COMPLEX POST-TRAUMATIC STRESS DISORDER IN THAI ELEPHANTS

Prevalence and Management Implications

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MS Conservation Medicine 2019 |
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Table of Contents

List of Tables and Figures

Executive Summary

About 60% of the remaining Thai elephant population is living to serve as a tourist attraction; with an estimated 2,700 captive elephants and only 2,000-3,000 wild elephants remaining in Thailand (TECC, 2019). Unfortunately, the number of captive elephants continues to increase as the wild population steadily decreases due to the capture of elephants to be used in logging and tourism (IUCN, 2019). Other factors working against the Asian elephant include the fragmentation and loss of land as human development continues to expand (IUCN, 2019).

The exploitation of Asian elephants in Thailand is contributing to the demise of the Thai elephant and the development of psychological trauma in those that are living for human gain. Psychological distress among captive elephants is not a new issue within elephant camps, proven through the excessive expression of stereotypical behaviors in captive elephants and the incidences of mahouts being injured and/or killed by their elephants. Due to the dominance-based training techniques and harsh management style frequently used in elephant camps, elephant psyche is often compromised, resulting in the presentation of dangerous and harmful behaviors (Rizzolo and Bradshaw, 2019).

Research conducted by Hakeem et al. confirmed the high level of cognition elephants are capable of due to their large, convoluted hippocampi, putting them at risk for psychological disorders, such as post-traumatic stress disorder (Hakeem et al., 2005). With such cognitive ability, emotional expression, and sentience, the current exploitation of elephants across Thailand in the logging and tourism industry is creating a physically and psychologically unhealthy captive elephant population (Rizzolo and Bradshaw, 2016). With the emergence of trans-species psychology research, researchers have been able to identify cases of post-traumatic stress disorder (PTSD) and complex post-traumatic stress disorder (c-PTSD) in species including chimpanzees, African elephants and Asian elephants. The distinction between PTSD and c-PTSD is two-fold; first, c-PTSD is characterized by long term exposure to trauma or stress often early on in brain development causing undeveloped neuropathways to form (Rizzolo and Bradshaw, 2019). Second, c-PTSD is most often seen in captive animals while PTSD is more commonly diagnosed in wild/free-range animals.

This case study focuses on the expression of symptoms consistent with c-PTSD in a group of rescued Asian elephants in Thailand. Beginning with a review of the use of Asian elephants in tourism and logging throughout Thailand, providing extensive background on training methods and how a life of work impacts both the physical and psychological health of the elephant. Next, an evaluation of the psychological health of rescued elephants at a sanctuary in Northern Thailand is reviewed. The objective of the research done in this case study is to advance knowledge around the psychological impacts of unfair working conditions to improve safety and welfare practices in sanctuaries. In achieving a better understanding of how the brain reacts to trauma and stress, identifying symptoms and triggers, and pinpointing which

management methods are most efficient in reducing symptoms and removing triggers, a decline in potentially dangerous and unhealthy behaviors may be seen in captive elephants across Thailand.

This study evaluates 11 elephants residing in a sanctuary in Northern Thailand where they are able to live a life of autonomy, free of cruelty. After obtaining information regarding the health, behaviors, and personal history of the elephants upon entrance to the sanctuary, behavioral observations were able to commence to track the progress of each individual. Psychological health differed greatly between elephants, this could be due to a number of reasons, such as: type of work the individual was rescued from, age at time of separation from mother/if the elephant was wild caught or captive bred, number of years residing in the sanctuary, and differences in personality which can impact the ways in which individuals are able to cope with stress and trauma.

Interviews with caregivers to learn life history, paired with behavioral analysis, led to finding six of the 11 elephants with psychological disturbance consistent with behaviors of c-PTSD. Although 55% of the sample population was found to exhibit pathological trauma, all 11 sanctuary residents have shown improvement since their time of rescue. By providing the elephants with a management style that offers autonomy and self-determination, symptoms of trauma can be alleviated (Rizzolo and Bradshaw, 2016). In managing elephants with symptoms of pathological trauma, it is critical to individualize treatment; for example, if an individual elephant experiences elevated stress levels when they are put into an enclosure at night, putting them on a single leg long chain in an open space may be a better option, and vice versa. By interpreting behavioral cues as a means of communication, sanctuary owners and caregivers can better address the needs of their elephants and treat them as individuals, rather than using blanket management strategies.

Introduction

Asian elephants (*Elephas maximus*) are listed as endangered and decreasing on the International Union for Conservation of Nature (IUCN) Red list. Threats impacting Asian elephants include deforestation, lack of suitable habitat and habitat fragmentation, all of which are caused by humans. Although a primary threat to Asian elephants is the rapidly growing human population resulting in diminished land and resources for wildlife, there are additional threats that humans pose to Asian elephants. A major threat that humans present is the tourism and entertainment industry that has been exploiting a number of species for centuries. The removal of elephants from the wild to serve as tourism attractions contributes to dwindling numbers in the wild as well as significantly impacting the population that is currently being held in captivity (IUCN, 2019).

Elephants throughout Thailand are used for multiple purposes in captivity: illegal logging, trekking/riding, circuses, street begging, and historical reenactments. In order to participate in these activities, elephants undergo domination-based training methods in which individuals are restrained with ropes and chains and implements such as bull hooks are used to get the elephant to submit to humans (Rizzolo and Bradshaw, 2019). This physical training method affects the psychological health of the elephant as it is meant to replace the love and memory the calf has for its mother with a fear and submission to humans (King, 2005). In Thailand this training method is referred to as “phajaan” which means “to crush” and can often take weeks of restrictive and often cruel training (King, 2005). With increasing popularity of elephant rides and shows, more elephants are being taken from the wild daily to serve in the tourism industry. This poses as a major threat to both individual elephants, as their welfare is severely compromised, and the population on a large scale, as the number of wild elephants is rapidly dropping. There are about 35,000-40,000 Asian elephants left in the world today, and about 15,000 are in captivity (WWF, 2019). With upwards of 30% of the remaining population living within human confines, the cycle of wild elephants being taken for tourism serves as a major threat to species survival (WWF, 2019). In Thailand the population number is even more dire, estimating the total wild population around 2,000-3,000 individuals with 2,700 captive, privately owned elephants (TECC, 2019). Thailand was chosen as the focus of this case study due to the popularity of elephant tourism throughout the country. Many Asian countries utilize and exploit elephants; however, Thailand has a high rate of tourism and is a very popular location to interact with elephants. Because the demand for elephant rides and interaction is so high across the country, there is an abundance of captive facilities that are not meeting the standard of care that Asian elephants require.

Training and Stress

When it comes to individual elephants in captivity, there are a number of threats to their psychological health when working so closely with humans. Starting from the time they are calves, often taken from the wild or captively bred and taken from their mothers in order to feed the tourist industry. Female calves generally stay with their mothers most of their lives as they remain with their herd. Male calves usually stay with their mothers for 10-15 years as they generally nurse for up to seven years (Schulte, 2000). Elephant calves are very attached to their mothers and rely on them for almost everything. This dynamic is ideal for such large mammals as females who usually only reproduce a handful of times in their lives and generally will not have a calf within 7 years of their last. Because of this attachment, in order to obtain an elephant calf and fend off the mother and herd, the herd is often killed when a calf is taken for tourism purposes. A tactic that is often used is to scare a herd in one direction into a trap hole, individuals will often break legs and die on the spot or starve as they are unable to get out. Although less calves are being obtained from the wild, this is still an issue throughout Thailand, along with forced breeding practices in order to continue feeding the industry with calves. Once the calves are acquired, they are broken in order to be utilized in tourism. This initial step is both harmful to the population number and the psyche of the calf that was taken as they will often be highly stressed when separated from their mothers (King, 2005).

During the breaking process, the welfare of the elephant is at an all-time low. They are unable to move freely and express natural behaviors (King, 2005). The five freedoms of animal welfare include: freedom from hunger and thirst, freedom from discomfort, freedom from pain, injury or disease, freedom to express normal behaviors and freedom from fear and distress. Throughout this process all freedoms are ignored as the calf is restrained without access to food or water for a period of time. The intensity of the training is dependent on how unnatural the end job for the elephant will be—for example, training an elephant to perform in the circus is among the most intense of the training methods due to the need for elephants to achieve positions that are unnatural for their bodies (Rizzolo and Bradshaw, 2019). Oftentimes their trunks are restrained during the breaking which is highly stressful as they utilize their trunks to eat, drink, breathe, communicate, and express other natural behaviors. This process is uncomfortable and cruel as people sit on their backs and heads to get them used to humans being on top of them, utilize implements such as bull hooks, chains and sometimes fire to control them and punish them if they are not behaving accordingly. This is a highly stressful and fearful experience for the elephant. Following the phajaan, the elephant is taught how to walk with a human, their feet often times in hobbles or shackles. Once the training process is over, the elephant can then be used for a variety of tasks.

Common Uses of Elephants

Logging

One of the main industries that supports the economy in Thailand is exports, which includes the logging industry. Logging in Thailand has been a complex industry for over a century and has relied heavily on the use of elephants. In 1899 all the forests in Thailand were declared government property, forcing all loggers to pay the Royal Forest Department to profit the Kingdom. The Forest Industry Organization (FIO) was established in 1956 to institute government control of all industrial uses of the forests. With massive amounts of forest being lost, the government began establishing national parks and forest conservation areas in 1962, however, the rate of deforestation continued to increase. This motivated the government to institute laws around logging in the late 1960's which required replanting of trees to replace what was being cut. However, this was not well enforced or managed, deeming this law unsuccessful. This began the illegal logging throughout Thailand that does not comply with re-planting or guidelines for where and how much one can cut. However, in 1988 there was a massive flood in southern Thailand which contributed to the law being changed to completely ban all commercial logging—this law became effective in 1989 (FAO, 2006).

Unfortunately, commercial logging is still taking place in Thailand despite its legality. Loggers are occasionally caught by law enforcement and taken into custody, and oftentimes are paid off with money or an elephant that can work (FAO, 2006). Elephants are a big part of the logging industry in Thailand today, as they are trained to pull the logs through the forest and to the trucks, then lift the logs onto the trucks for transport. This industry contributes to a lot of physical suffering of elephants, punishments for not working or for working inadequately are harsh and the toll pulling logs takes on the body is immense. Fatality and injury of elephants is prevalent in logging due to falls and rogue logs (Begley, 2006). Additionally, chains are used to strap logs behind the elephant so they can pull these heavy logs which can result in major damage to their limbs and joints as the weight can be too extreme for their bodies (Rizzolo and Bradshaw, 2018). There have been elephants who have dislocated shoulders and hips and broken their legs from the intense physical demand of this work. Additionally, elephants are unable to eat and drink as consistently as needed to remain healthy, resulting in higher incidence of injury, disease, and death. Illegal logging is a major obstacle in elephant conservation as it is difficult to regulate and often not enforced (Begley, 2006).

Street Begging

Another harmful use of elephants in Thailand is for street begging. This is seen primarily in larger cities and often the elephants are used as a tourist attraction for photos. Generally, this is done with calves or younger individuals as they are easier to navigate through cities. This

is a very harsh life for an elephant as they have very sensitive eyes and ears and being in a city exposed to so much noise and light is very damaging (Rizzolo and Bradshaw, 2018). Often this exploitation can cause blindness from the bright lights and flash photography. With little natural vegetation around, the elephants are often fed poor diets and not nearly enough food to keep them healthy, frequently resulting in malnourishment and disease (Rizzolo and Bradshaw, 2018). There is also a high death rate of elephants brought into the cities as they can get injured very easily. There have been incidences of elephants falling into holes in the streets and breaking their legs or being trapped. This has poor welfare implications and results in high stress levels (Rizzolo and Bradshaw, 2018).

Performances

Tourist attractions that are common worldwide that are also problematic in Thailand include circuses and historical reenactments. Many of the historical reenactments of wars or battles often use elephants as the vehicles in which the soldiers move around and fight. These are often accompanied by cannons and loud noises which can be very stressful for the elephants, and elicit a fight or flight response from the elephants, putting human and elephant lives at risk. Events such as these have proven to have very poor welfare for elephants and poor safety for the humans that are involved in the event. Circuses have a longstanding history and can be seen all over the globe. Oftentimes animals travel around in small cages to get from show to show and are trained with harsh training methods in order to do stunts for a crowd. This is no different in Thailand where bull hooks and other weapons are used to force elephants to contort their bodies and perform unnatural tricks. Injuries from this kind of training and work are very prevalent as they are often distributing their weight differently than they normally would and putting too much pressure on certain body parts (Rizzolo and Bradshaw, 2018).

Elephant Camps

Finally, among the most common form of elephant tourism in Thailand is elephant rides (trekking) and captive elephant parks. There are sanctuaries all over Thailand and Southeast Asia for elephants, some operate under different rules and treat their elephants better than others. Many are trekking camps in which the elephants are used exclusively for giving rides to visitors. These elephants are sometimes chained or roped up to a pole or tree, often in small enclosures, until a visitor comes to ride them. Sometimes they are being held in shade or in the sun, but usually do not have constant access to food or water. Elephants usually eat for up to 18 hours a day and these camps, like the previous examples, do not allow for constant intake of food and water oftentimes resulting in highly unhealthy individuals (Rizzolo and Bradshaw, 2018). Additionally, with constant sun exposure there is high incidence of skin damage and

dehydration. When being trained to work in these camps, elephants are not to throw dirt, mud, or plant material onto their backs as it would be thrown onto visitors. Unfortunately, this is their mechanism for sun protection and with long days out in the sun, the bodies of these elephants are majorly impacted (Rizzolo and Bradshaw, 2018). Saddles can be quite heavy on the elephants backs and sit on their joints, causing damage to shoulders and hips while being very hard on their backs. On top of the physical toll of the equipment, at many camps implements such as bull hooks are utilized to maintain control of the elephant (Begley, 2006).

Other activities that are common in these elephant camps include elephant paintings, bathing elephants, and different photo opportunities with the elephants. Elephant paintings are common in camps that use a domination-based management style to control their animals. Tourists can get a picture that is painted by an elephant's trunk in which the elephant is controlled by its caregiver. Common methods of doing this include using a nail to apply pressure to the thin skin of the ear or simply pulling on the ear (Rizzolo and Bradshaw, 2018). Elephants have very sensitive and thin ears and therefore the pain of this act can encourage them to create these paintings. Another common activity that is recently becoming more criticized as unethical is bathing elephants as many captive facilities allow people to swim, take mud baths and bathe the elephants. During which time the elephants are closely interacting with visitors and often pose for photos picking up humans with their trunks and allowing humans to ride on them for photos. The act of bathing and mudding is a natural behavior that elephants use to cool off and protect themselves from the sun. By allowing humans to be involved in this, natural behaviors are being impeded on and the elephant is no longer in control (Rizzolo and Bradshaw, 2019).

Forced Breeding

At many different captive facilities forced breeding is practiced in order to captively breed calves to continue working. Not only is forced breeding dangerous for the female, it is often traumatizing and inhumane. The female is generally tethered or chained to poles or trees to keep her from moving, a bull is then released into the enclosure with her and allowed to breed with her. This is unethical breeding since the female is unable to escape the male, and often the male will attack her. Without any way of getting away from the bull, the female will often die or have long lasting injuries from such attacks (Rizzolo and Bradshaw, 2018).

Implications of Working Elephants

Elephants are exploited in so many different ways worldwide; however, exploitation is emphasized in regions where elephants are extant. This review focuses on Thailand because of the increasing popularity for tourism and the number of Asian elephants in the country. Due to

the mistreatment of Asian elephants, many suffer in various ways. There are many physical implications such as blindness, broken bones and dislocations as well as trauma to their skin from chains, sun damage, and hooks (Rizzolo and Bradshaw, 2018). However, this damage is often incomparable to the psychological damage that is done to each elephant that lives a life serving humans.

As this issue persists, there are more people being attacked and killed by elephants which is a major issue when trying to conserve the population. This not only leaves the future of the Asian elephant unknown, but also brings more of a negative perception to conservation efforts and elephants in general. As there is an increasing number of elephant rescues and sanctuaries from tourism and logging camps, these elephants require proper treatment and can be dangerous (Rizzolo and Bradshaw, 2018). It is vital to understand the best course of action in terms of treatment and management to decrease the number of injuries and deaths attributed to elephants. This would benefit caregivers, elephants and conservation as a whole.

Current Research

The Brain

Elephants are among the smartest species on the planet. They have extremely large and convoluted hippocampi which enables them to have keen memories and complex emotional expression (Hakeem et al., 2005). Elephants have been seen to grieve their dead, show signs and symptoms of psychological disorders such as depression, and be able to remember members of their herds years after separation (Rizzolo and Bradshaw, 2019). However, with increased stress, the memory and cognitive functions of the brain are negatively affected. Studies have shown that elephants in tourism with extremely high stress levels have decreased ability to recognize their own reflection, while the majority of elephants can do so (Raine et al., 2001). Studies such as the one conducted by Raine et al. have proven that the impact of stress on the brain of the elephant can have major detrimental effects that can be long-term and impact the way the elephant interacts with their environment. The hypothalamic-pituitary-adrenal (HPA) axis regulates behavior and more specifically is associated with social behavior while increasing right hemisphere dominance within the brain (Tang et al., 2003). This development of the right brain is involved with regulation of stress, emotion, attachment and social behavior (Schore, 2005). Some of the highly complex behaviors elephants show, such as self-awareness and grieving, are related to this attachment development in the right brain maturation and growth early on in life (Schore 2002). With increased stress, a reduction in right brain activation is often observed, predisposing the individual to violent behavior and lack of social awareness (Raine et al., 2001).

There is a lot of information pertaining to the elephant's brain and cognition that support the need for further research on psychological disorders in elephants. Due to the

complexity of the elephant's brain and the neural substrates, the psychological capacity of the elephant is immense and puts them at risk for trauma comparable to human trauma (Rizzolo and Bradshaw, 2019). When this trauma occurs early on in life, it disrupts the development of the brain by compromising the neuroendocrine development and growth (Rizzolo and Bradshaw 2019). This impact changes the cognition of the elephants and alters the potential the individual has for utilizing their brains to the full capacity. This serves as a major disadvantage to the individual going forward as they do not learn key information from their mothers and can have compromised growth. Additional research has shown that a single traumatic event (not necessarily long-term exposure) can cause lifelong transformations in social learning abilities and neural organization—this can disrupt socialization as well as the ability to learn natural behaviors and behave as a wild elephant (Bradshaw, 2009). This can not only be the result of direct causes, such as separation from or death of mother, but also indirect causes such as transmission of stress from the mother that creates negative impacts on the plasticity of the individuals brain, therefore increasing the vulnerability of the calf to psychopathogenesis and potential early death (Cirulli et al., 2003).

These developmental setbacks are amplified in bull elephants increasing the significance and potential danger in working with these individuals (Bradshaw, 2009). It is thought that elephants undergo two stages of brain development, the second of which occurs in their teen years. In many captive facilities, if breeding occurs, the calf is taken from its mother early on in its development. In bulls this is especially present due to the fear of their aggression and difficulty managing them in times of high aggression. However, when these male calves are taken from their mothers so early on, they are often kept isolated which is thought to cause them to miss the second phase of brain development due to a lack of socialization and understanding of social behaviors within a herd (Bradshaw, 2009). This not only adds to the trauma of the individual by being separated from its mother too early in development but alters brain development that carries lifelong repercussions. Further, female elephants will often have less obvious symptoms in comparison to males as females will tend to internalize in the form of depression, while males will externalize which will present as hyper-aggression (Bradshaw and Schore, 2007).

The more often an individual is moved or transported to a new captive facility, the more severe this trauma and lack of socialization gets as they are brought into unfamiliar surroundings coupled with the stress of transportation and the loss of any social bonding that may have occurred in the previous facility. A life in captivity with minimal socialization and variety often can lead individuals to have robot-like behaviors which can present as loss of appetite, depression, stereotypy and apathy (Timerman, 2002).

Although many of the resulting neural implications of trauma can alter the cognition of the individual, it has also been seen that some of this can be alleviated through proper care and management. Elephants that reside in domination-based facilities that control the elephants

through fear and stress have decreased cognition, once brought into facilities and sanctuaries where this is not the case, the elephant's neuropsychology can be recalibrated due to the repair of trust, and the ability to be autonomous and regulate stress and emotion. This kind of environment can also be key to reducing trauma symptoms, which can further repair and recalibrate the neuroendocrine system (Rizzolo and Bradshaw, 2019).

PTSD vs. c-PTSD

Building on this knowledge of the elephant's brain, it has been seen that elephants can be diagnosed with post-traumatic stress disorder (PTSD). The first researcher to identify this was Dr. Gay Bradshaw who first observed this disorder in African elephants who had been orphaned due to culling. These African elephants were known for terrorizing rhinoceroses sexually and physically, making researchers question the motive and potential past life trauma that has led to this behavior (Bradshaw, 2009). This has not been an uncommon trend among African elephants that have experienced poaching and culling first hand, especially as calves. A similar trend has been seen in calves that have been separated from their mothers too early (Rizzolo and Bradshaw, 2019). In wild population, PTSD symptoms have been seen and understood as expressions of stress and lack of autonomy in their environments. The African elephants observed in Bradshaw's study were victims of witnessing the death of their mother and herd and were then victims of translocation leaving them with a lack of control over their lives, causing the expression of PTSD symptoms (Bradshaw, 2009).

Similarly, captive individuals have been diagnosed with complex post-traumatic stress disorder (c-PTSD) from similar but more long-term traumas. The distinction between PTSD and c-PTSD is two-fold; first, c-PTSD is characterized by long term exposure to trauma or stress often early on in brain development causing undeveloped neuropathways to form (Rizzolo and Bradshaw, 2019). Second, c-PTSD is most often seen in captive animals while PTSD is more commonly diagnosed in wild/free-range animals. In Asian elephants, the distinction is important in noting that captive individuals have long-term trauma due to domination-based training and management methods in order to serve in tourism and logging. Whereas, wild individuals do not undergo such training and management and are more at the mercy of conservation efforts resulting in culling and translocation or trauma through hunting and poaching (Rizzolo and Bradshaw, 2019).

Since much of PTSD and c-PTSD is attributed to the separation of a young individual from its mother or family unit early on, this has implications on the generational knowledge that is so important in wild species. Elephants, and many other species that do not live solitary lives, are reliant on social interactions and bonds in order to pass down knowledge through the generations (Rizzolo and Bradshaw, 2019). This is how elephants learn of the best places to find resources, what presents danger to them and their young, and how to problem solve. Human

presented adversity for wildlife (such as poaching, culling, tourism and exploitation) serve as major barriers to the dissemination of knowledge throughout generations of wild populations and may contribute to social extinction of species (Bradshaw, 2009). Social extinction will occur when there are no longer enough wild individuals reproducing to pass knowledge down to younger members (Bradshaw, 2009). If all reproducing females of a species were, at one point or currently, residing in captivity and were taken from their families from a young age, they do not possess the same knowledge and skill that they would have if they had grown up with their wild counterparts teaching them how to survive in the wild. This serves as an additional repercussion of the unfortunate actions that are causing such psychological harm to elephants.

Due to the mostly unexplored nature of this topic, there is very little primary data on psychological disorders in Asian elephants or trans-species psychology in general. The majority of published work in this discipline focuses on the human mind with some works looking into chimpanzees and elephants. Materials beginning to surface about elephant psychology is primarily being done by Dr. Gay Bradshaw and Jessica Rizzolo. Gay Bradshaw developed trans-species psychology with the first work being done in the African elephants suffering from trauma of culling, previously mentioned. This work was built upon with a study looking at c-PTSD in captive Asian elephants in Thailand that found that 73% of the study population showed at least one symptom of c-PTSD, concluding high prevalence (Rizzolo and Bradshaw, 2016). The study also concluded that rehabilitation is possible with proper care in sanctuaries in which domination-based management is not utilized and instead the elephants are free to heal and live autonomously (Rizzolo and Bradshaw, 2016). The ability to exercise autonomy over their lives is critical in recovering from being heavily managed and controlled by humans from a young age. Prevalence is higher in individuals that were taken from their mothers at a young age (at or before five years of age) and who were wild caught (Rizzolo and Bradshaw, 2019).

Research methods used in looking at trans-species psychology are adopted from human psychology. Indicators and symptoms are taken from the human psychology DSM and altered to align with the expressions and language consistent with non-human animals. This method is proven effective because of the similarities between the human and non-human animals' brains, leading scientists to find that core brain functions are shared across species (Hakeem et al., 2015). This is backed up by the sense of self seen in many animals, including elephants observed through self-recognition and expression of complex emotional capacity.

Looking at psychological assessments of chimpanzees and their diagnosis with c-PTSD provides insight into the diagnosis in elephants. A study conducted by Bradshaw et al. diagnosed chimpanzees who had previously been involved in laboratory testing for several years and documented how their symptoms changed once placed in a sanctuary. These chimpanzees were in captivity for sustained periods (15-20 years) and underwent painful, invasive and stressful medical procedures for the purpose of biomedical research. One subject, Jeannie, suffered permanent neurological damage from over 200 "knockdowns" and long-term

physical ailments due to the manipulations done by scientists (Bradshaw et al., 2008). Conclusions made by Herman (1992) and other scientists communicate that many c-PTSD symptoms come about through a victim's dependence on the person(s) in power that makes them unable to exercise their autonomy. Authors concluded that these chimpanzees were experiencing symptoms of dissociation and attachment disorders as well as complex PTSD. However, a notable point made by Bradshaw et al. was that although the individuals were moved to a sanctuary in which they were able to make their own decisions and had self-empowering opportunities, they were still incarcerated and with this comes the potential for re-traumatization of individuals. Sanctuaries are ideal for rehabilitating individuals who may need extra attention for psychological and physical ailments; however, depending on the species, continued confinement and reliance on a person of power can still potentially be an unhealthy and traumatic environment (Bradshaw et al., 2008).

Studies such as this one serves as building blocks for additional studies looking into trans-species psychology by continuing to build off of human psychology. Trans-species psychology aims to communicate that just because a species is unable to verbally express trauma does not mean it is not being expressed in various other ways and that the species is not communicating its trauma in the only way it's able. It was previously believed that children were incapable of developing post-traumatic stress because of the inability to verbally express trauma in the typical way adults are able (Bradshaw et al., 2008). The human psychology field has since acknowledged that not only can children be diagnosed with PTSD, but they show very high prevalence due to their reliance on a person of power, and vulnerability within society. The underlying similarity is the dependency and reliance on another, putting the individual in an extremely vulnerable position often resulting in victimization (Bradshaw et al., 2008). Therefore, this is easily related to not only chimpanzees but other highly intelligent and self-aware species that are residing in a management situation where they have a reliance on another in order to survive and meet all their needs.

In order to diagnose an individual who is unable to verbalize their trauma, caregivers must be able to recognize the vocal and somatic expressions of emotion and trauma to understand what they are intending to communicate. Researchers must be able to understand the language that the individual is using to communicate their trauma to identify and resolve symptoms. In observing chimpanzees, Bradshaw et al. found that although their study focused on complex PTSD, there are other diagnoses that would fit the symptom clusters being seen in these individuals. Other diagnoses include reactive attachment, major depressive disorders and anxiety disorders due to the outbursts and violent episodes seen in studied individuals (Bradshaw et al., 2008).

Complex PTSD and PTSD as a Diagnosis

Post-traumatic stress disorder is characterized by two different things: the symptoms and the precipitating source (Bradshaw, 2009). This distinguishes this diagnosis from other psychological diagnoses as understanding the past trauma and experiences of the individual is key in understanding the trauma they are expressing. The only other disorder that requires an understanding of background of the individual is reactive attachment disorder, as previously mentioned, which has similar symptom clusters to PTSD and is relevant to research further when thinking about trans-species psychology (Bradshaw, 2009).

The four diagnostic clusters pertaining to PTSD diagnosis as explained in the DSM-5 are: re-experiencing, avoidance, negative cognitions and mood, and arousal (APA, 2013). The four categories are further broken down into symptom clusters. Re-experiencing covers the spontaneous memory of traumatic events which often manifests in flashbacks or psychological distress. Avoidance covers memories, thoughts, feelings or external reminders of traumatic events, this can often then lead to re-experiencing. Negative cognitions and mood represent a plethora of different feelings including a distorted sense of blame on oneself or others, diminishing interest in activities and estrangement from others. This category also includes an inability to remember key events or traumas. The last category, arousal, is most notable for aggressive and self-destructive behaviors. Arousal also covers sleep disturbances, hypervigilance and related behaviors (APA, 2013). These definitions are taken out of the DSM-5 and from that can be interpreted to be more fitting of animal psychology and behavior.

These criteria for diagnosing PTSD can be broken down into specific behavioral indicators to measure prevalence in non-human species. For example, an overestimation of danger falls into the arousal category; in elephants, common indicators of this symptom cluster would be charging at a caregiver without provocation, being easily startled and distrustful, an unrealistic perception of danger and flinching in the absence of physical force due to the expectation of violence (Rizzolo and Bradshaw, 2016). Connections such as this one are made due to the links in current literature that confirm such cognitive similarities between human and non-human animals suggesting that the process of diagnosis is the same once a common way of communicating is established.

One Health Component

The Caregivers

The conservation of elephants and treatment of psychological disorders in captive elephants relies heavily on the caregiver. The needs of the animal that is being cared for need to be met in order to see progress in treatment and reduce the individual's stress. However, this cannot be done if the needs of the caregiver are not first met. There is not only a moral obligation to care for these caregivers, but a requirement to ensure their needs are met before any animal care needs are expected to be met. Those working hands on in conservation and

putting themselves in potentially risky situations are in just as dire a situation as the animals at risk if they are unable to live off of their paychecks, feed themselves and their families, or do not feel safe in their work environment. If these key points are not addressed, the caregivers outlook on conservation may be skewed in a negative direction, therefore rendering all conservation efforts ineffective. If the livelihood necessities of those who are working with individual rescue cases are ignored, these workers will no longer contribute to conservation. Some major gaps that need to be addressed in this area focus on the welfare of the caregivers and sanctuary personnel working with the elephants. To better understand incidences of injury and death in each facility, as well as the perceived safety of each caregiver. By collecting data from these workers to understand their perceived welfare and safety at work, changes can be made to ensure they are reducing their risk of injury or attack by elephants. Additionally, looking into wages is critical in gaining support in elephant conservation. Future research is needed in comparing wages between domination-based management facilities with more ethical sanctuaries that are focused on the healing of the elephant. If wages and safety are significantly improved at facilities that are empowering the elephants, participation in conservation will increase as workers will gravitate toward the higher income. By addressing and meeting the needs of the Thai people who are working closely with Asian elephants, advancements in conservation and social science can be made throughout Thailand.

The Environment

Conservation of Asian elephants has implications on the health of the environment and their ecosystems as well. One of the major threats to Asian elephants is a decrease in habitat as human population continues to grow and close in on what was formerly natural land. This has increased development in once natural areas and impacted biodiversity as well as climate change with mass deforestation. This not only has negative implications on wildlife populations but also on human health and environmental health. Elephants are often referred to as “destructive” as they search for food and eat mass amounts of vegetation; however, it has been noted that this “destructiveness” plays a major role in transforming the ecosystem overtime. Not only does this bring about more biodiversity to the area that the elephants are residing, but also creates a mosaic of grassland and woodland which is beneficial to preserving the landscape, increasing plant growth and introducing more diversity of wild species in these areas (Sheldrick, 2017). Therefore, by continuing to conserve elephants not only in the wild but also throughout sanctuaries worldwide where they are able to be autonomous, there is a greater impact being made on the landscapes in which they reside, improving the health and diversity of the ecosystem.

Manuscript

Abstract

Asian elephants have long been utilized and exploited for human gain; whether it be in the logging or tourism industry, elephants have been serving in captivity for centuries. On top of the physical ailments that present from a life in domination-based captivity, neuroscientists and psychologists have recently revealed the immense psychological trauma that can occur due to the convoluted brain structures that elephants have in common with humans (Hakeem et al., 2005). Through imaging and modeling of the elephant's brain, neuroscientists have confirmed the high level of cognition, emotional expression, and sentience. This led to some preliminary studies being done looking at incidence of complex post-traumatic stress disorder (c-PTSD) and its effects in Asian elephants. In Thailand, this issue is very prevalent due to the high number of Asian elephants in captive environments undergoing harsh training methods with early life trauma (RIzzolo and Bradshaw, 2016). However, symptoms of c-PTSD can be mitigated through proper care and management that allows elephants to express autonomy and self-determination (Rizzolo and Bradshaw, 2016). There are many facilities throughout Thailand that are committed to healing the psychological damage done to Asian elephants in captivity, one of which is reviewed in this study to conclude the progression of the disorder from the time of rescue while identifying management styles successful in alleviating symptoms.

Introduction

Elephants are considered one of the most intelligent species in the world, being able to pass the mirror self-recognition test (Plotnik, de Waal and Reiss, 2006) and utilize tools. Due to their intellectual capacity, elephants have long been used to serve humans in tourism as well as in laborious work pulling logs, which often inflicts trauma. Research by Hakeem et al. has compared the human brain to that of an elephant and has confirmed the many similarities between the two species. The size and convoluted nature of the hippocampus of the elephant suggests a deeper ability to think as well as a heightened ability to feel and express emotions (Hakeem et al., 2005). This research not only confirms the intelligence and cognitive ability of elephants but also suggests that they are more similar to humans than was once believed (Hakeem et al., 2005). With such sentience, research has found that elephants have shown behaviors consistent with mourning and depression while having intricate social structures and behavior (Plotnik, de Waal and Reiss, 2006). Of these include the matriarchal herd structure, birthing rituals in which a nanny aids in protection of the calf, and the formation of lifelong friendships. With such high cognitive functionality, the way in which elephants are being wiped out and cruelly trained by humans has profound effects on individual's mental health and

wellness. With the up and coming field of trans-species psychology, topics such as this are beginning to emerge as welfare and species population concerns are becoming more relevant.

Since many captive elephants are taken away from their mothers prematurely for a life of often unfair working conditions, this early life trauma and exploitation can manifest into complex post-traumatic stress disorder (Rizzolo and Bradshaw, 2019). The manifestation of c-PTSD not only increases management difficulty and danger, but also becomes very evident as the elephant will stereotype and exhibit abnormal behaviors at different stimuli depending on their triggers (Rizzolo and Bradshaw, 2016). Many previous studies have examined reproductive and physical health measures in captive elephants, as well as PTSD in wild African elephants, with little research going into the psychological damage being done to elephants in captive settings. The distinction between PTSD and c-PTSD is two-fold; first, c-PTSD is characterized by long term exposure to trauma or stress, often early on in brain development, causing undeveloped neuropathways to form (Rizzolo and Bradshaw, 2019). Second, c-PTSD is most often seen in captive animals while PTSD is more commonly diagnosed in wild/free-range animals (Rizzolo and Bradshaw, 2019). For the purposes of this study, the distinction is important in noting that captive individuals have long-term trauma due to domination-based training and management methods in order to serve in tourism and logging. Whereas, wild individuals do not undergo such training and management and are more at the mercy of conservation efforts resulting in culling and translocation or trauma through hunting and poaching.

In diagnosing c-PTSD in all species, the symptoms and signs are very similar to that in humans. According to the DSM-5, there are four diagnostic clusters that aid in diagnosis of post-traumatic stress disorder. These include: re-experiencing, avoidance, negative cognitions and mood, and arousal (APA, 2013). Each of these breaks down further into specific symptoms, see Table 1 below.

Diagnostic Clusters	Symptom Clusters
Re-experiencing	Spontaneous memory of traumatic event. Manifests in flashbacks or psychological distress.
Avoidance	Memories, thoughts, feelings, external reminders. Can lead to re-experiencing.
Negative Cognitions and Mood	Distorted sense of blame on oneself or others, diminishing interest in activities and estrangement from others.

	Inability to remember key events or traumas.
Arousal	Sleep disturbances, hypervigilance.

Table 1: PTSD symptoms

From the human DSM-5 symptom clusters for PTSD, researchers Jessica Rizzolo and Dr. Gay Bradshaw created a chart laying out the symptom clusters of c-PTSD as seen in elephants. As you can see from Table 2 below, these symptoms are universal for all species and can be utilized in the evaluation of psychological health of all animals.

c-PTSD Symptom Cluster	Specific Symptoms	Examples of Behavioral Indicators
Post-traumatic stress	Fear at trauma-related stimulus	Distress vocalizations, avoidance, and/or violent response to trauma-related stimulus such as mahout or bull elephant
Avoidance behaviors	Avoidance of social contact Tension reduction behaviors	Self-injurious behaviors, stereotypies, avoidance of other elephants
Mood disturbances	Anxiety, aggression	Intense social anxiety/agoraphobia (retreating/remaining in confined space), physical aggression towards humans and/or elephants
Altered self-capacities	Altered stress regulation, altered emotional regulation, impaired socialization	Unpredictability, lack of impulse control, inability to discern and communicate social cues
Cognitive symptoms	Hypervigilance	Charging at mahout without provocation, flinching in absence of physical force, distrustful of humans, unrealistic assumption of danger, easily startled

Table 2: c-PTSD Behavioral Indicators

Trans-Species Psychology

Trans-species psychology is a branch of psychology based around human and non-human animals sharing commonalities in cognition and emotions. The field has been emerging as more research is being done on animals in captivity and the impacts of close human contact on wildlife. Trans-species psychologists look at animal behavior and expression through the same lens as human behavior and expression to further understand and diagnose potential disorders that are mirrored between species (Rizzolo and Bradshaw, 2019). Research in this realm of psychology has thus far been heavily focused on primates as they are so closely related to humans; a study conducted by Bradshaw et al. diagnosed chimpanzees with complex post-traumatic stress disorder after living in facilities in which they were used as test subjects for medical procedures (Bradshaw et al., 2008). Observing behavior in conjunction with an extensive knowledge of the chimpanzee's history and background allowed researchers to diagnose individual chimpanzee's complex post-traumatic stress disorder (c-PTSD) and evaluate how the disorder manifested overtime once the individuals were relocated to a sanctuary. An additional study conducted by Rizzolo and Bradshaw looked at diagnosing Asian elephants with c-PTSD and concluded that 34% of the study population showed symptoms of post-traumatic stress and over 50% of the population exhibited mood disturbances (including anxiety and increased aggression) (Rizzolo and Bradshaw, 2016). With this focus on animal psyche there is increased understanding of animal welfare and how to properly manage wildlife that are living in captivity. A distinct difference between trans-species psychology and animal behavior is the diagnosis of individual animals. Trans-species psychology aims to understand symptoms, rather than behaviors, and view them as a way of non-verbal communication that leads to the ability to diagnose based on psychological assessment (Bradshaw, 2008).

Methods

Study area and population

The study population includes Asian elephants at a captive facility located in Sukhothai, Thailand that houses both male and female elephants. Data was collected during the rainy season (July-October) of 2019. The sanctuary is home to 11 elephants, including four bulls and seven females, ranging from 15 years of age up to mid 60's. All of the elephants came from trekking, logging, street begging or shows such as circuses. For the purpose of this study, female elephants were observed as well as male elephants who were not in musth, to avoid additional confounding variables such as increased aggression and irritability. In order to diagnose the individuals with c-PTSD, two methods of data collection were used.

Data collection

When assessing symptoms consistent with trauma in elephants, body language and expressions must be translated and understood as a communication method. First, a history of the elephant as well as notable behaviors upon entrance into the park were obtained to understand the progress made. With the history form (see figure 1 below for example) an understanding of body condition, location in which they were moved from/type of management, and age were acquired as well as an understanding of the behaviors they were exhibiting upon arrival from the mahouts. This process allowed for a baseline to be determined. This baseline measurement is critical to then make conclusions about how management style has influenced the progression of any unhealthy behavioral patterns.

Elephant:	Lom		
Location moved from: street begging			
Date of arrival: July 2006		Current date: July 2019	
Age at arrival	2	Current age:	15
Body condition at arrival: underweight/m		Current body condition: healthy	
Behaviors exhibited upon arrival:		panic, unpredicatable reactions, repelled from touch, running water/loud noises scared her, run in fear from other elephants	
Altered self capacity	X		
Cognitive symptoms	X		
Mood disturbances	X		
Avoidance behaviors	X		
Post-traumatic stress	X		
Stereotypy			

Figure 1. History Form Example

Once a brief history on the individual was taken, behavioral analyses of the elephant began to track which behaviors they show and the frequency (see figure 2, behavioral analyses form below). Daily walks to the forest with the elephants allowed for data collection with no behavioral interference. Each elephant was observed for a minimum of twice a week for three hours at a time as individuals were free to come and go as they pleased on walks and were not forced to stay in one particular area for data collection. Viewing each elephant for long periods of time not only aids in determining diagnoses, but also tracks progress and management of each individual. Through utilization of the ethogram results paired with the backgrounds learned from the mahouts and sanctuary owner, each individual elephant's psychological wellbeing could be accurately assessed.

		Date: 7/22		Time:		Weather: 92 overcast	
Location: enrichment enclosure		Mahout present: no		Visitors around: no		Body condition (1-5): 3	
Time				Behavior			Notes
Hours	altered self cap	cognitive sympt	mood disturban	avoidance beha	posttraumatic s	stereotypy	
11:00				X		X	swaying at gate

Figure 2. Behavioral Analyses Form

Results and Discussion

Of the 11 elephants residing at the sanctuary, six display behaviors consistent with complex post-traumatic stress disorder; meaning 55% of the study population is currently exhibiting pathological signs of trauma. Of these elephants, three presented stereotypy in the form of swaying, one showed re-experiencing and avoidance, one displayed negative cognition and mood, and one with increased stress symptoms such as distress vocalizations. The percentage of expression of each specific symptom can be seen in figure 2, symptom distribution chart, above.

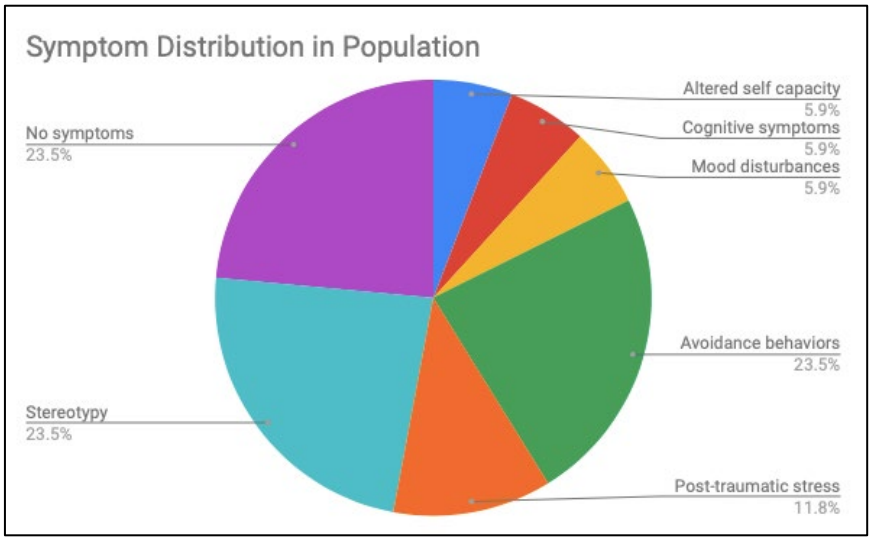

Figure 3. Symptom Distribution

Although more than half of the individuals in the population show symptoms of trauma, many show significant progress and alleviated symptoms from the time of rescue. Two of the individuals that stereotyped only showed these symptoms while in an enclosure with no mahout around. Both were observed swaying at the gate of their enclosures, with no mahout nearby but with human presence in line of sight. However, neither of these individuals have any avoidance behaviors while out in the open land with their mahouts. This is significant progress from when these two elephants were rescued and were showing more frequent and compulsive signs of trauma.

Almost every individual observed in this study showed stereotypy or signs of trauma upon entrance to the sanctuary; however, with proper management, all have alleviated

symptoms. Fortunately, at many reputable elephant sanctuaries, each elephant is managed a bit differently depending on their needs. At the sampling site, each individual was managed in such a way that numerous previous symptoms being seen were no longer present. This is due to the ability of the staff to specialize treatment and management depending on where the elephant has come from, and what they need in order to be healthy. The elephants have the ability to exercise autonomy and freewill every day, allowing them to be free from the psychological hold that humans often have over their elephants. However, in individuals diagnosed with c-PTSD, there are still triggers that cause certain behavioral changes, such as aggression or stereotyping (see figure 3 below for frequency of each symptom observed). For example, one of the observed elephants was utilized in trekking and logging camps and was constantly transported via truck. Upon arrival at the sanctuary she exhibited stereotypy and aggression; after living at the sanctuary for about 9 years, the elephant shows no stereotypy, aggression, or symptoms of depression but will charge at trucks when they are driving near her in open land. This shows a presence of c-PTSD as trucks cause avoidance and re-experiencing for this individual. Similarly, one of the bull elephants residing at the sanctuary of focus only stereotypes when other elephants or groups of humans are in his presence, acting as a trigger or stimulus for potential re-experiencing leading to avoidance behavior expression. Cases of other elephants at the sanctuary, include an individual that at the time of rescue was in extremely poor health, was aggressive toward mahouts and had heightened environmental fears. This individual, 9 years after being rescued, shows no aggression or abnormal cognitive symptoms as seen upon arrival at the sanctuary. The trauma this individual experienced primarily was observed in distress vocalizations when separated from the rest of the herd. This shows tremendous progress that is due to the way this elephant has been managed and the interaction she was able to make with her mahout to enable healing.

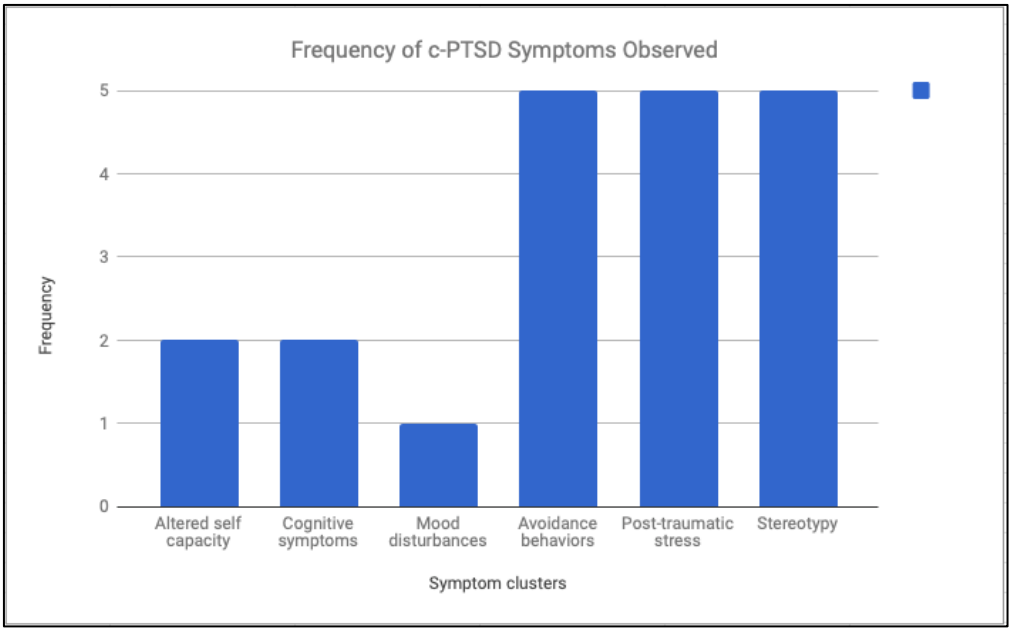

Figure 4. Frequency of Symptoms

With the progress seen from the elephants observed in this study, it can be concluded that elephants not only thrive in a more hands-off management style, but also that care cannot be generalized for all individuals. With the current research in trans-species psychology looking into the complexity of the elephants' brain, proving high level of emotional intelligence and cognition, each elephant should be assessed upon entrance to a captive facility to determine their needs. Providing social interaction to those who may be seeking companionship, a mahout that has a good relationship with them, proper housing and safety precautions to ensure both human and elephant safety. By listening to the needs of the elephant, they are able to better adjust during the transition to a more ethically run facility and reduce incidences of c-PTSD behavior presentation. Each individual manifests trauma and stress differently, bulls usually externalize trauma in the form of lashing out and aggression while female elephants often will internalize stress and trauma in the form of stereotyping, depression, and refusal to eat or interact with other elephants (Bradshaw and Schore, 2007). Just with this distinct behavioral difference, the sex of the elephant determines many management implications—such as: housing needs, how closely caregivers should interact with the individual, and if/when other elephants should be introduced to the individual to aid in social interaction. Management of a bull in captivity is a difficult feat, in order to ensure proper care and welfare the psychological and physical health need to be considered when creating a management plan. The same is true for female elephants, although often easier to manage in captivity, some may require a more hands-off approach to aid in trauma recovery.

In managing Asian elephants at a sanctuary, the most ideal method to ensure psychological progress and health is allowing the elephants to have autonomy and self-determination. This is achieved through letting each individual elephant make their own decisions around contact with guests/staff and giving them the time and space to exhibit normal behaviors—such as eating, drinking, bathing, socializing, and playing both alone and in a group. By offering autonomy to individuals that have experienced restriction and abuse in their lives, they are able to more successfully recover from trauma related stress. Another trend in stress behaviors that was recorded was the utilization of a strict schedule causing additional stress to the elephants as they are able to link a time and location with a certain action, such as a consistent feeding time. Often the implementation of a strict schedule, such as a feeding or bath time at the same time and place daily, increases stereotypy during and just before and after that time block due to the anticipation and stress of the activity. This can be counterproductive in facilities whose goals are to rehabilitate their elephants and reduce pathological trauma related behaviors.

This case study provides an analysis of the plasticity of the Asian elephant psyche and cognition when exposed to prolonged human interaction and dominance-based training methods. The results of this study confirm high prevalence of psychological breakdown and trauma resulting in the diagnosis of c-PTSD, a lifelong diagnosis with the ability for alleviated

symptoms through proper management. Many of the Thai elephants working in logging and tourism have psychophysiological damage due to early separation from mother, cruel training methods, and lack of elephant interaction. This underdevelopment poses as a challenge for safe management; however, by providing elephants with the opportunity to regain their autonomy, reduce human interaction, and socialize at their will, alleviation of symptoms is possible.

Acknowledgements

I would first like to thank Dr. Christopher Whittier for helping me in the development of this project, and for all of his support throughout the year. I am very appreciative of all of the guidance and time both Dr. Whittier and Dr. Allen Rutberg have given me throughout the progression of this project. I would also like to thank Katherine Connor and everyone at Boon Lott's Elephant Sanctuary for welcoming me in and allowing me to conduct my research. Their encouragement as well as the support from the Tufts Elephant Conservation Alliance (TECA) in funding the project made this research possible, thank you TECA for your support. Finally, I would like to thank Dr. Alison Robbins, Dr. Jessica Sparks, Tracey Glover, all of the MCM professors/lecturers, and the MCM 2019 class for all of their knowledge and inspiration along the way.

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