017) showed that care staff who had worked the longest time with the turtles and who regularly participated in behavioural training were the most likely to form the strongest bonds. While we also found a link between the time a person was employed as a caregiver and bond development, it was not the most influential variable for human–animal bond development. In our results, we found that the animal's taxonomic class and whether a caregiver had previous experience developing a bond with another animal or not were significant determinators of perceived human–animal bonds.

While this survey did not ask specific questions on the nature of care activities, time spent on said activities, and specific types of work, it is assumed that traditional tasks were conducted around and with the animals, including cleaning, feeding, preparing and distributing food, and, more often today, the preparations and provisions of enrichment and interaction through positive reinforcement training, as well as behaviour observation, educational presentations and interactions, and even research (Brando & Buchanan-Smith, 2018). Daily training,

husbandry, and caregiving create opportunities for keepers to establish relationships with zoo animals, which can lead to bonds (Carlstead, 2009). While people may have varied amounts of time and opportunity to interact with animals, the quality of interactions (e.g., positive reinforcement training, providing enrichment, or conducting education and research activities together) are likely more important factors in developing good relationships. In zoos and aquariums caring for different species, caretakers often see differences in time and opportunity to engage with animals across different species which may impact their perception of their bond with the animals. For example, in some facilities, marine mammals may have three to five daily training sessions as well as presentations and other activities with their primary caregivers (Brando, 2020, 2022), while fish and reptiles may not require daily training or other forms of direct interaction at all depending on their husbandry requirements. This is consistent with published findings which suggest that there are higher reports of bonds in commonly trained mammals such as primates and carnivores (Hosey & Melfi, 2012), with a lack of similar findings for fish and reptiles in the published literature.

The increase in identification of bonds with time spent with the animal could also indicate that the quality of interactions and the perceptions of necessity and appropriateness are likely to drive the potential formation of relationships, not just time investment. The quality of interactions between mammals and caregivers allows for bonds to develop more easily, as well as the species and what types of activities are enjoyed together. There is a long history of training mammals, including marine mammals, to voluntarily participate in their care through positive reinforcement training (Pryor, 1975), and such methods have been introduced for birds such as parrots (Heidenreich, 2007). Most of the fish in this study were sharks, which often receive regular positive reinforcement training, including target training, visitor interactions, and feeding sessions, that potentially contributed to the development of a bond with these species.

Species

Regarding the species, more caregivers indicated they had a bond with mammals—predominantly marine mammals. However, it is essential to consider that as the present study was conducted at SeaWorld Parks, the focus was on institutions with a predominant focus on marine mammals—hence, the skew in our results towards caretakers responsible for such species. Additionally, at some of the largest parks in the United States and, indeed, globally, resource availability (e.g., staff numbers, time available per animal for training and other activities, etc.) may be greater than at smaller animal care facilities. It is worth noting, therefore, that only three terrestrial mammal caregivers completed this survey. Furthermore, more respondents were caretakers responsible for birds and fish when compared with reptiles and cephalopods.

Regarding marine mammals, our results align with Welsh et al. (2022) in which a modified LAPS was used to measure the strength of perceived human–animal bonds between trainers and both dolphins and companion animals in their care. Like our study, Welsh et al.'s respondents perceived themselves to have a bond with a dolphin, although LAPS scores for attachment to dolphins were significantly lower than for companion animals. LAPS scores for trainers were comparable to those for zoo animals. While interactions with different species of mammals are not per definition easier, many reptiles may spend most of their time hiding or resting, and fish are often in larger quantities in tanks. Thus, setting up interactions with these species is often more time consuming, especially when diving or snorkelling to interact with the animals (Williams, 2020), making one-to-one interactions with caretakers more cumbersome, potentially hindering creation of a bond.

Contrary to these assumptions, our results showed that people often bonded with fish, which may be associated with an increase of shark training for husbandry and educational purposes in zoo facilities (Grassmann et al., 2017; D'Cruze et al., 2019). As our study did not differentiate between the different taxa of fish, such as noting differences between those who work with cartilaginous fish and those who work with bony fish, it is possible that there are differences not noted. While previous research found that creating human–animal bonds with closer relatives, such as mammals, is easier than with more distant relatives, such as birds or fish (Cerrone, 2019), our study suggests that time spent with the animal and predisposition of the person for creating such bonds is a more important variable when developing a bond than relative proximity. This survey did not enquire with which taxonomic class the previous experience of a bond with another animal was, nor if the animals in their care had already experienced bonds with other people. The previous experience with a bond of any kind it seems, as no specifics were collected, was a stronger explanatory variable than all the other personal variables. It is likely that readiness and predisposition to develop a bond is higher when a person already has experienced this in a positive manner with another animal.

Previous Experience with Human–Animal Bonds
While not researched specifically, animals that have experienced positive bonds with people, such as marine mammals and birds in presentations or as ambassador animals, as well as reptiles and sharks that receive training and interaction, are likely to be more open to development of bonds with a new care staff member if the same methods and approaches are used as suggested by Bassett & Buchanan-Smith (2007). Likewise, a human caretaker who has previously developed a bond with an animal may therefore be more likely to use techniques and approaches that are essential in the formation of a bond with a new animal. Training an animal to participate in their care through positive reinforcement (e.g., to take a voluntary blood sample) not only turns the experience for the animal into a positive one, it also allows multiple trainers to perform this behaviour with the same animal and replicate creating these opportunities with multiple animals (Desportes et al., 2007). Good relationships allow for a multitude of different voluntary behaviours to be trained over time with many different animals in a group such as gating, tube feeding, or x-rays (Brando, 2010).

Our study highlights the importance of the previous experience of a bond into being predisposed to develop a new bond on the side of the human caretaker. The aspects that influence bond development are still unclear, but the fact that our data show that people also developed bonds with birds and fish highlights that time spent caring for animals, as well as animals and care staff coming together for training sessions, all contribute to a perceived bond. The data also beg the question about how caregivers develop bonds with non-mammalian animals to improve the animals' well-being as well as their own. The fact that a higher percentage of participants felt comfortable admitting they consider their pet to be a friend, while a much lower percentage of participants felt the same about animals under their care professionally, even though many thought bonds are professionally appropriate, could also be related to the amount of time they spend during their day with those animals. Furthermore, in the zoological community, people are traditionally wary about anthropomorphizing animal behaviour. Having wild animals as "friends" might be seen as one step too far, with the idea that it might not be entirely professional to admit such a statement. It may be considered that wild animals "should be and stay wild" (Brando, pers. obs., 2004).

Positive reinforcement training of animals in zoos did not become commonplace until the 1950s, around which time attitudes surfaced suggesting that zoos should focus on creating natural habitats rather than artificially encouraging desired responses from animals (Fernandez & Martin, 2021). This attitude is still prevalent in many facilities that do not consider animals as continually learning or that care staff can have a big impact on animals' lives. How work is carried out—for example, using positive reinforcement rather than chemical or physical forms of restraint—can make a big difference on how the animals perceive the people who care for them. Fortunately, contemporary zoos and aquariums recognise the human dimension in animal welfare (Mellor et al., 2020) and the importance of attention to learning and training (Melfi et al., 2020), including habituation to human presence for many of their voluntary behaviors and a 24/7 across lifespan approach to human–animal interactions (Brando & Buchanan-Smith, 2018).

It may also be that care staff compare the animals they care for in their professional life with the animals in their care at home (e.g., a domesticated animal like a cat or dog vs an iguana or macaw). However, many facilities today also house a wide variety of domesticated species or have combinations of domesticated and wild species working together such as dogs and cheetahs. Today, many animals have roles in zoos, such as an ambassador or exhibit animal, and zoos have goals such as species conservation and education. The combination of a zoo's purpose, philosophy, and traditions likely affects approaches and perceptions towards being friends with the animals in their care more than their ability to have or express that they see their animals as friends.

Improving human–animal bonds through a wide variety of activities may not only increase animal welfare but may also reduce staff turnover. Considering how much experience hiring managers want prospective care staff to have when they apply, including previous experiences of a bond with an animal could not only facilitate bond formation with animals in their care within the new facility but also increase happiness and, in turn, job satisfaction for the human caretakers.

Future research will benefit our progressing the understanding of human–animal bonds through, for example, an understanding of time budgets per animal, the types of activities conducted, and caregiver perceptions of their animal bonds. Such research would aid in a better understanding of the nature of human–animal bond formation in zoos, aquariums, and other facilities responsible for animal care. As human–animal bonds are both beneficial to the welfare and well-being of caretakers and all animals, not only mammals but also lesser studied species such as fish and reptiles, all stakeholders involved in animal care will benefit from building positive bonds with each other.

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