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STAFF PERCEPTIONS OF RESPONSIBILITY AND IMPLEMENTATION OF COGNITIVE ENRICHMENT FOR NON- HUMAN PRIMATES IN ZOO SETTINGS

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STAFF PERCEPTIONS OF RESPONSIBILITY AND IMPLEMENTATION OF COGNITIVE
ENRICHMENT FOR NON-HUMAN PRIMATES IN ZOO SETTINGS

A Thesis

Presented to

The Graduate Faculty

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In Partial Fulfillment

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Master of Science

Primate Behavior and Ecology

by

Ember Nevada Toth

May 2023

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Graduate Studies

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ABSTRACT

STAFF PERCEPTIONS OF RESPONSIBILITY AND IMPLEMENTATION OF COGNITIVE ENRICHMENT FOR NON-HUMAN PRIMATES IN ZOO SETTINGS

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In zoos, caregivers have considered enrichment as vital for their animal collections' physical health and development. Since primate species are endangered and continue to decline in numbers in their natural habitat, zoos are steadily becoming the only places we can view and learn about them. In today's zoos, cognitive enrichment—which falls into overlapping categories of enrichment and does not yet have a universally accepted definition—is either absent or inconsistently offered. Providing challenges to stimulate cognitive well-being has been found to influence the overall welfare of captive primates. Cognitive enrichment is considered very important according to zookeeper surveys but is not provided often for captive animal populations. This study aimed to gather information about who is perceived as the responsible party in providing cognitive to primates enrichment in North American, AZA-accredited zoos. I found that direct-contact staff were perceived as responsible for most tasks regarding cognitive enrichment implementation. I also identified some trends that suggest perceptions about cognitive enrichment might differ based on job classification and amount of professional experience. The results of this study identified that there are differences in perception between roles, and I suspect that this is an issue which needs resolved, as a resolution could result in improved enrichment supply and therefore animal welfare.

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CHAPTER I

INTRODUCTION

Cognition and cognitive enrichment in zoos have become an increasingly studied subject within animal behavior and welfare research over the last decade. The literature published over this time has defined the term “welfare” in a multitude of similar, yet distinct ways. The earliest English definition of “welfare” comes from the Middle English, which literally means “a well-faring” for someone (Maple & Perdue, 2013). More recently, “wellness” was considered synonymous to both “welfare” and “well-being” (Maple & Perdue, 2013). Today, the Association of Zoos and Aquariums (AZA) defines animal “welfare” as “an animal’s collective physical, mental, and emotional states over a period of time... measured on a continuum from good to poor” (AZA, 2022b).

Research from zoos as well as studies reporting zookeeper surveys have shown that globally, cognitive enrichment and cognitive challenges are considered an important form of enrichment to offer zoo animals to maintain good welfare (Hall et al., 2021; Maple & Perdue, 2013; Meehan & Mench, 2007). This is interesting, since zoo employee responses showcased a lack of consensus about which enrichment activities were considered cognitive enrichment (Clark, 2017; Hall et al., 2021). For example, in a recent survey, Hall et al. (2021) asked participants to categorize enrichment into either “cognitive enrichment,” “not cognitive enrichment,” or “not enrichment,” and none of the provided enrichment objects/scenarios were unanimously sorted into any one category. Therefore, there seems to be a noticeable disconnect between the importance of cognitive enrichment and its use in zoos.

Likewise, many publications identify an array of measures used to evaluate welfare, none of which are standardized in the literature. The Five Freedoms Model evaluates welfare based on

factors such as a lack of anxiety, pain, fear, thirst, hunger, and distress (Mellor & Beausoleil, 2015). The continuation of that model—the Five Domains Model—has since been adapted by the World Association of Zoos and Aquariums (WAZA) as their welfare guide (Binding et al., 2020; Mellor & Beausoleil, 2015). The AZA Animal Welfare Committee (AWC) does not subscribe to a model or provide a direct set of welfare evaluation standards but encourages their institutions to stay current on recent findings in the welfare literature (Silver, 2021). Other institutions have evaluated welfare using behavioral proxies (Fraser, 2009), comparing success rates at tasks (Huskisson et al., 2021), measuring hormones or body condition (Binding et al., 2020), and even evaluating social interactions when enrichment is absent/present (Jacobson et al., 2019). Though there are a multitude of evaluation methods, they are not standardized across zoo environments and tend to vary between institutions and research studies.

Additionally, many articles note the use of enrichment to conduct research or exercise cognitive skills. However, researchers do not explicitly label that enrichment as cognitive enrichment (cognitive research/experimental tasks; MacDonald & Ritvo, 2016; computer tasks; Egelkamp et al., 2016). Employee reports from global zoo staff provide mixed information on how often cognitive enrichment is offered to their animals (Hall et al., 2021), which may potentially be a product of the lack of consistent labelling. Reports were then dependent on what each zoo (or each individual) considered to be “cognitive enrichment.” As the AZA does not appear to have a captive welfare or enrichment knowledge requirement for zoo employees to have before being hired (AZA, 2022d), it cannot be expected that all zoo staff, regardless of animal contact, have similar or standardized knowledge of either subject.

The AZA Accreditation Standards staff section only indicates that zoo personnel should be “qualified,” though that term is vague. Additionally, there are not differentiated sets of prerequisites based on whether the employee is in animal care or management (AZA, 2022d).

This does not mean that cognitive enrichment or cognitive welfare are being overlooked. However, those who work as zookeepers tend to be time-poor (Hoy et al., 2010) and underpaid (Bunderson & Thompson, 2009), so their motivation for being in this field is likely based on passion for animals rather than economic status or reward (Bunderson & Thompson, 2009). This may not be true of other positions at a zoo whose primary functions do not put them in animals' spaces often or at all. This could suggest a drastic difference in what knowledge, priorities, and motivations zoo staff with different types of jobs have regarding cognitive enrichment and welfare for primate species.

Therefore, the goal of the current study was to investigate cognitive enrichment provisioning of zoo-living primates from an institutional scope. Reports on current opinions about cognitive enrichment, and on the perception of responsibility for primate cognitive enrichment from AZA-accredited zoo employees were used for this purpose. The results identified a potential barrier, namely perceptions about responsibility and influence that differ by job classification, that may have larger consequences to the consistent provisioning of cognitive enrichment to primates. This study can begin informing zoos of areas that need improvement to ensure zoo-living primate welfare, as the perceptions about who is responsible for the regular and consistent provision of cognitive enrichment was shown to place reliance on direct-contact staff. The study results have implications that can be used to help accreditation agencies, zoo staff, and zoo-based welfare and cognition researchers in North American zoos identify what next steps to take to make positive changes for the staff, and therefore the primates, in these institutions.

CHAPTER II

LITERATURE REVIEW

Captive settings come in many different shapes and sizes, ranging from big reserves and sanctuaries to zoos and aquariums. While the public loves seeing their favorite wild animal up-close when they visit the zoo, the nature of animals living in human-managed environments requires special considerations to be made for their care (enrichment and stereotypes, Swaisgood & Shepherdson, 2005; history and review of animal welfare assessment, Fraser, 2009). In previous studies on captive animals, animals housed in barren environments showed increased stress and self-directed behaviors (Lecorps et al., 2021; Maple & Perdue, 2013), so providing a dynamic, complex, and interactive living situation is key to avoid unduly stressed animals (Clark, 2017; Swaisgood & Shepherdson, 2005). Animals exhibited decreased stress and abnormal behaviors with the presence of enrichment (e.g., habitat design, food puzzles, tasks, training) provided in enclosures (cognitive enrichment reviewed by Clark, 2017; Meehan & Mench, 2007). Patrons of zoos have also been shown to support zoos more when the animals are not exhibiting stress or abnormal behaviors (reviewed in Learmonth et al., 2021). However, animals may still face struggles in evolutionarily and ecologically abnormal contexts, even when such considerations are taken.

Welfare

Captive environments have become the home for many species of primate over the years. Though some may think a life in a zoological facility is preferable to the harsh conditions of the wild, chronic stress and depressive-like states have previously been observed in animals living in captive settings, including zoos (Hosey, 2005; Lecorps et al., 2021). Because there are both positive and negative aspects to wild animals living in zoos, many zoological institutions that house primates have prioritized managing these factors to maintain and improve animal welfare

(Binding et al., 2020; Hosey, 2005). Some positive aspects of a zoo environment include the opportunity for minimized stress/negative emotions and maximized opportunity for positive emotions (Maple & Perdue, 2013), the ability to provide varied enrichment (Ward et al., 2018), welfare research dedicated to improving animal well-being (Binding et al., 2020; Ward et al., 2018), and guaranteed access to food/water/shelter for all animals (Hosey, 2005; Howell & Cheyne, 2018). Some negative aspects are decreased opportunities to perform the full repertoire of species-specific behaviors (Hosey, 2005; Maple & Perdue, 2013), boredom (Maple & Perdue, 2013), potential obesity (Hosey, 2005; Maple & Perdue, 2013), artificial environments/restricted space (Hosey, 2005; Razal & Miller, 2019), a reliance on human management (Mellor & Beausoleil, 2015), and the presence of zoo visitors (Hosey, 2005), though there is mixed research about this last factor (reviewed by Sherwen & Hemsworth, 2019). Essentially, the zoo staff's focus in captivity is to help the animals to live well while the focus in the wild is simply for an animal to survive (Maple & Perdue, 2013).

Welfare is a term that is regularly used in the animal care field (whether that be zoos, sanctuaries, or laboratories) as well as within accreditation bodies like the British and Irish Association of Zoos and Aquariums (BIAZA; Maple & Perdue, 2013), the WAZA (Maple & Perdue, 2013) and the AZA (2022d). However, welfare is inconsistently defined (Fraser, 2009; Hau & Schapiro, 2007). One definition states that good welfare should be measured by similarities to wild-type behaviors and experiences (reviewed by Howell & Cheyne, 2018), but elsewhere “welfare is achieved when positive mental experiences are promoted and...negative mental experiences are minimized” (Frederickson, 2019, p. 3). In some cases, welfare is “measured on a continuum from good to poor” conditions that refer to the animal's physical, mental, and emotional states (AZA, 2022b), whereas other times “animal care” is used

synonymously with welfare (Maple & Perdue, 2013). Beginning about 20 years ago, “wellness” became considered synonymous with “welfare,” and “well-being” gained popularity (Hau & Schapiro, 2007; Maple & Perdue, 2013). This specific view of welfare has produced multiple initiatives and projects aimed at improving animal well-being. An example is the wellness research program offered by the University of California at Davis College of Veterinary Medicine (Maple & Perdue, 2013) and the San Francisco Wellness Initiative (founded in 2011), whose goals are to discover new ways to improve the living conditions of zoo animals (Maple & Perdue, 2013).

However, there are other views of welfare that have long been considered the standard for measuring captive animals’ health and mental state. For example, the Five Freedoms model (Mellor & Beausoleil, 2015) introduced in 1979 had a main goal of evaluating welfare based on measurable variables. This model, therefore, determines “good” welfare to be any situation where an animal is free from measurable “poor” welfare states, referred to as negative affective states. “Poor” welfare states (as we understand them now) are limited to thirst, hunger, anxiety, fear, pain, and distress (Mellor & Beausoleil, 2015). Subsequently, the Five Domains model (FDM) used the Five Freedoms Model as its foundation. Although the FDM mirrored the negative affective states from the Five Freedoms as its focus, in the late 1990s, scientists clarified the affective states encompassed within the term “distress.” Originally designed to avoid negative welfare states in animals used in research, teaching, and testing capacities, the FDM has since switched focus to promoting positive welfare states (Mellor & Beausoleil, 2015). The FDM is foundational for animal behaviorists’ understanding of welfare as it pertains to the titular five domains: the physical/functional domains (nutrition, environment, health, and behavior) and the psychological domain (mental state; Mellor & Beausoleil, 2015).

Primates, specifically large-bodied ape species, are the most represented taxa in welfare research (Anderson et al., 2008; Binding et al., 2020; Melfi, 2009). Scientists studying welfare have historically placed a disproportionate focus on the mammalian (Egelkamp & Ross, 2018; Hopper, 2017) and “mega-vertebrate” taxa (Maple & Perdue, 2013). Specifically, primates have a long history in laboratory science (Clark, 2017; Egelkamp & Ross, 2018) and research performed within various captive settings (Binding et al., 2020; Diana et al., 2021). An investigation of publication trends from the journal *Zoo Biology* showed that mammals were the subject of 82% of the articles published in the journal’s first 11 years (1982-1993) and continued to be the most represented class (Anderson et al., 2008). Another review of multiple journals showed Hominidae comprised 13.5% of the welfare-related publications (Binding et al., 2020), which was the largest percentage of studies regarding a single taxonomic family.

Perhaps this disproportionate focus is simply due to the prevalence of primates in zoos, where today’s cognition researchers are focusing their efforts (Egelkamp & Ross, 2018; Frynta et al., 2013). The monopoly of primates in these investigations over time has allowed for the compilation of large amounts of captive-primate-specific welfare data (Binding et al., 2020). The current housing and husbandry standards as dictated by regulatory bodies, such as the United States Department of Agriculture (USDA), ensure baseline animal welfare in these captive environments. Moreover, facilities with captive primates can and should strive to improve beyond these minimum standards by learning from that welfare research data. Additionally, zoos should aim to use the available welfare data to provide their animals with a high-quality environment and caretaking practices (Hau & Schapiro, 2007), therefore providing a “luxurious” life in captivity (Melfi, 2009). Primate welfare studies can also contribute to future improvements of the captive caretaking guidelines for other taxa by providing a strong

behavioral science foundation. New studies can then focus on extending or refining the parameters of previous studies (Binding et al., 2020; Howell & Cheyne, 2018). For example, as of 2017, there was still no single measure that perfectly evaluated animal welfare (Howell & Cheyne, 2018; Veasey, 2017), and there remains a demand for multiple validated measures with which to evaluate welfare in zoo settings.

Caretaking and Enrichment in Zoos

Different countries may follow captive care guidelines from national or regional agencies such as BIAZA, the European Association of Zoos and Aquariums (Whitham & Wielebnowski, 2013), or the Zoo and Aquarium Association Australasia (Frederickson, 2019). North American-based zoos stay current on best care practices for zoo-living species through guidelines from notable accreditation agencies, such as the AZA and WAZA (Maple & Perdue, 2013). AZA accreditation is held by ~200 zoos and aquariums in North America, which is a testament to the many actions AZA has taken to prioritize animal health and welfare (AZA, 2022a; Silver, 2021).

In 2000, the AZA established the AWC (Silver, 2021) and, by 2005, the AZA elevated the AWC to be the decision-makers in charge of zoo animal care (Maple & Perdue, 2013). With this guidance, animal care professionals now strive to provide the highest level of care to produce a life in zoos that satisfies all the animals' needs (Howell & Cheyne, 2018).

Additionally, the AZA ensures that these needs are evaluated on an individual species basis. The AWC has most recently delegated the responsibility of developing taxon- and species-specific welfare standards and guidelines to the Taxon Advisory Groups (TAGs) and the Species Survival Plan Programs (SSPs), respectively (AZA, 2022d). In 2017, the AZA then integrated a welfare assessment requirement into the standards for any institution they accredit (AZA, 2022d; Binding et al., 2020). The AZA also requires claims and concerns about the development of

institutional animal welfare processes made by zoo staff (Whitham & Wielebnowski, 2013) to be investigated by the AZA Accreditation Commission (Stein, 2022). The AZA Accreditation Commission is the final authority on determining if a facility is meeting/exceeding standards and subsequently awarding accreditation to facilities that do so (AZA, 2022d).

A goal of the AZA Accreditation Standards for 2018-2022 was for accredited institutions to be held to the highest standards for “assuring excellence in animal care and welfare” (AZA, 2022d; Silver, 2021). Any AZA-accredited institution is subject to inspection and accreditation review every five years (Stein, 2022) to ensure those standards are upheld. AZA-accredited institutions must also have a process for assessing animal welfare and wellness (AZA, 2022d). As of 2013, AZA was leading the way in developing 160 species-specific animal care manuals (ACMs) that provide zookeepers with compiled husbandry and management knowledge to adequately care for the taxa at their institutions (AZA, 2022b; Whitham & Wielebnowski, 2013). These manuals are created with input from experts in TAGs, SSPs, professionals in multiple disciplines, and researchers (AZA, 2022b). As of 2020, there were a total of 34 ACMs completed (with a small number translated into multiple languages)—and another 25 in progress as of December 2021—to aid the 238 AZA-accredited institutions (AZA, 2022a). All manuals are technically considered works in progress because they are meant to always represent the current science, and therefore will continue to be updated as information and best practices change. The AZA also necessitates review of ACMs as needed, as well as making the updates accessible to paid and unpaid employees for their review (AZA, 2022d).

For primates specifically, true, or brown lemurs (*Eulemur* spp.), Hamadryas baboons (*Papio hamadryas*), and all large-bodied ape species (except the bonobo, *Pan paniscus*) have finalized ACMs. However, bonobo, ring-tailed lemur (*Lemur catta*), mangabey (*Lophocebus*,

Rungwecebus, and *Cercocebus*), nocturnal prosimian, ruffed lemur (*Varecia*), and guenon (*Cercopithecus*) care manual statuses are currently listed as being in progress (AZA, 2022c). Completion of those manuals and the AWC's 2021-2023 strategic plan will ensure the AWC is a "science- and research-based resource for...gaining knowledge about understudied taxa" and shares existing welfare knowledge with accredited institutions (Silver, 2021).

Animal care manuals are just one example of actions taken by an accreditation agency to aid in the promotion of excellent caretaking for zoo-living species. Some agencies allow institutions to take a more individual-based approach to caretaking, or evidence-based assessments of care, rather than following predetermined guidelines (Binding et al., 2020; Melfi, 2009). It should be noted that there has historically been a taxonomic group bias (e.g., *Pan* within the order Primate) that dominates these studies (Howell & Cheyne, 2018). While this is helpful for captive populations of *Pan* spp. to receive a "holistic approach" to housing and husbandry (Rose et al., 2019), there are many other primate species that need care in zoos as well (Melfi, 2009). Evidence-based approaches are particularly useful when recognizing that animals cannot verbally communicate care preferences, and, therefore, the caretaker's educated opinion (as a proxy) must be considered when evaluating care practices for zoo populations (Whitham & Wielebnowski, 2013). The strategy for WAZA, for example, mentions specifically that all zoo (and aquarium) staff must be trusted to care for the creatures in captivity in a way that keeps conservation and welfare in mind, while meeting all the necessary requirements of care (Maple & Perdue, 2013). It has been a common idea among zoo professionals over at least the past decade, however, that constant innovation in animal care practices is an important part of fostering an excellent caretaking standard (AZA, 2022c; Maple & Perdue, 2013).

Generally, captive environments have classically been considered “more extreme” than most other environments. An example of this sentiment is the presence of some behaviors, like auto-aggression or regurgitation that is not seen in wild environments (Hosey, 2005). This includes zoos, though they are commonly viewed as being better than laboratory settings, in the sense that unnaturalistic captive environments can cause abnormal behaviors and stereotypies to arise (Hosey, 2005; Meehan & Mench, 2007; Ward et al., 2018). Stereotypies are behaviors that are apparently functionless, repetitive, and are considered indicative of poor welfare (Howell & Cheyne, 2018; Kim-McCormack et al., 2016; Veasey, 2017). Therefore, it is important to refer to the literature on zoo primate welfare to identify what has previously been shown to indicate welfare status. It was a popular idea in the early 2000s that evaluating the welfare of animals living in zoos should be based on wild-captive comparisons of behaviors (Hosey, 2005). Trying to replicate wild-type situations and behaviors for zoo primates, however, may not always be the best caretaking practice (Maple & Perdue, 2013). In the wild, animals are liable to experience all the states that the FDM says we should prevent zoo animals from experiencing (e.g., thirst, hunger, anxiety, fear, and pain; Melfi, 2009; Mellor & Beausoleil, 2015). Because “a good life in the wild is a hard life” (Maple & Perdue, 2013, p. 24), trying to replicate *wild-type experiences* may conflict with good zoo welfare practices. However, trying to replicate the *types of skills* that animals must use in the wild is considered beneficial (Maple & Perdue, 2013; Meehan & Mench, 2007). The most common way to promote this is through enrichment designed to promote the expression of a broad range of behaviors by mimicking naturally occurring challenges or situations to stimulate and improve the animal’s mental state and welfare (Clark, 2017; Meehan & Mench, 2007).

Multiple studies show that some captive animals are motivated and will sometimes prefer to “work” for their resources (Clark, 2017; Maple & Perdue, 2013; Melfi, 2009), otherwise known as contrafreeloading. This is not ubiquitous but has been shown via reports of high engagement levels on a provided task (Clark, 2011; Meehan & Mench, 2007; Scheer et al., 2019). Therefore, zoo staff implement enrichment so that the animals within a facility experience novel or challenging situations to not only attempt to mitigate negative affective states, but also to promote positive affective states (Melfi, 2009; Mellor & Beausoleil, 2015). “Enrichment” has multiple definitions depending on the situational context and species to which it refers (Gartner & Weiss, 2018; Meehan & Mench, 2007), and successful enrichment will likewise be held to varying standards depending on the type of enrichment provided (Krebs & Watters, 2017; Ward et al., 2018). The AZA defines enrichment as “a process to ensure that the behavioral and physical needs of an animal are being met by providing opportunities for species-appropriate behaviors and choices” (AZA, 2022d). Previously, the provision of environmental or feeding enrichment had been the sole forms of enrichment considered in animal care practices (Clark, 2017; Hoy et al., 2010). However, over the past decade, zoo welfare scientists have focused on the psychological welfare needs of zoo animals via the enrichment subcategory of cognitive enrichment (Krebs & Watters, 2017; Ward et al., 2018). While this is practiced with primates (Clark, 2011; Clark, 2017), it is encouraged in many other taxa as well (Clark, 2017; Hall et al., 2021; Hopper, 2017).

Cognition and Cognitive Enrichment

Captive environments are gradually becoming the only places to view and learn about “wild” non-human primate species, and it is the animals’ right to be nurtured in all aspects of their health, including the aspect that is so important in social and intelligent primates: the brain.

It is important to identify what changes to the environment impacts captive primate welfare, as previous research has shown serious effects of the environment on welfare. Behavior studies have repeatedly shown that captive animals living in unenriched environments exhibit undesirable behaviors that are indicative of distress (Hau & Schapiro, 2007; Lecorps et al., 2021; Mallapur, 2005). The behaviors performed are often harmful, redirected and/or self-injurious, which are indicative of poor welfare (Hau & Schapiro, 2007; Lecorps et al., 2021). Exposure to frequent stressors, or stressors occurring during important developmental periods can promote depressive states in animals (Lecorps et al., 2021). Primates in captive settings should be in environments that are enriched, as the animals who live in enriched spaces showcase fewer abnormal behaviors (Hau & Schapiro, 2007; Mallapur, 2005).

The previous focus on non-cognitive enrichment and behavioral welfare has created a gap in the literature regarding cognitive enrichment. Alternate investigations could add beneficial data for both the maintenance and development of cognitive welfare, as well as for cognitive enrichment practices in all captive settings (Clark, 2011; Clark, 2017; Hopper, 2017; Meehan & Mench, 2007). In an investigation of zoo-based papers published between 2009 and 2019, the majority had husbandry or welfare implications, whether it was the aim of the paper or happened to be a part of the overall outcome (Rose et al., 2019). In conjunction with a review showing that captive and sanctuary institutions in the past 20 years have placed more importance not only on physical well-being but also the psychological well-being of animal populations (Kim-McCormack et al., 2016), these studies show the recent upward trend of cognition research performed in zoos. As of 2018, a review of cognition studies in zoos identified only 12 species represented in the literature, nine of which were primates (Egelkamp & Ross, 2018). Over the past 10 years, focus on psychological welfare has opened cognitive research to other, non-

primate taxa as well (Clark, 2017; Hopper, 2017), which may further indicate increased importance to organizations housing zoo animals. Recent studies show that focusing research programs on the psychological and cognitive characteristics of the primates used in research can be beneficial both for answering research questions and enrichment purposes (Huskisson et al., 2020; Krebs & Watters, 2017; Ward et al., 2018). Therefore, cognition research itself can be an important tool to answer questions about welfare and behavior in zoo primate populations (Clark, 2017; Huskisson et al., 2020).

While these developments allowed cognition studies to move outside of laboratory settings over the past decade (MacDonald & Ritvo, 2016; Ward et al., 2018), it is still an active area of interest for improving and introducing cognitive enrichment and cognitive challenges to captive populations (Clark, 2017; Clark et al., 2019). In primate populations, cognitive tasks have been shown to be enriching (Clark, 2011; Huskisson et al., 2021), or at least successful in reducing stress, proxied via decreased stereotypic behaviors in zoo settings (Clark, 2017; Swaisgood & Shepherdson, 2005). There are multiple reviews that detail the efficacy of technology- or digital media-based apparatus in both primate cognition research and welfare. These reviews all reported at least partly successful completion of the task by whichever primate species was in question (Clark, 2017; Egelkamp et al., 2016; Egelkamp & Ross, 2018; MacDonald & Ritvo, 2016). The use of cognitive tasks has also recently been suggested to gather baseline welfare data for more knowledgeable and accurate monitoring, allowing for cognitive testing and welfare evaluation to happen concurrently (Egelkamp & Ross, 2018; Huskisson et al., 2021).

One potential missed opportunity is the lack of zoo animals utilized for *cognitive* research (Clark, 2017; Egelkamp & Ross, 2018; Hopper, 2017; Ward et al., 2018). In a review published

in *Zoo Biology*, Hosey (1997) noted that the published zoo research from 1989 to 1994 did not include much basic research, and very few papers were authored solely by university or zoo researchers. This suggests collaboration, however, when looking at the publications from *Animal Behavior* from 1993-1994, there were almost no zoo-based studies (Hosey, 1997). Hosey (1997) suggests that the research done in zoos is only being conducted by zoo staff and is specifically for maintenance of those zoos' animal populations. The dearth of basic cognitive studies specifically, stems from some staff's perceptions that zoos are not places to research basic science (Fernandez & Timberlake, 2008; Hopper, 2017) or because academic researchers think zoo animals do not make good sample populations (Hopper, 2017; Hosey, 1997). However, research with zoo animals can be both informative and important (Hopper, 2017).

Cognitive research performed in zoos is highly representative of the field of comparative cognition (Egelkamp & Ross, 2018; Hopper, 2017). Zoos offer diverse species, and the possibility of large sample sizes if a multi-institutional approach is taken (Hopper, 2017), benefitting the external validity of the findings. While some zoos in the United States have in-house research centers, these facilities are used primarily for welfare and conservation research rather than basic cognition research, which could help inform other types of studies (Hopper, 2017). Notably, primates are over-represented in welfare and cognition research (Egelkamp & Ross, 2018; Hall et al., 2021). However, the goal should not be to stop using primates in cognition studies but to instead recognize that there is a greater need for non-primate taxa to be represented in cognition research (Rose et al., 2019). Therefore, it may be beneficial to use the wealth of existing primate literature to continue expanding our understanding of welfare and cognitive enrichment. This could serve as a foundation for comparative research on welfare and cognitive enrichment in other captive zoo taxa (Egelkamp & Ross, 2018).

Cognitive enrichment is considered by some zoo staff to be too difficult to implement (Ward et al., 2018). It has become more popular in zoos over the past 10 years (Ward et al., 2018), as a recent survey of zoo staff reported that, for North American zoos, the percentage of non-human primates (excluding large-bodied apes) that received cognitive enrichment was significantly higher than any other group of animals (Hall et al., 2021). Cognitive enrichment may be one of the more important types of enrichment to provide to captive populations, especially because previous research has shown that a captive animal's physical health alone is not a reliable indicator of good welfare (Fraser, 2009).

Research on Factors Affecting Cognitive Enrichment in Captivity

Recent years have seen an exponential increase in the number of publications about enrichment (cognitive enrichment: Clark, 2017; Hopper, 2017; Meehan & Mench, 2007; computerized apparatus: Clark, 2017; Scheer et al., 2019; Wagner et al., 2016; cognitive research as enrichment: Clark, 2017; Egelkamp et al., 2016; MacDonald & Ritvo, 2016). Cognitive research is slowly gaining a foothold in zoos, which is both good for the research community and enriching to the animals as it is most likely a novel experience (Huskisson et al., 2020). However, these studies seem largely to come from the same few zoos (Clark, 2017; Hopper, 2017). While this does not mean other zoos have not been using cognitive enrichment, the data used to support cognitive enrichment decisions are coming from a small institutional sample.

A recent survey by Hall et al. (2021) showed that globally, according to self-reported answers to survey questions, zoo staff have realized the importance of cognitive research and enrichment. As cognitive enrichment becomes more widespread, concerns about the logistics of providing cognitive enrichment to each institutions' specific population of primates may arise. Hall et al. (2021) found a regional difference in who oversaw the provision of enrichment at

different facilities, with 67% of the South/Central American participants indicating that dedicated welfare/enrichment staff were present for this task. The same study showed that overall, only about 65% of the respondents (regardless of country) reported providing cognitive enrichment to zoo animals more than once a week. Keeper interest was also considered the most influential measure for the success of cognitive enrichment (Hall et al., 2021).

As most zoos have group-housed primates, case studies have been used to provide examples of cognitive enrichment implementation with groups. For example, at Zoo Atlanta (Atlanta, Georgia), a special enrichment device was designed so that the Bornean orangutans (*Pongo pygmaeus*) could interact with it freely, driven by their own choice (Scheer et al., 2019). This caused them to effectively take turns, which was also noted in western lowland gorillas (*Gorilla gorilla gorilla*) in a different cognitive enrichment study (Clark et al., 2019). Therefore, some arguments have been made for allowing the implementation of cognitive enrichment to a whole group instead of individually. While it depends on the species, for some such as chimpanzees (*Pan troglodytes*), cognitive performance tends to be better when they are in a group because of their ability to teach one another (de Waal & Ferrari, 2010). This is beneficial because the standard organization for zoo primates is group-living (AZA, 2022d).

The Zoo Atlanta study also documented the development of a new digital enrichment application, its use, and effectiveness. While researchers found variability in usage, the team identified three important factors (i.e., familiarity of stimuli, modularity in design, and engagement with the public) for developing effective technology-based cognitive enrichment for zoos (Scheer et al., 2019). Staff at Bristol Zoo Gardens (Bristol, United Kingdom) investigated the influence of cognitive enrichment on a population of western lowland gorillas. Staff presented a problem-solving paradigm that required gorillas to move a food reward through

different cube designs to obtain that reward (Clark et al., 2019). The researchers found the gorillas consistently engaged with and had more success when they used tools rather than just their fingers. Researchers also found evidence that participation was rewarding regardless of food reward, as the reward was low-value, and the gorillas were never food deprived. Therefore, the gorillas' consistent use of the device suggests that engagement with it was not driven by necessity but rather by the gratifying nature of the activity itself (Clark et al., 2019).

Some zoos have altered their enclosures to facilitate cognitive research participation and allow visitors to experience research in real time, including the Think Tank exhibit at Smithsonian National Zoo (Washington, D.C.), the Regenstein Macaque Forest at Lincoln Park Zoo (Chicago, Illinois), and the Simon Skjodt International Orangutan Centre at Indianapolis Zoo (Indianapolis, Indiana; Hopper, 2017). If more zoos adopted similar research programs (not exclusive to cognitive enrichment given to the group rather than individual), the field of comparative cognition could improve and apply findings to zoo-animal welfare and enrichment. Computerized tasks have been shown to not only be the preferred activity of rhesus macaques (*Macaca mulatta*), but also to have replaced the stereotypic behaviors macaques otherwise engaged in during their day (Clark, 2011; Washburn & Rumbaugh, 1992). Likewise, cognitively enriching activities decreased behavioral signs of distress better than the provision of “toys” (e.g., plastic objects; Clark, 2011). Computerized cognitive enrichment was similarly enjoyed by laboratory macaques (Washburn & Rumbaugh, 1992), as they spent about 40% of the time engaging with the device when it was offered, even with a “free food” condition associated with time away from the device (Egelkamp & Ross, 2018). The Lincoln Park Zoo has even boasted a 90% voluntary participation rate regardless of social consequences or understanding of the task itself (Egelkamp & Ross, 2018; Jacobson et al., 2019).

While it would be ideal for zoos that do not employ cognitive research or enrichment practices to start doing so as soon as possible, there are multiple limitations that influence what zoo staff can offer. A large reason cognitive enrichment has not been universally adopted is because of the logistic and situational issues that make deploying a new enrichment program difficult. The main limitation of captive environments is space (Hosey, 2005; Ward et al., 2018). Because space is limited, zoo staff try to make enclosures as complex as they can to at least encourage species-appropriate locomotion and movement patterns (Hosey, 2005). Another limitation is the human management of zoo populations, which reduces the opportunities for daily cognitive and/or mental exercise received by primates. One example is food provisioning in zoos; in the wild, foraging comprises a large proportion of the primate activity budget, whereas in zoos, food may just be given without any added challenge (Hosey, 2005). Besides the fact that simply providing animals with food is not allowing them to use different cognitive skills, some evidence shows that large-brained animals like primates may prefer to be challenged. Zoo-living primates might prefer to work for their food rather than just have it handed to them, though that may not be true for each species or individuals in zoos (Clark, 2017; Clark et al., 2019).

An additional challenge with the implementation of cognitive enrichment in zoos is the time necessary to provide it to animals. In fact, the issue of time constraints was highlighted as the main limiting factor on recent zoo staff surveys regarding enrichment (Hall et al., 2021; Hoy et al., 2010). Another problem is the lack of agreement on terminology when it comes to cognitive enrichment (Hall et al., 2021) and welfare (Fraser, 2009). There is not any one universally agreed upon definition for either. This means that although many zoo employees find cognitive enrichment to be important for animal welfare, there is no consensus on what either of the terms mean (Hall et al., 2021). Presumably, whatever local and federal laws a zoo follows,

combined with standards outlined by whichever accreditation agency they joined, would provide them with a definition of both. However, as mentioned earlier, across all zoos in the world, and even within one country, there could be multiple different definitions and standards for enrichment that zoo professionals follow.

Interdepartmental Communication

A lack of consistency in definitions and standards could be one reason for variation in enrichment provisioning, not only regarding the importance of cognitive enrichment and the amount it is offered, but also in who provides enrichment to zoo animals (Hall et al., 2021). However, common understanding between all zoo departments and staff within an institution may also contribute to implementation challenges. Hall et al. (2021) reported that regionally, North America had the highest self-reported value for provisioning what the authors operationally defined as cognitive enrichment to their animal populations. Of the North American participants, 31.8% of the total responses reported the use of cognitive enrichment more than once a day (Hall et al., 2021). Including data from all regions, direct- and indirect-contact staff both identified “time to observe animal response”, “limited funds”, “number of animals”, and “workload for others” as factors impacting enrichment implementation (Hall et al., 2021). Indirect-contact staff, however, did not rank “limited funds” and “importance of enrichment to workplace” as being as impactful as the direct-contact staff did (Hall et al., 2021). This may be an indicator that some barrier exists between direct- and indirect-contact staff regarding the factors influencing cognitive enrichment implementation.

In North America, the AZA is the most prominent accreditation agency for zoos and aquariums (AZA, 2022a), which suggests that most of the North American zoos who participated in Hall et al. (2021) would be following the same rules and utilizing the same guidelines. The

results from that study suggest that although part of the same organization, different types of employees operate on different information that may not be understood by the other job levels. The results emphasize that consistent and regular implementation of cognitive enrichment must lie in another part of the zoos' staffing or management structure. Interestingly, in zoo settings, husbandry knowledge is expected for animal-facing jobs, however knowledge about zoo-living animal welfare is not always a prerequisite. Rather, on-the-job learning is normally adequate for direct-contact employees, but welfare knowledge may not be required for indirect-contact employees at all (reviewed by Bacon et al., 2021a).

Organizations that promote inclusion and positive interactions among all levels of employees tend to gain support from the employees themselves (Yahaya, 2020). One study showed that inclusion in decisions or changes to the work process and environment was deemed important by lower-authority employees (Yahaya, 2020). There is also a precedent in managerial studies to formally define the roles of each organizational subsystem (e.g., managerial, maintenance, adaptive) for the most efficient role completion and collaboration (Katz & Kahn, 1978). For example, Yahaya (2020) found evidence regarding employee inclusivity and job dissatisfaction in written responses from home hospice employees who report to middle-management personnel. This evidence hinted at the perceived lack of importance middle management placed on other employees' opinions about needed improvements or changes (Yahaya, 2020). Fostering employee inclusivity at every level garners more support for higher-level management and could improve job satisfaction. Role expectations are also an important part of the feelings that may contribute to teamwork and employee satisfaction. In spaces where role expectations are not clearly outlined, there can be examples of employees only identifying their actual role expectations after those expectations have been infringed upon. This can be

when employees are still learning what their roles entail or when there are changes made to role expectations that employees were not consulted about beforehand (Kramer & Danielson, 2017).

In zoos, there are different categories of employees who have responsibilities and knowledge that are applicable specifically to their job. Zookeepers in China and Europe reported that a portion of the knowledge they use to properly do their jobs (e.g., from enrichment conferences, animal welfare courses, other animal talks) was gained by self-directed education (Bacon et al., 2021a). In this case, knowledge about cognitive enrichment and its importance to zoo primate welfare may not be required for indirect-contact employees. This difference in knowledge may cause a juxtaposition in priorities that affects institution-wide goals depending on which employee is asked. There is also survey evidence that zoo staff hold either a “human-centric” or “animal-centric” view of animal care, which can contribute to the contrast between which employees feel responsible for or what they consider to be important aspects of their jobs (Bacon et al., 2021a). The same survey found that zookeepers felt all staff working in a zoo need some form of animal welfare training (Bacon et al., 2021a). Both findings support general extant differences between the priorities of different employee levels within one organization.

Therefore, there is a need to investigate how responsible employees in different job categories feel regarding cognitive enrichment provision, as the aforementioned factors may affect this feeling. Though all levels of zoo staff agree that cognitive enrichment is important and should be provided to animals in zoo collections, there needs to be a shift in who feels responsible for enrichment if zoo animal cognitive welfare is to be improved and streamlined (Hall et al., 2021).

The Current Study

The previously discussed studies provide a foundation for the questions investigated in this project. In synthesizing information from the Hoy et al. (2010) and Hall et al. (2021) surveys

along with the findings from the zoo management literature, there seems to be evidence of some type of disconnect between the direct-contact (those who work with animals as a primary function of their position) and indirect-contact (those who do not interact with animals as a primary function of their position) staff at zoos. Therefore, this study expanded on the previous studies by offering the survey to staff at any level of management to evaluate the understanding and perceived sense of responsibility that may influence the frequent and consistent implementation of cognitive enrichment, specifically to zoo-living primates. For some level of control over extraneous variables, this study focused on every level of management and staffing from AZA-accredited zoos that care for primate populations. Whereas the preceding studies asked questions solely about physical implementation of enrichment and the issues with implementation, the current study asked zoo staff for their perceptions about different factors that may contribute to cognitive enrichment provisioning to zoo-living primates. Participants were asked about their perception of responsibility for and on issues with the implementation of cognitive enrichment, as well as their institutions' standards for welfare knowledge. I anticipated that overall, the results from this study would align with those of Hall et al. (2021).

Three hypotheses were addressed in this study. First, I hypothesized that the perceptions of responsibility for cognitive enrichment implementation would vary between job classification, years of professional experience, and/or time employed at the institution. I predicted the following: (1) both direct- and indirect-contact employees would unanimously identify direct-contact employees as responsible for the implementation of cognitive enrichment provided to primate populations; and (2) responsibility for cognitive enrichment would be perceived as greater for employees with more professional experience or time employed at the current institution. Secondly, I hypothesized that the factors impacting the routine implementation of

cognitive enrichment and perceived influences over those factors would be ranked differently depending on job classification, professional experience, and time spent at the institution. I predicted the following: (1) participants with more professional experience or longer employment would perceive greater influence over factors impacting cognitive enrichment implementation than those with less experience or shorter employment; and (2) direct-contact staff would cite finances and time constraints as the leading issues to implementing cognitive enrichment, whereas indirect-contact staff would cite other issues. Finally, I hypothesized that the participants' perceived importance of knowledge about captive primate welfare would vary between job classification and professional experience. I predicted the following: (1) direct-contact staff would identify zoo-living animal welfare knowledge as a necessary condition to hiring and continued employment, whereas indirect-contact staff would not; (2) indirect-contact employees would not identify ancillary or continued education about captive primate welfare as a necessity, whereas direct-contact staff would; and (3) perceived importance of welfare knowledge would be ranked higher for participants with more professional experience.

CHAPTER III

METHODS

Ethics Approval

This study was approved by the Central Washington University Human Subjects Review Committee in November of 2022 (CWU HSRC, #2022-114-ONL). The survey (see Appendix A) was also reviewed and approved with modifications by the Ape TAG (see Appendix B). Many of the AZA-accredited zoos required their own institution's research committee to review and approve a research proposal (oftentimes accepting an AZA Research Proposal) before data could be collected from any staff members. I produced an AZA Research Proposal or completed those institutional-specific proposal forms when required.

Participant Recruitment

The AZA accreditation is not specific to institutions in the United States, though it is the main accreditation that zoos in the United States seek. Survey participants came from AZA-accredited zoos (according to the list of accredited institutions from the AZA website as of May 2022) within the United States. Participation came from all levels of staff at those zoos, whether they worked directly with the primate populations or within the facility but with little-to-no contact with the primates. Participants were recruited with an online survey via social media outlets, as well as emails sent directly to AZA zoo contacts. These contacts came from a list of institutional representatives provided by the AZA Ape TAG chair after the project was approved by the Ape TAG. For the validity of the sample and analyses, only English-speaking zoos in the U.S. were contacted. Of the 89 AZA Ape TAG zoos, the primate species represented by the 27 institutions in this study are all the large- and small-bodied ape species. The staff at these

facilities, therefore, must consider primate welfare for a vast array of animals during their everyday husbandry and enrichment practices.

There were 230 total AZA zoos at the time of the survey, but only 84 were both under the Ape TAG and located in the United States. The goal for this project was to obtain at least two participants (one from each contact-level category) from each zoo, which would total 168 responses based on the Ape TAG institution numbers. However, not every zoo was able to or agreed to participate. Therefore, a realistic response goal of approximately 100 responses was calculated by obtaining one response from each of those 84 Ape TAG zoos and gaining at least 20 responses via snowball sampling from the survey posted on social media (Twitter and Facebook).

The survey distributed to the public via social media was titled “Primate Cognitive Enrichment Responsibility Survey,” and the survey link was attached to a tweet and Facebook post with a short message (Appendix C). The survey distributed to the AZA Ape TAG contacts had minor modifications to gain TAG approval, and so those contacts were sent the survey titled “Primate Cognitive Enrichment Responsibility Survey-AZA” in hyperlink form. The hyperlink was sent directly to AZA Ape TAG Zoo contacts in an email containing a brief message and a PDF of the plain language statement (PLS) and Ape TAG Approval letter (Appendix C and D, respectively). While the email had a short paragraph outlining main ideas about the study, the study details were in the PDF itself.

To participate, individuals needed to be 18 years or older, fluent speakers/readers of English, have access to the internet, and be associated with an AZA-accredited institution housing primates at the time of data collection. Participation in the survey was entirely voluntary. Consent was obtained from all participants before beginning the survey, and participants were given the option to opt out at any point. If participants opted out, they were sent to the survey

end and thank you page. Participants were also provided contact information for the PI, as well as the CWU HSRC so they could gain further information or ask questions.

Survey Design and Procedure

The survey was constructed using the online survey system Qualtrics (2023) and consisted of 22 questions, which required write-in, multiple choice, or Likert scale responses. The survey began with an introductory block that provided an overview of the main research goals of the survey, as well as the ethics and privacy overview. Participants were first asked to provide demographic information, including their age, race and ethnicity, gender identity, the size of their institution (the number of employees), their position classification (direct- or indirect-contact), the number of years employed at their current institution, and the number of years of experience in their field. There was a section of optional questions where participants were also asked to provide their institution name, job title, and the job titles of who reports to them and who they report to, as well as an open-ended question allowing for extra comments about cognitive enrichment. Participants chose and/or wrote in answers to these questions so they could provide the most accurate and appropriate answer to represent themselves. Some of these questions were housed in different sections depending on which survey version was taken, but each survey had identical questions. Potentially identifiable demographic factors were only collected to analyze themes. For example, no names, institutions, or job titles are reported to ensure participant anonymity; however, the number of institutions with similar job titles could be reported numerically, e.g., eight of the participating institutions used “animal caretaker” compared to the six who used “husbandry technician” instead.

Following the demographics section, the survey was comprised of three different blocks of multiple-choice and Likert scale questions (adapted from Hall et al., 2021) evaluating participant perceptions, including their perceptions of responsibility for the implementation of

primate cognitive enrichment, perceptions of the issues with implementation of primate cognitive enrichment, and perceptions of the importance of continued learning about zoo-living primate welfare (Appendices A and B). The first question of the first block provided the participants with the operational definition of cognitive enrichment for the rest of the survey: “Cognitive enrichment is a task (or tasks) whose use (1) engages evolved cognitive skills by providing opportunities to solve problems and control some aspect of the environment, and (2) is correlated to one or more validated measures of well-being” (Clark, 2011, p. 6). The participants were then asked to rate their institution’s implementation of cognitive enrichment based on their institution’s adherence to that definition.

Participants were next asked to rate how responsible they perceived their job position as being for various activities related to the implementation of cognitive enrichment (e.g., design of cognitive enrichment, sourcing finances, and enrichment evaluation). The nine factors participants rated were adapted and modified from those provided in Hall et al. (2021), and some were conceived specifically for this study (see Appendices A and B). Participants then ranked 11 factors (also from Hall et al., 2021) on their perception of the impact the factors had on the successful implementation of cognitive enrichment. The ranking system was from 1 = “Most impact” to 11 = “Least impact.” The 11th factor was an option to select “Other” where participants could write in and rank an additional factor. Those same factors (excluding “Other”) were then ranked by participants based on their perceived influence over these factors (0 = “None at all” to 5 = “A great amount”).

The third block investigated the importance of welfare education to the staff at the participating institutions. Participants were presented with a series of conditional questions that were only prompted if certain answers were chosen in the preceding question. Participants were

first asked, “Were you required to have a certain amount of knowledge about captive animal welfare to be hired for your position?” If they answered affirmatively, they were forwarded to a question(s) about their institution’s encouragement towards continued learning about welfare: “Does your institution either encourage and/or require continued learning about captive animal welfare for your job position?” If they answered affirmatively, they were asked: “Does your institution provide any resources for continued learning about captive animal welfare?” If they answered affirmatively, they were directed to the last conditional question, which asked them to select resources their institution provides from a list. Additionally, all respondents were asked, “Have you ever taken it upon yourself to learn more about captive animal welfare in your spare time?” The last question in this block was seen by every participant, and it asked, “Does your institution require periodic educational updates for your position (Example: taking a class on your position’s main function every few years to ensure up-to-date skills and information)?” The survey closed with a participant debrief and a place to include their contact information if they were interested in an update upon the study’s completion.

Data Analysis

The dataset was evaluated for outliers using interquartile ranges. Respondents who indicated they were non-AZA zoo employees in May of 2022 or who failed to fully answer a dependent variable question were excluded from analysis. Demographic information was assessed to determine if there were any differences in the overall dataset based on gender identity or race/ethnicity. However, the data were largely skewed towards female-identifying, European/Caucasian participants, and further inferential comparisons based on demographics were omitted. Instead, descriptive statistics were used to emphasize trends in the survey responses and demographics of the respondents.

To choose which statistical tests to use for group comparisons (direct- vs. indirect-contact staff), the ranked dependent variables were assessed using a Shapiro-Wilks test of normality to investigate whether the data were normally distributed. All but one factor, “Institution Rate”, came back $p < .05$; therefore, non-normality was assumed for most factors, and non-parametric tests were used to analyze those dependent variables. “Institution Rate” by job classification (direct- vs. indirect-contact staff) was analyzed using an independent samples t -test. For all other analyses, I used Mann-Whitney U tests and Spearman rank correlations to determine if any of the dependent variables (rankings related to perceived responsibility for, perceived influence over, and the importance of learning about cognitive enrichment implementation) were affected by job classification, years of professional experience, or years employed at the current institution. The data for both years of professional experience and years employed at the current institution were continuous, not binned, for any analyses. Significance was set at $p = .05$.

Participant Demographics

Of the 128 individuals who began the survey, only those who answered all dependent variable questions were retained. After cleaning of the data set, six of the 18 indirect-contact participants (33.3%) and 28 of the 98 (28.6%) direct-contact participants’ data were excluded, along with 12 others who opened the survey but did not answer any questions. This resulted in data collected from 82 participants. Because some questions were conditional (only shown to participants based on their answers to a previous question), the number of responses varied across some survey items ($n = 58-82$). The sizes of the AZA-accredited institutions represented by the participants ranged from 10 to 3000 employees ($n = 71, M = 252 \pm 405$).

There were 82 total participants whose data were collected for analysis: 70 identified as direct-contact and 12 identified as indirect-contact. Of the 82 participants, 79.3% identified as

female, 14.6% identified as male, 2.4% identified as non-binary/third gender, and 3.7% preferred not to provide that information. The distribution of the ethnicity responses ($n = 85$ due to participants who identified as multiple ethnicities) showed that 80.0% of participants identified as European/Caucasian, and the other 20.0% was comprised of the remaining options (African American, Asian, Hispanic/Latinx/Spanish origin, Native Hawaiian or Pacific Islander, Other, or Prefer not to answer). American Indian and Alaska Native were not chosen (see Tables D1 and D2 for demographic information). The age of the participants ranged from 21 to 63 years old, and the mean age was 35.7 (± 10.2 years). The participants were asked how long they worked for their current AZA institution, and answers ranged from two months to 25 years ($M = 6.43 \pm 6.83$ years). Respondents also indicated they had from six months to 38 years of experience ($M = 12.48 \pm 9.32$ years) in their professional field.

CHAPTER IV

RESULTS

Participant Perceptions

Institution Rating

Direct-contact staff ($n = 70$) were compared to indirect-contact staff ($n = 12$) in their perceived rating for the implementation of cognitive enrichment at their institution. The mean score for the direct-contact group (6.57 ± 1.95) was lower than that of the indirect-contact group (7.17 ± 1.70). However, participants did not rate their institutions on the implementation of cognitive enrichment differently based on job classification ($t(80) = -.099, p = .32$).

Perceived Responsibility for Cognitive Enrichment

Responsibility for cognitive enrichment was measured by staff members ranking nine factors on a scale from 0 = “Not responsible at all” to 10 = “Exclusively responsible,” with the option to also choose “I don’t know.” Only one factor, responsibility to advocate for cognitive enrichment to the positions who report to you, was ranked similarly by direct- and indirect-contact staff ($p > .05$, Table 1). Direct-contact staff ranked seven of the nine responsibility factors higher than indirect-contact staff (see Table 1).

There were no correlations between the amount of professional experience held by an employee and six of the nine factors measuring responsibility for cognitive enrichment ($p > .05$). There were four factors with significant correlations (see Table 2). There were notable negative correlations between years of professional experience and responsibility for physically providing cognitive enrichment and responsibility for up-keep of cognitive enrichment, indicating that with more years of experience the perceived responsibility for these two factors was less. There was one strong positive correlation between years of professional experience and responsibility for

Table 1*Median Ranks of Responsibility for Cognitive Enrichment Factors by Job Classification*

Factors	Direct contact (Mdn)	Indirect contact (Mdn)	<i>n</i>	<i>U</i>	<i>p</i> -value
Design	8.0	0.0	82	108.5	< .001
Physical	10.0	0.0	82	42.0	< .001
Ensuring	9.0	0.0	82	166.0	< .001
Financing	0.0	4.0	78	232.0	.016
Supporting	8.0	0.0	80	207.5	.014
Up-keep	9.0	0.0	82	70.5	< .001
Evaluation	8.0	0.0	81	148.0	< .001
Advocating as higher-up	5.0	0.0	68	262.0	.22
Advocating to higher-ups	8.0	1.5	76	231.0	.028

sourcing finances for primate cognitive enrichment, and one weak positive correlation between years of employment at the current institution and responsibility for advocating for cognitive enrichment to the position(s) supervised. These both indicate that with more years of experience or years employed at the current institution, there was more perceived responsibility for those two factors. The remaining responsibility factors were not ranked differently by professional experience or years of employment at the current institution (see Table D3).

Perceived Impact of Factors on Cognitive Enrichment

Eleven factors impacting the implementation of cognitive enrichment were ranked by staff members from 1 (“Most impact”) to 11 (“Least impact”). Only one factor was ranked differently based on job classification: The importance of enrichment to the institution was

Table 2

Significant Spearman's Rank Results for Responsibility Factors by Years of Professional Experience and Time at Current Institution

Factor	Experience (years)			Employment (years)		
	<i>p</i> -value	<i>r</i>	<i>n</i>	<i>p</i> -value	<i>r</i>	<i>n</i>
Advocating as a higher-up	—	—	—	.01	.310	68
Physical	.001	-.350	82	—	—	—
Financing	.006	.306	78	—	—	—
Up-keep	.002	-.342	82	—	—	—

Note. Significance is set to $p = .05$.

ranked higher by direct- ($Mdn = 5.0$) than indirect-contact staff ($Mdn = 2.0$, $U = 194$, $p = .003$; see Table D4). Of the 11 factors, the direct-contact staff ranked time to observe animal response to enrichment as having the most impact on implementation of cognitive enrichment ($Mdn = 3.5$), followed closely by the amount of personal knowledge about cognitive enrichment ($Mdn = 4.0$) and amount of enrichment training ($Mdn = 4.5$). Excluding the “Other” option, direct-contact staff ranked aesthetics ($Mdn = 9.0$) and workload for others created by enrichment ($Mdn = 8.0$) as having the least impact. For indirect-contact staff, the factor ranked as having the most impact on cognitive enrichment implementation was importance of enrichment to the institution ($Mdn = 2.0$), and the factor ranked as having the least impact was workload for others created by enrichment ($Mdn = 9.0$) and aesthetics of enrichment ($Mdn = 9.5$). None of the factors were ranked differently based on years of professional experience or years at the current institution ($p < .05$, see Table D5).

Perceived Influence Over Factors Impacting Cognitive Enrichment

Staff members ranked their perceived influence over 10 factors impacting the implementation of cognitive enrichment from 1 (“None at all”) to 5 (“A great amount”). Six of the 10 total factors were ranked differently depending on job classification (see Table 3). Direct-contact staff ranked the following five influence factors higher than indirect-contact staff: The influence over the amount of enrichment training (direct *Mdn* = 3.0, indirect *Mdn* = 1.0, *U* = 206, *p* = .004); the amount of personal knowledge about cognitive enrichment (direct *Mdn* = 4.0, indirect *Mdn* = 2.0, *U* = 158, *p* < .001); the influence over time to observe the animals’ response to enrichment (direct *Mdn* = 2.0, indirect *Mdn* = 1.0, *U* = 243, *p* = .014); the influence over the number of animals who receive enrichment (direct *Mdn* = 3.0, indirect *Mdn* = 1.0, *U* = 240, *p* = .018); and the influence over others’ workload created by enrichment (direct *Mdn* = 3.0, indirect *Mdn* = 1.5, *U* = 231, *p* = .011). Indirect-contact staff ranked the influence over funding for enrichment (*Mdn* = 3.5) higher than direct-contact staff (*Mdn* = 2.0, *U* = 214, *p* = .005).

Two of the 10 factors had weak significant correlations the amount of professional experience held by an employee. There were positive correlations between increasing years of professional experience and more perceived influence over amount of enrichment training, and sourcing finances for enrichment. The rest of the factors were not ranked significantly different based on years of professional experience. Regarding years of employment at their current institution, three of the 10 factors had weak significant correlations. All three correlations were positive between years employed at the current institution and influence over amount of enrichment training, importance of enrichment to the institution, and funding for enrichment. Therefore, the more time at an institution, the more influence participants perceived themselves as having for those factors involved in cognitive enrichment implementation. The remaining

Table 3

Median Ranks of Perceived Influence Participants Had on Factors Affecting the Implementation of Cognitive Enrichment by Job Classification

Factors	Direct contact (Mdn)	Indirect contact (Mdn)	<i>U</i>	<i>p</i> -value
Training	3.0	1.0	206	.004*
Knowledge	4.0	2.0	158	< .001*
Importance	4.0	2.0	335	.253
Observe	2.0	1.0	243	.014*
Funding	2.0	3.5	214	.005*
Time	3.0	2.0	345	.304
Decisions	3.0	1.5	299	.105
Aesthetics	2.0	1.5	341	.288
No. of Animals	3.0	1.0	240	.018*
Workload	3.0	1.5	231	.011*

Note. Significant results marked with an asterisk (*)

seven of the 10 factors were not ranked significantly different based on years of employment at the current institution (see Table 4).

Importance of Welfare Knowledge

Of the 82 participants, 72% ($n = 59$) indicated that they were required to have a certain amount of knowledge about zoo-living animal welfare to be hired for their position, and 8.5% ($n = 7$) indicated that they did not know. Of those 59 staff members who needed welfare knowledge to be hired, only 8.5% classified their jobs as indirect contact (see Table 5). These affirmative responses comprised 77.1% of the total direct-contact participants and 41.7% of the indirect-contact participants.

Table 4

Significant Spearman's Rank Results for Perceived Influence Over Factors Impacting Cognitive Enrichment by Years of Professional Experience and Time at Current Institution

Factor	Experience (years)			Employment (years)		
	<i>p</i> -value	<i>r</i>	<i>n</i>	<i>p</i> -value	<i>r</i>	<i>n</i>
Training	.04	.227	82	.012	.277	82
Importance	—	—	—	.016	.266	82
Funding	.005	.305	82	.011	.281	82

Note. Significance is set to $p = .05$.

Of the total participants, 93.9% ($n = 77$) indicated that they had taken it upon themselves to learn more about zoo-living animal welfare on their own time. Direct-contact staff made up 87% ($n = 67$) and indirect-contact positions made up the remaining 13% ($n = 10$) of responses (see Table 5). These affirmative responses were made up of 95.7% of the total direct-contact participants and 83.3% of the indirect-contact participants.

Of the total participants, 78.0% ($n = 64$) indicated that their institution either encourages and/or requires continuing education about zoo-living animal welfare for their job position. Out of those 64 respondents, 85.9% ($n = 55$) were from direct-contact staff, whereas 14.1% ($n = 9$) were from indirect-contact staff (see Table 5). These affirmative responses were made up of 78.6% of the total direct-contact participants and 75.0% of the indirect-contact participants.

Only the 64 participants who indicated they were encouraged/required to continue learning about animal welfare for their job were asked if their institution provided any resources for continuing learning about zoo-living animal welfare. In total, 90.6% ($n = 58$) of participants indicated that their institutions provide resources for continuing education: 15.5% ($n = 9$) of which were indirect- and 84.5% ($n = 49$) were direct-contact staff (see Table 5). These

Table 5***Survey Responses Regarding Welfare Education Policies at Zoos****Institutional Welfare Knowledge Requirement for Hiring*

Job Classification	No % (n)	Yes % (n)	I don't know % (n)	Total % (n)
Direct	15.7% (11)	77.1% (54)	7.2% (5)	100% (70)
Indirect	41.7% (5)	41.7% (5)	16.6% (2)	100% (12)
Total	19.5% (16)	72.0% (59)	8.5% (7)	100% (82)

Self-driven Learning about Zoo-living Animal Welfare

Direct	4.3% (3)	95.7 (67)	N/A	100% (70)
Indirect	16.7% (2)	83.3 (10)	N/A	100% (12)
Total	6.1% (5)	93.9 (77)	N/A	100% (82)

Institutional Policy for Continued Learning about Zoo-living Animal Welfare

Direct	21.4% (15)	78.6% (55)	N/A	100% (70)
Indirect	25.0% (3)	75.0% (9)	N/A	100% (12)
Total	22.0% (18)	78.0% (64)	N/A	100% (82)

Does Institution Provide Resources for Continued Learning about Zoo-living Animal Welfare

Direct	10.9% (6)	89.1% (49)	N/A	100% (55)
Indirect	0% (0)	100% (9)	N/A	100% (9)
Total	9.4% (6)	90.6% (58)	N/A	100% (64)

affirmative responses came from 70.0% of the total direct-contact participants and 75.0% of the total indirect-contact participants.

From the 58 respondents who indicated resources were provided for continuing education about welfare, educational materials were indicated as being offered for 79.3% ($n = 46$) of respondents. This was followed by classes/seminars/lectures (77.6%, $n = 45$), conferences (67.2%, $n = 39$), research publications/journal subscriptions/etc. (58.6%, $n = 34$), financial assistance (56.9%, $n = 33$), and time (vacation, PTO, etc.; 48.3%, $n = 28$).

The relationship between the amount of professional experience held by an employee and factors proxying importance of welfare knowledge only had one significant correlation: If participants had ever taken it upon themselves to learn more about zoo-living animal welfare ($r(80) = -.221, p = .046$). The rest of the items did not significantly correlate with years of experience. The relationship between the years employed at the current institution and factors proxying importance of welfare knowledge had no factors that were significantly correlated with years of employment at current institution (see Table D5).

CHAPTER V

DISCUSSION

This project expanded on the Hoy et al. (2010) and Hall et al. (2021) studies by evaluating the perceived sense of responsibility of direct- and indirect-contact staff regarding the implementation of enrichment to zoo-living primates. The study aim was to identify existing differences in perceptions regarding the implementation of cognitive enrichment to primates between different types of zoo employees. Like previous survey results, zoo staff identified the importance of cognitive enrichment in the care and welfare of their animals (Hall et al., 2021). Findings suggest that perceptions of responsibility and influence over cognitive enrichment implementation are impacted by job-classification and years of professional experience.

Staff Perceptions on Responsibility for Cognitive Enrichment

A main goal of the current study was to investigate how responsible different job classifications perceived themselves as being for different factors proxying cognitive enrichment. Responsibility for factors involved in primate cognitive enrichment was perceived as belonging to direct-contact staff for most of the nine factors, and only one factor was significantly perceived as an indirect-contact job duty (sourcing finances for enrichment). These results mirror previous findings showing that most participants identified direct-contact staff as those who oversee the creation and delivery of cognitive enrichment (Hall et al., 2021).

The factors primarily identified as direct-contact staff responsibilities were tangible enrichment factors (e.g., designing, providing, maintenance, and evaluation), which makes sense because keepers spend more time physically in the animals' space. The other three factors that were identified as being the responsibility of direct contact staff were not contingent on being in the animals' spaces (ensuring, supporting, advocating), like the factor identified as an indirect-

contact responsibility (financing). Perhaps these factors were still identified as direct-contact responsibilities simply because these staff are perceived as knowledgeable about animal welfare overall and are likely to be enthusiastic and motivated to see these aspects of enrichment carried out (Bacon et al., 2021a). The perception about direct-contact staff responsibility also aligns with previous findings that imply direct-contact staff (namely zookeepers and animal caretakers) impact both the zoo-living animals' behavior and welfare (Chelluri et al., 2013; Jensvold, 2008). However, to my knowledge, there are no studies yet investigating how important non-keeper positions within a zoo are to animal care and welfare, which could be an informative future study from a workplace efficacy and team morale standpoint.

Only three of the nine responsibility factors were correlated with years of professional experience. Participants with more professional experience perceived themselves as having less responsibility for two of these factors (physically providing enrichment and up-keep of enrichment), which was unexpected. This could be a skewed representation, as the indirect-contact participants—who largely did not identify themselves as responsible for these two factors—reported higher mean years of professional experience than direct-contact staff. However, this result could be reflective of a difference in the ability for each job classification to continue progressing.

In the United States, zoo animal care staff are highly educated but poorly paid individuals who do not inherently have much opportunity for advancement (Bunderson & Thompson, 2009). Conversely, indirect-contact staff may have more ability for advancement, and therefore, those in indirect roles may remain employed in their field for longer. Keepers have reported doing their job because of their passion for animals (Bunderson & Thompson, 2009) rather than an

occupational identification or moral duty. This could impact their feelings of responsibility for work-related tasks.

Overall, the findings support the prediction that direct-contact staff are perceived as the responsible party when it comes to most factors involved in providing zoo-living primates with cognitive enrichment. Human-animal relationships made between direct-contact staff and zoo animals over time can be enriching to the animals (reviewed by Claxton, 2011), which could affect the sense of responsibility those staff members feel towards enrichment. However, as the years in the professional field increased, perceived responsibility for physically providing and the up keep of primate cognitive enrichment was less. These findings may reflect a trend in zoo staff, where those positions with longevity may not find the direct aspects of cognitive enrichment provisioning to be their responsibility, but rather identify the supporting aspects to be their responsibility. Another possibility is that the longer an individual works for an institution, the more responsible they feel for the animal's welfare. Studies show that some employees have "place attachment" (Jorgensten & Stedman, 2001) to the workplace which may influence how employees behave (Murphy & Maynard, 2022).

Staff Perceptions on Factors Impacting Cognitive Enrichment

Only one factor (importance of cognitive enrichment to the institution) was ranked higher for direct- than indirect-contact staff. This result supports a similar finding from Hall et al. (2021) in which the same factor was perceived as more important by positions within the zoo who would be classified as indirect in the current study. This could be due to different staff perceptions about support provided by the institution for certain activities. Support could come in many forms such as funding, knowledge, training, and time (Hall et al., 2021) as well as institution-wide encouragement of a "culture of care" (Bacon et al., 2021a) and/or management

acknowledging a reported lack of knowledge of good animal welfare (Bacon et al., 2021b). All other factors for this question block were ranked similarly regardless of job classification, years of professional experience, and years employed at the institution, suggesting that zoo staff consider all presented factors as impacting cognitive enrichment similarly.

The top ranked factor for direct-contact staff was “time to observe animal response to cognitive enrichment,” which mirrors previous research findings (Hall et al., 2021; Hoy et al., 2010). However, the second highest ranking factor was not “funding” like in Hall et al. (2021). North American zoos may allot more funding to primate care than other taxa or than other regions allot to primates species, so it may not be as prominent of an issue as it was in Hall et al.’s (2021) global study. In the current study, the “amount of personal knowledge about cognitive enrichment” was the second highest ranking factor. There is some evidence in international (European and Chinese) zoos that non-care staff (namely management) showcase a lack of animal welfare knowledge (Bacon et al., 2021b), so this finding could be evidence for similar knowledge distributions among zoo staff in North America.

Although predicted, indirect-contact staff did not cite “finances” or “time constraints” as the most impactful factors on enrichment implementation. Instead, indirect-contact staff ranked “importance of enrichment to the institution” as having the most impact. This is a different finding to Hall et al. (2021), which could be due to the different scales used in each of the two studies. In Hall et al., (2021) the participants were both direct and indirect staff from global zoos or all levels of employee from one zoo in Australia. Hall et al. (2021) also looked at the distribution of cognitive enrichment among various groups of zoo-housed animals, not just primates. The current study’s participants may have different perceptions about cognitive

enrichment because enrichment for primates may be expected, more supported, or funded more frequently than for other kinds of animals.

Staff Perceptions on Their Influence Over Factors Impacting Cognitive Enrichment

Direct-contact staff perceived a greater influence over five factors impacting cognitive enrichment than indirect-contact staff. These factors were, “training,” “knowledge of enrichment,” “time to observe animals’ response to enrichment,” “number of animals who receive enrichment,” and “others’ workload created by enrichment.” These perceptions of influence align with already discussed findings about perceived responsibility; presumably, these factors all fall into the standard animal caretaker job description (as defined in Hall et al., 2021 used for this study). This result also indicates a certain level of direct-contact staff interest (Hall et al., 2021) in these factors versus others. The only factor that indirect-contact staff perceived themselves as having greater influence over was “funding for enrichment,” which is again, presumably, more likely in the job description for indirect- than direct-contact positions.

Funding can influence many of the other factors that were listed, such as training and upkeep, but indirect-contact staff did not perceive themselves as having a significant amount of influence over those items. It may be the case that indirect-contact positions do not necessarily know what that funding goes towards specifically, but rather just have a general perception that money is going to ‘enrichment.’ Should the indirect-contact staff oversee allocating funds, but not know what all is included within or needed for adequate enrichment, they may underfund. Being underfunded may lead to cheaper enrichment supplies being used and could even potentially necessitate that direct-contact staff choose which taxa to prioritize giving enrichment to. This could negatively affect animal welfare, not just for primates.

The only factors showing significant differences in perceived influence based on professional experience were “amount of enrichment training” and “funding for enrichment.” Influence over “amount of enrichment training” was higher as years of professional experience increased. This may be because animal keeper staff know they are relied on for enrichment and are willing to seek out training and information in their personal time to make adequate enrichment for the animals (Clark, 2017; Hall et al., 2021). A system dependent on employee self-education may be flawed, as it relies on steady motivation and interest from the keepers in keeping up to date on animal welfare standards and care practices. If employees are driving their own education, even if they use institution resources, it could also be an issue if the resources being offered aren’t monitored as they could be outdated. More experience may also instill a feeling of more influence over the amount of enrichment training due to the expectations placed on a role over time (Kramer & Danielson, 2017). Similar reasoning holds for the correlation observed between professional experience and a perceived influence over funding for enrichment: An amalgamation of place attachment and loyalty (Murphy & Maynard, 2022) as well as role expectations over time (Kramer & Danielson, 2017) might lead staff with more time in a field to be more invested in a greater number of factors involved in the job.

There was also a relationship between longer employment at an institution and a higher perceived influence over the amount of enrichment training, funding for enrichment, and influence over importance of enrichment to the institution. The same explanations previously mentioned could hold true for correlations between longer employment and perceived influence over amount of enrichment training and funding for enrichment. However, the third factor could be explained by the mentor status that seems to follow people who have participated in a role for longer (Kramer & Danielson, 2017). Further research on the distribution among zoo staff of

supervisors and supervisees could provide information that helps us understand the degree of influence each position has, and in what capacity a supervisor influences their supervisees. Also, further research into the relationship between employment length and perceived influence over cognitive enrichment could aid in identifying which factors staff think impact cognitive enrichment. For example, maybe an institution's accreditation has changed every few years leading to changes in resource accessibility. Or there may be a trend where over time at one institution, the individuals' perceptions will change for whatever reason. Further investigations of this question could then be used to expand the current study and highlight additional differences based on job classification, years of experience, and employment in that instance.

Staff Perceptions on Welfare Education

My prediction that knowledge of zoo-living primate welfare would be identified as a necessary condition both to hiring and continued employment was supported. Over 70% of participants indicated they needed welfare knowledge to be hired, and over 75% of participants indicated that their institution required/encouraged continued learning about welfare. As expected, direct-contact staff comprised most of those total responses; however, of the indirect-contact staff respondents, 41.7% indicated they did need welfare knowledge to be hired and 75.0% indicated they were required/encouraged to continue learning about welfare. This result suggests that it is at least somewhat common for potential employees to be required to have animal welfare knowledge to be hired to work in zoos. It also suggests that zoos are aware that welfare research is an ever-growing, constantly changing field, so the staff should be sure to stay updated by continuing to learn about welfare during employment (Bacon et al., 2021a; Bacon et al., 2021b).

I predicted that only direct-contact employees would identify extra or continued learning about zoo-living primate welfare as necessary. The results show support for this prediction in that over 80% of the participants who reported that their institution required/encouraged continued learning about zoo-living animal welfare also self-identified as having a direct-contact job. Educational materials and classes/seminars/lectures were the resources most reported as being offered by institutions. Interestingly, of those participants that reported continued education was required/encouraged, all the indirect-contact participants said that their institution provided resources for that endeavor, whereas some direct-contact staff did not believe their institution provided any resources. This could just be an interdepartmental communication barrier, where staff whose jobs may overlap with the departments with the resources know of certain offerings that other staff may not. It may also be due to previously identified barriers to delivering animal welfare training to staff at zoos (e.g., time, money, language-appropriate resources, staff interest and motivation; Bacon et al., 2021b). Also, if workers look for their own resources, their organizations may not spend money on their own resources.

There may also be different perceptions on which resources are most appropriate or substantive. This could be a difference that is seen between job classifications, professional experience and time employed, so further research asking about continued learning could deepen the understanding about these perceptions. To clarify this discrepancy, future studies should determine where or from whom employees obtain resources when they are needed and if they elect to use their own outlets rather than workplace ones. Future research should also focus specifically on each of the current study's hypotheses individually to expand upon the trends observed and results found in this investigation. A larger and more diverse study sample, both

from each job classification and including more zoos, is needed to allow for external reliability and illuminate additional barriers that may be present for zoo employees.

Limitations and Future Directions

The limitations of this project are characteristic of survey-based research projects. For example, the responses from the survey participants may not be accurate or representative of the participants' true feelings as the choices provided may have been limiting. Though open-ended, write-in responses were offered, few respondents opted to use them, or the written responses aligned well with one of the provided options. Also, while the raw data had sufficient responses to provide a reasonable sample size, once cleaned, the sample size of complete survey responses became relatively small. The sample was also geared toward only English-speaking, AZA-accredited zoos in the United States, so the sample and results are skewed to reflect Western perceptions from that subset of zoo employees (Fraser, 2009).

The sample was also somewhat biased, as the people who were motivated to take it were those interested in cognitive enrichment and primate welfare. Therefore, the results are likely to have a positive bias towards cognitive enrichment. The sampling method in the current study used voluntary participation, therefore participating staff members were likely already interested in zoo primate welfare or cognitive enrichment, and motivated to complete the survey. Also, the respondent population was skewed towards direct-contact participants, and therefore those specific views. Therefore, the differences observed might exist because each job classification exists on either end of a spectrum. However, the proportion of direct- to indirect-contact participants, though not evenly distributed, may be representative of the proportion of those employees in North American-based zoos. Future research efforts should work to recruit

participation from employees at every level of zoo administration to determine the stratification of perceptions across an entire institution.

I recommend that future investigations employ more standardized question formatting, and streamlining the factors being investigated to only those that show interactions. Namely, if future studies continue to investigate AZA-accredited institutions, I recommend using verbiage found in AZA protocols rather than that found in previous studies, or perhaps further clarifying which specific group of job positions are the most relevant participants, rather than accepting responses from all positions interested in taking the survey. Future research should also utilize focus groups to ensure carefully worded questions or perhaps conduct in-person interviews to allow for in-the-moment clarification for the participants and to increase the likelihood of analogous data collection. Although not the main focus of the study, it would also be interesting to investigate post-pandemic effects on perceived responsibility, to see if perceptions have changed based on any aspect of the zoo workplace culture, support, or responsibility were affected by the time spent caring for animals during a pandemic. This is especially intriguing, as time constraints and overburdened keepers were already a topic of conversation pre-pandemic.

The differences in perceptions found in this study could also be a direct result of direct-contact employees seeing the actual implementation of cognitive enrichment, whereas indirect-contact employees have minimal exposure to enrichment outcomes for both direct-contact staff and the primates. As direct-contact staff are the ones who actually implement enrichment and are aware that enrichment implementation is historically reliant on care staff (Hall et al., 2021), direct-contact staff may not see the institution's opinions on cognitive enrichment as being all that important to its implementation. Perhaps direct-contact staff are also more willing to dedicate their own time to keep current on enrichment practices, which enables them to

implement enrichment as they please. Further research should evaluate another measure or way of asking this question that might be better suited to determining 1) where that disconnect lies within the realm of a functioning staff bound by AZA standards, and 2) what it says about the perceptions that staff of different job classifications have about their institution's role in certain processes. Notably, future studies should address the inclusion of more indirect-contact perceptions to obtain a more balanced study sample, and therefore, a more accurate view of how an entire zoological institution is positioned around important animal care issues.

Conclusions

These results highlight the extant differences between direct- and indirect-contact zoo staff in perceptions of responsibility and impact of certain factors on cognitive enrichment provisioning. There remains a sole reliance on and expectation of time-poor direct-contact staff to administer cognitive enrichment (observed in Hall et al., 2021). Specifically, the main issues to be addressed and corrected around cognitive enrichment implementation seem to be staffing time and the level of importance of cognitive enrichment to an institution. More senior management and indirect-contact staff could work to implement and/or endorse systems that support direct-contact staff in continued education and encourage the use of cognitive enrichment by allocating time and finances to direct-contact staff. These systems could show direct-contact staff that there is institutional support and understanding about animal care. This validation would also work to better support and manage staff needs, which would ultimately aid in animal care.

The differences in perceptions from the current study might exist because each job classification as they are described here are either entirely animal-facing or entirely not animal-facing. To better unite direct- and indirect-contact staff in their goals and perceptions, an

individual/team/department hired to be a liaison between the two job classifications could be effective. While it is not feasible to ask indirect-contact employees to have all the welfare knowledge of a direct-contact staff member, an intermediate position, or positions, within a zoo organization whose job duties require knowledge of and communication with both job classifications could reduce the gap between different levels of employee within a zoo and ultimately allow for the better execution of care practices for the animals. Overall, more research on cognitive enrichment and staff perceptions regarding its implementation, for all zoo-housed species, should be investigated more thoroughly.

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APPENDIX A

Primate Cognitive Enrichment Survey

Start of Block: Survey Introduction

Q1 The following short survey evaluates the perceptions of employees at AZA-accredited institutions regarding primate welfare and cognitive enrichment. This study should take approximately 20-25 minutes to complete.

This study is designed to gather information about zoo employee perceptions of responsibility in the implementation of cognitive enrichment to zoo-housed primates, as well as the importance of continued learning about welfare for primates in human care. The intention with this survey is to determine how zoo staff of all levels and across AZA-accredited institutions perceive differences between who is responsible for, and the issues with implementation of, cognitive enrichment to zoo primates. Also, to determine to what extent it is important to learn about primate welfare. We also gathered demographic information to better understand if a certain age, gender, race identity, or professional background affect these perceptions.

Your decision to participate is strictly voluntary and there are no anticipated risks, physical discomforts, or direct psychological stressors associated with these research procedures. You may withdraw from participating at any time and to do so you simply close your internet browser. Declining to participate will involve no penalty to you. If you submit a survey, your responses are recorded for data analysis purposes only. Any information you share will not be shared with outside sources or published. Data will be stored on a secure server and can only be accessed by the research team. Reasonable and appropriate safeguards have been used in the creation of this web-based survey to maximize the confidentiality and security of your responses; however, when using information technology, it is never possible to guarantee complete privacy. You can ask questions about the research by contacting Ember Toth in the Central Washington University (CWU) Department of Anthropology (412-600-6209 or tothe@cwu.edu). You may also contact the CWU Human Protections Administrator if you have questions about your rights as a participant or if you think you have not been treated fairly. The CWU Human Subjects Review Council (HSRC) office number is (509) 963-3115. Please click “I accept” if you are 18 years or older and wish to participate.

I accept (1)

I do not accept (2)

Skip To: End of Survey If The following short survey evaluates the perceptions of employees at AZA-accredited institutions..to the. = I do not accept

End of Block: Survey Introduction

Start of Block: Demographic Information

All numeric values for data analysis are included in parentheses after the choices they represent

Q2 How did you hear about this survey?

Email (1)

Social Media (2)

Other (3) _____

Q3 With which gender do you most identify?

Male (1)

Female (2)

Non-binary / third gender (3)

Prefer not to say (4)

Other (5) _____

Q4 What is your ethnicity (Please choose all that apply)

American Indian or Alaska Native (1)

Asian (2)

African American (3)

European/Caucasian (4)

Hispanic, Latinx, or Spanish Origin (5)

Native Hawaiian or Pacific Islander (6)

Prefer not to answer (7)

Other (8) _____

Q5 What is your age?

Q6 What level of animal contact do you have in your position?

- Direct-contact (positions that work directly with animals) (1)
- Indirect-contact (positions that work within the facility but do not contact the animals as a primary function of their job) (2)
- Other (please explain below) (3)

Q7 Approximately how many employees are there at your institution?

Q8 How long (years) have you worked for your current institution?

Q9 How many years of experience do you have in your professional field?

End of Block: Demographic Information

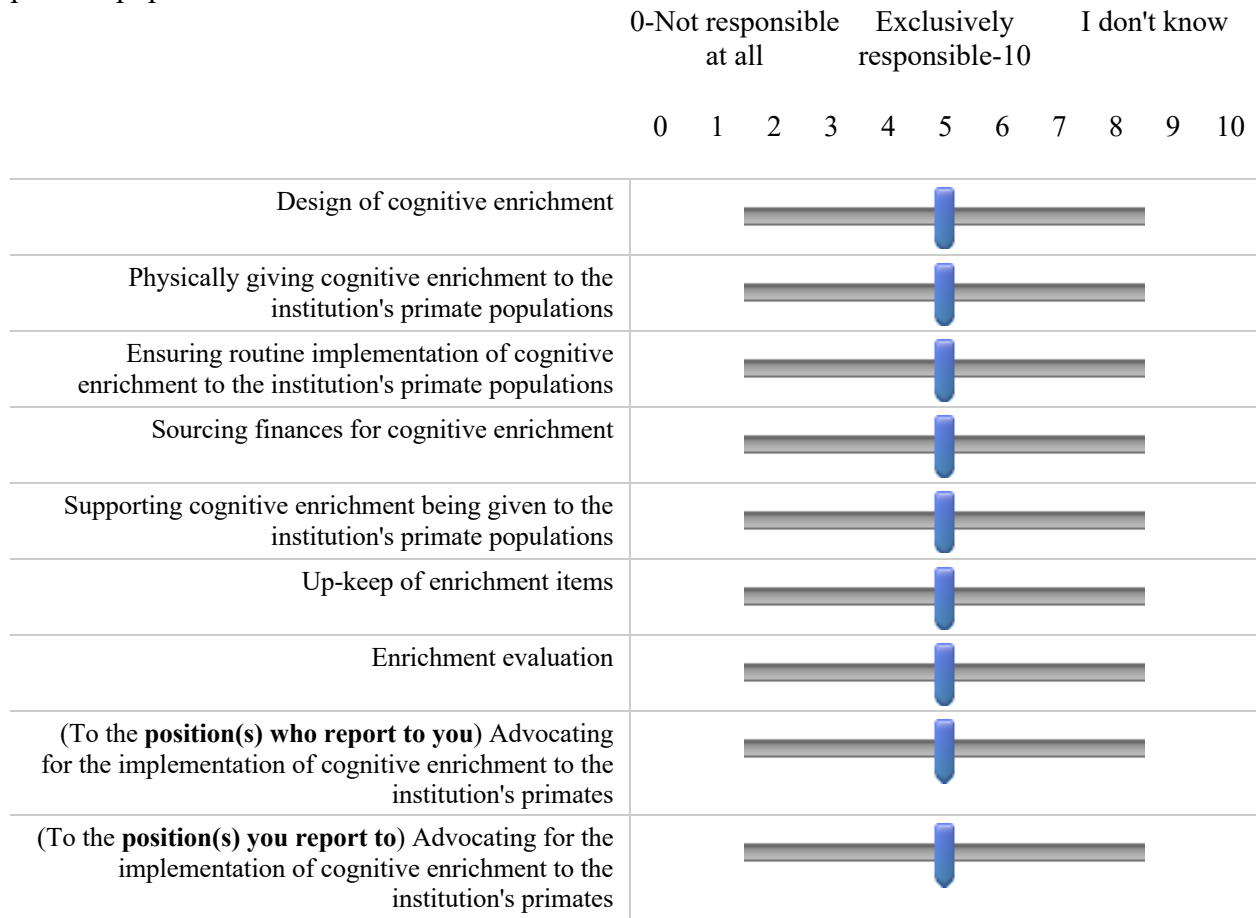
Start of Block: Perceptions of Responsibility

Q10 *Hover over the blue word to read definition*

How would you rate your institution on implementation of **cognitive** enrichment for zoo-living primate population(s)? Consider frequency and quality of enrichment.

- 0 (0)
- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10 (10)

Q11 Please consider your job position at your institution. On a scale of 0-10, how responsible is your position for the following activities related to cognitive enrichment for your institution's primate populations?



End of Block: Perceptions of Responsibility

Start of Block: Issues of Implementation

Q12 Drag and rank the factors below based on your perception of the factors impacting the implementation of cognitive enrichment. Rank so that 1 is the factor with the most impact and 11 is the factor with the least impact:

- _____ Amount of enrichment training (1)
- _____ Amount of personal knowledge about cognitive enrichment (2)
- _____ Importance of enrichment to your institution (3)
- _____ Time to observe animal response to enrichment (4)
- _____ Funding for enrichment (5)
- _____ Time available to spend on enrichment (6)
- _____ Decisions concerning enrichment (7)
- _____ Aesthetics of enrichment (8)
- _____ Number of animals who get enrichment (9)
- _____ Workload for others created by enrichment (10)
- _____ Other (11)

Q13 Please consider your job position. How much influence do you perceive yourself as having when it comes to the following factors regarding cognitive enrichment?

	None at all (1)	A little (2)	A moderate amount (3)	A lot (4)	A great amount (5)
Amount of enrichment training (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amount of personal knowledge about cognitive enrichment (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Importance of enrichment to your institution (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time to observe animal response to enrichment (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Funding for enrichment (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time available to spend on enrichment (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Decisions concerning enrichment (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aesthetics of enrichment (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of animals who receive enrichment (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Workload for others created by enrichment (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Issues of Implementation

Start of Block: Importance of Ancillary Learning

Q14 Were you required to have a certain amount of knowledge about zoo-living animal welfare to be hired for your position?

- No (1)
- Yes (2)
- I don't know (3)

Q15 Have you ever taken it upon yourself to learn more about zoo-living animal welfare in your spare time?

- No (1)
- Yes (2)

Q16 Does your institution either encourage and/or require continued learning about zoo-living animal welfare for your job position?

- No (1)
- Yes, they require and/or encourage it (2)

Skip To: Q16a If Does your institution either encourage and/or require continued learning about zoo-living animal welfare... = Yes, they require and/or encourage it

Display This Question:

If Does your institution either encourage and/or require continued learning about zoo-living animal welfare... = Yes, they require and/or encourage it

Q16a Does your institution provide any resources for continued learning about zoo-living animal welfare?

- No (1)
- Yes (2)

Display This Question:

If Does your institution provide any resources for continued learning about zoo-living animal welfare? = Yes

Q16b What kind of resources do they offer? (Choose all that apply)

- Financial Assistance (Grants or Discounts, Travel, etc.) (1)
 - Time (Vacation, PTO, etc.) (2)
 - Educational Materials (3)
 - Research Publications, Journal Subscriptions, etc. (4)
 - Classes/Seminars/Lectures (5)
 - Conferences (6)
 - Other (explain below) (7)
-

Q17 Does your institution require periodic educational updates for your position (Example: taking a class on your position's main function every few years to ensure up-to-date skills and information)?

- No (1)
- Yes (2)

End of Block: Importance of Ancillary Learning

Start of Block: Optional questions

Q18 What institution do you work for? (Optional. Will NOT be reported)

Q19 What is your **job title**? (Optional. Will NOT be reported)

Q20 Who do you report to? Provide applicable ***job titles*** ONLY (Optional. Will NOT be reported)

Q21 Who reports to you? Provide applicable ***job titles*** ONLY (Optional. Will NOT be reported)

Q22 Anything else that you would like to share about zoo-living primates and cognitive enrichment at your institution? (Optional)

End of Block: Optional questions

Start of Block: Survey Debrief

Q23 In order to protect your privacy, you are advised to close your web browser and clear its cache before leaving your own computer or a computer in a public place. Any information you have shared will NOT be shared with outside sources or published.

Thank you so much for participating in this research study. Your participation is valuable to us. We know you are busy, and we very much appreciate the time you devoted to participating.

Any information you have shared will NOT be shared with outside sources or published.

If you are interested in obtaining a copy of the final report of this study, please leave your email address in the text box below. Any further questions or comments you have regarding this study, its purpose or procedures, can be directed to either the primary investigator, Ember Toth at tothe@cwu.edu, or Dr. Jessica Mayhew at mayhewj@cwu.edu.

You may also contact the Central Washington University HSRC at (509) 963-3115 for further questions about your rights as a participant. If your responses to any of the questions caused concerns, the resources below may be helpful

Befrienders Worldwide; Search for helplines by country at <https://www.befrienders.org/>
Compassion Fatigue Awareness Project with resources for identifying and addressing compassion fatigue symptoms at <https://www.compassionfatigue.org/>

Again, in order to protect your privacy, you are advised to close your web browser and clear its cache before leaving your own computer or a computer in a public place.

Once again, thank you for your time and participation in taking part of this study.

Email Address:

End of Block: Survey Debrief

APPENDIX B

Primate Cognitive Enrichment Survey – AZA

Start of Block: Survey Introduction

Q1 The following short survey evaluates the perceptions of employees at AZA-accredited institutions regarding primate welfare and cognitive enrichment. Cognitive enrichment is a task (or tasks) whose use (1) engages evolved cognitive skills by providing opportunities to solve problems and control some aspect of the environment, and (2) is correlated to one or more validated measures of well-being (Clark, 2011, p.6). This study should take approximately 20-25 minutes to complete. This study is designed to gather information about zoo employees' perceptions of responsibility in the implementation of cognitive enrichment to zoo-housed primates, as well as the importance of continued learning about welfare for primates in human care. The intention with the survey is to determine how zoo staff of all levels and across AZA-accredited institutions perceive differences between who is responsible for, and the issues with implementation of, cognitive enrichment to zoo primates. Also, to determine to what extent it is important to learn about primate welfare. We also gathered demographic information to better understand if a certain age, gender, race identity, or professional background affect these perceptions. **Your decision to participate is strictly voluntary and there are no anticipated risks, physical discomforts, or direct psychological stressors associated with these research procedures. You may withdraw from participating at any time and to do so you simply close your internet browser. Declining to participate will involve no penalty to you. If you submit a survey, your responses are recorded for data analysis purposes only. Any information you share will not be shared with outside sources or published. Data will be stored on a secure server and can only be accessed by the research team. Reasonable and appropriate safeguards have been used in the creation of this web-based survey to maximize the confidentiality and security of your responses; however, when using information technology, it is never possible to guarantee complete privacy.** You can ask questions about the research by contacting Ember Toth in the Central Washington University (CWU) Department of Anthropology (412-600-6209 or tothe@cwu.edu). You may also contact the CWU Human Protections Administrator if you have questions about your rights as a participant or if you think you have not been treated fairly. The CWU Human Subjects Review Council (HSRC) office number is (509) 963-3115. Please click “I accept” if you are 18 years or older and wish to participate.

I accept (1)

I do not accept (2)

Skip To: End of Survey If Q1 = I do not accept

End of Block: Survey Introduction

Start of Block: Demographic Information

Q2 How did you hear about this survey?

- Email (1)
- Social Media (2)
- Other (3) _____

Q3 With which gender do you most identify?

- Male (1)
- Female (2)
- Non-binary / third gender (3)
- Prefer not to say (4)
- Other (5) _____

Q4 What is your ethnicity (Please choose all that apply)

- American Indian or Alaska Native (1)
- Asian (2)
- African American (3)
- European/Caucasian (4)
- Hispanic, Latinx, or Spanish Origin (5)
- Native Hawaiian or Pacific Islander (6)
- Prefer not to answer (7)
- Other (8) _____

Q5 What is your age?

Q6 What level of animal contact do you have in your position?

- Direct-contact (positions that work directly with animals) (1)
- Indirect-contact (positions that work within the facility but do not contact the animals as a primary function of their job) (2)
- Other (please explain below) (3)

Q7 Approximately how many employees are there at your institution?

Q8 How long (years) have you worked for your current institution?

Q9 How many years of experience do you have in your professional field?

Q18 What AZA-accredited institution do you work for?

End of Block: Demographic Information

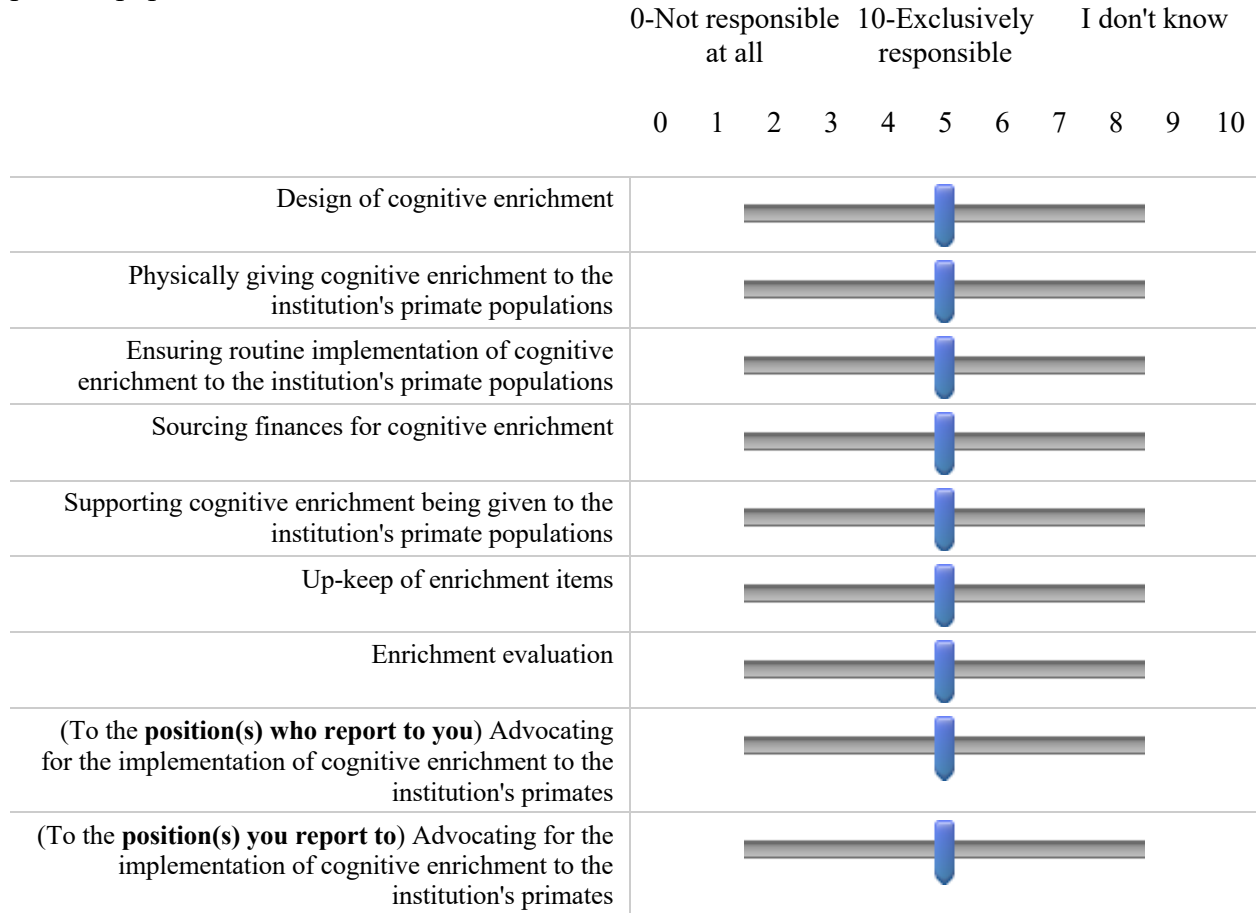
Start of Block: Perceptions of Responsibility

Q10 *Hover over the blue word to read definition*

How would you rate your institution on implementation of **cognitive** enrichment for zoo-living primate population(s)? Consider frequency and quality of enrichment.

- 0 (0)
- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10 (10)

Q11 Please consider your job position at your institution. On a scale of 0-10, how responsible is your position for the following activities related to cognitive enrichment for your institution's primate populations?



End of Block: Perceptions of Responsibility

Start of Block: Issues of Implementation

Q12 Drag and rank the factors below based on your perception of the factors impacting the implementation of cognitive enrichment. Rank so that 1 is the factor with the most impact and 11 is the factor with the least impact:

- _____ Amount of enrichment training (1)
- _____ Amount of personal knowledge about cognitive enrichment (2)
- _____ Importance of enrichment to your institution (3)
- _____ Time to observe animal response to enrichment (4)
- _____ Funding for enrichment (5)
- _____ Time available to spend on enrichment (6)
- _____ Decisions concerning enrichment (7)
- _____ Aesthetics of enrichment (8)
- _____ Number of animals who get enrichment (9)
- _____ Workload for others created by enrichment (10)
- _____ Other (11)

Q13 Please consider your job position. How much influence do you perceive yourself as having when it comes to the following factors regarding cognitive enrichment?

	None at all (1)	A little (2)	A moderate amount (3)	A lot (4)	A great amount (5)
Amount of enrichment training (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amount of personal knowledge about cognitive enrichment (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Importance of enrichment to your institution (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time to observe animal response to enrichment (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Funding for enrichment (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time available to spend on enrichment (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Decisions concerning enrichment (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aesthetics of enrichment (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of animals who receive enrichment (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Workload for others created by enrichment (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Issues of Implementation

Start of Block: Importance of Ancillary Learning

Q14 Were you required to have a certain amount of knowledge about zoo-living animal welfare to be hired for your position?

- No (1)
- Yes (2)
- I don't know (3)

Q15 Have you ever taken it upon yourself to learn more about zoo-living animal welfare in your spare time?

- No (1)
- Yes (2)

Q16 Does your institution either encourage and/or require continued learning about zoo-living animal welfare for your job position?

- No (1)
- Yes, they require and/or encourage it (2)

Skip To: Q16a If Q16 = Yes, they require and/or encourage it

Display This Question:

If Q16 = Yes, they require and/or encourage it

Q16a Does your institution provide any resources for continued learning about zoo-living animal welfare?

- No (1)
- Yes (2)

Display This Question:

If Q16a = Yes

Q16b What kind of resources do they offer? (Choose all that apply)

- Financial Assistance (Grants or Discounts, Travel, etc.) (1)
 - Time (Vacation, PTO, etc.) (2)
 - Educational Materials (3)
 - Research Publications, Journal Subscriptions, etc. (4)
 - Classes/Seminars/Lectures (5)
 - Conferences (6)
 - Other (explain below) (7)
-

Q17 Does your institution require periodic educational updates for your position (Example: taking a class on your position's main function every few years to ensure up-to-date skills and information)?

- No (1)
- Yes (2)

End of Block: Importance of Ancillary Learning

Start of Block: Optional questions

Q19 What is your **job title**? (Optional. Will NOT be reported)

Q20 Who do you report to? Provide applicable **job titles** ONLY (Optional. Will NOT be reported)

Q21 Who reports to you? Provide applicable ***job titles*** ONLY (Optional. Will NOT be reported)

Q22 Anything else that you would like to share about zoo-living primates and cognitive enrichment at your AZA-accredited institution? (Optional)

End of Block: Optional questions

Start of Block: Survey Debrief

Q23 In order to protect your privacy, you are advised to close your web browser and clear its cache before leaving your own computer or a computer in a public place. Any information you have shared will NOT be shared with outside sources or published.

Thank you so much for participating in this research study. Your participation is valuable to us. We know you are busy, and we very much appreciate the time you devoted to participating.

Any information you have shared will NOT be shared with outside sources or published.

If you are interested in obtaining a copy of the final report of this study, please leave your email address in the text box below. Any further questions or comments you have regarding this study, its purpose or procedures, can be directed to either the primary investigator, Ember Toth at tothe@cwu.edu, or Dr. Jessica Mayhew at mayhewj@cwu.edu.

You may also contact the Central Washington University HSRC at (509) 963-3115 for further questions about your rights as a participant. If your responses to any of the questions caused concerns, the resources below may be helpful:

Befrienders Worldwide; Search for helplines by country at <https://www.befrienders.org/>
Compassion Fatigue Awareness Project with resources for identifying and addressing compassion fatigue symptoms at <https://www.compassionfatigue.org/>

Again, in order to protect your privacy, you are advised to close your web browser and clear its cache before leaving your own computer or a computer in a public place.

Once again, thank you for your time and participation in taking part of this study.

Email Address:

End of Block: Survey Debrief

APPENDIX C

Social Media Post/Email/Plain Language Statement

Twitter/Facebook Post: Calling all zoo staff! NEW GRADUATE PROJECT SURVEY!

Primates, Cognitive Enrichment, and Zoo Welfare focused. Perceptions of responsibility toward providing cognitive enrichment to primates in AZA zoos! Click the attached survey link to participate! https://cwu.co1.qualtrics.com/jfe/form/SV_0kwERd7XCJ2uPjM

Email Message:

Subject: Graduate Project Inquiry--Cognitive Enrichment in Zoo-Living Primates

Hello, [zoo/individual]!

My name is Ember Toth, and I am a Master's student at Central Washington University (CWU) in the Primate Behavior (MSc) program. I am contacting you to see if you and/or your colleagues at [zoo] would be interested in taking part in a survey investigating how staff perceive responsibility regarding the provision of cognitive enrichment to zoo-living primate populations. My research survey is focused on all staff members from AZA-accredited institutions that house nonhuman primates in the United States. My survey draws on the work of Hall et al. (2021, full citation below). I aim to determine: 1) whether there are differences in perceptions on this topic based on role; 2) the staff's perception of responsibility as it pertains to aiding in cognitive enrichment provisioning; and 3) the opportunities for staff at these zoos to engage with welfare education (continuing education, workshops, conferences, etc.). I think this study could be an important step to discovering barriers to the provision of enrichment and informing the field of areas that need improvement. Please refer to the attached PDF plain language statement for the specifics of this project.

The survey has been approved by the CWU Human Subjects Review Committee, and the AZA Ape TAG. The survey itself should only take approximately 20-25 minutes to complete. If you are interested in participating, please click the link provided (Primate Cognitive Enrichment Survey).

If your zoo/institution requires additional information from me, please email me with the request and I will respond with those materials in a timely fashion.

Thank you very much for your time.

Best,

Ember Toth

(If you are interested in exploring our 2021 cohort more, here is the link to our website: <https://www.cwu.edu/primate/graduate-cohorts>).

Reference:

Hall, B.A., McGill, D.M., Sherwen, S.L., and Doyle, R.E. (2021). Cognitive enrichment in practice: A survey of factors affecting its implementation in zoos globally. *Animals*, *11*(1721), 1-14. doi: 10.3390/ani11061721 (<https://www.mdpi.com/2076-2615/11/6/1721>)

Plain Language Statement: The following short survey evaluates the perceptions of employees at AZA-accredited institutions regarding zoo-living primate welfare and cognitive enrichment. This study should take approximately 20-25 minutes to complete. This study and its procedures

have been approved by the CWU Human Subjects Review Council (HSRC) as well as the AZA Ape Taxon Advisory Group (TAG).

Your decision to participate is strictly voluntary and there are no anticipated risks, physical discomforts, or direct psychological stressors associated with these research procedures. You may withdraw from participating at any time and to do so you simply close your internet browser. Declining to participate will involve no penalty to you. If you submit a survey, your responses are recorded for data analysis purposes only. Any information you share will not be shared with outside sources or published. Data will be stored on a secure server and can only be accessed by the research team. Reasonable and appropriate safeguards have been used in the creation of this web-based survey to maximize the confidentiality and security of your responses; however, when using information technology, it is never possible to guarantee complete privacy.

This study is designed to gather information about how AZA-accredited zoo employees perceive responsibility in the implementation of cognitive enrichment to zoo-housed primates, as well as the importance of continued learning about welfare for primates in human care. The intention with the survey is to determine how zoo staff of all levels and across AZA-accredited institutions perceive differences between who is responsible for, and the issues with implementation of, cognitive enrichment to zoo primates, as well as to what extent it is important to learn about primate welfare. It will help identify barriers, if there are any, to implementation of cognitive enrichment to primates. Therefore, the results of this study may be important for the future welfare of primates in human care to investigate the efficiency and consistency of cognitive enrichment provisioning in zoos. We will also gather demographic information to better

understand if a certain age, gender, race identity, or professional background affect these perceptions.

Again, any information you have shared will NOT be shared with outside sources or published.

Any further questions or comments you have can be directed to either the primary investigator, Ember Toth (412-600-6209 or tothe@cwu.edu), or Dr. Jessica Mayhew (mayhewj@cwu.edu) in the Central Washington University (CWU) Department of Anthropology. You may also contact the CWU Human Protections Administrator if you have questions about your rights as a participant or if you believe you have not been treated fairly. The CWU HSRC office number is (509) 963-3115.

Thank you so much for participating in this research study. Your participation is valuable to us. We know you are busy, and we very much appreciate the time you devoted to participating.

APPENDIX D

Supplemental Tables of Results

Table D1

Participant Demographic Identifiers

Gender Identity	Indirect-Contact	Direct-Contact	Total
Male	2	10	12
Female	7	58	65
Non-binary / third gender	0	2	2
Prefer not to say	3	0	3
Other	0	0	0
		Total Participants	82

Table D2*Participant Ethnicity Identification*

Ethnicity	Counts	% of Total
American Indian / Alaska Native	0	0
Asian	3	3.5
African American	1	1.2
European / Caucasian	68	80.0
Hispanic / Latinx / Spanish Origin	6	7.1
Native Hawaiian / Pacific Islander	1	1.2
Prefer not to answer	4	4.7
Other	2	2.3
Total Responses	85	

Table D3

Non-significant Spearman's Rank Results for Responsibility Factors by Years of Professional Experience and Time at Current Institution

Factor	Experience (years)			Employment (years)		
	<i>p</i> -value	<i>r</i>	<i>n</i>	<i>p</i> -value	<i>r</i>	<i>n</i>
Design	.136	-.166	82	.556	-.066	82
Physical	—	—	—	.256	-.127	82
Ensuring	.242	-.131	82	.966	-.005	82
Financing	—	—	—	.059	.215	78
Supporting	.627	-.055	80	.540	.069	80
Up-keep	—	—	—	.122	-.172	82
Evaluation	.141	-.165	81	.383	-.098	81
Advocating as a higher-up	.052	.237	68	—	—	—
Advocating to a higher-up	.293	-.122	76	.517	.075	76

Table D4

Median Ranks of Factors Impacting Implementation of Cognitive Enrichment by Job Classification

Factors	Direct contact (<i>Mdn</i>)	Indirect contact (<i>Mdn</i>)	<i>U</i>	<i>p</i> -value
Training	4.5	4.0	336	.27
Knowledge	4.0	5.0	359	.42
Importance	5.0	2.0	194	.003*
Observe	6.0	5.0	402	.82
Funding	5.0	4.5	406	.86
Time	3.5	5.0	324	.21
Decisions	6.0	7.5	328	.22
Aesthetics	9.0	9.5	300	.11
No. of Animals	5.0	6.0	416	.96
Workload	8.0	9.0	328	.22
Other	11.0	11.0	396	.41

Note. Significance is set to $p = .05$. Significant results marked with an asterisk (*).

Table D5

Non-significant Spearman's Rank Results for Rank of Factors Impacting Cognitive Enrichment by Years of Professional Experience and Time at Current Institution

Factor	Experience (years)			Employment (years)		
	<i>p</i> -value	<i>r</i>	<i>n</i>	<i>p</i> -value	<i>r</i>	<i>n</i>
Training	.84	-.023	82	.17	.151	82
Knowledge	.053	-.215	82	.46	.083	82
Importance	.66	.049	82	.14	.163	82
Observe	.44	-.087	82	.19	-.147	82
Funding	.41	.093	82	.86	-.020	82
Time	.46	.082	82	.36	-.103	82
Decisions	.71	.042	82	.61	.057	82
Aesthetics	.76	-.034	82	.20	-.143	82
# of Animals	.57	.063	82	.96	-.006	82
Workload	.36	.102	82	.96	.005	82
Other	.83	.024	82	.91	.013	82

Note. Significance is set to $p = .05$.

Table D6

Non-significant Spearman's Rank Results for Importance of Welfare Knowledge by Years of Professional Experience and Time at Current Institution

Question	Experience (years)			Employment (years)		
	<i>p</i> -value	<i>r</i>	<i>n</i>	<i>p</i> -value	<i>r</i>	<i>n</i>
Welfare knowledge requirement	.92	-.011	82	.83	-.025	82
Self-driven learning	.046*	-.221	82	.20	-.142	82
Institution's learning policy	.86	.019	82	.35	-.105	82
Institution's employee updates	.70	.043	82	.39	-.097	82

Note. Significant results marked with asterisk (*). Significance is set to $p = .05$.