Prevalence and Patterns of Complex PTSD in Asian Elephants (*Elephas maximus*)

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Introduction

Neuroscientists have established for decades that all vertebrates, humans and nonhumans alike, share the same brain structures and processes that govern cognition, emotions, and consciousness. In addition to passing the mirror self-recognition test (Plotnik, de Waal and Reiss, 2006), having the ability to perform complicated cognitive tasks including numeracy, means-end reasoning, and tool use (Hart et al., 2001; Foerder et al., 201; Irie-Sugimoto et al., 2009), using a complex and multi-channeled system of social language and learning (Plotnik and de Waal, 2014; McComb et al., 2001), and having the capacity to experience profound grief, empathy, and other emotions, elephants share with humans psychobiological structures and processes vulnerable to trauma (Bradshaw, 2009). As neuropsychology predicts, elephants subjected to a series of human-caused traumatogenic disturbances exhibit symptoms consistent with Post-Traumatic Stress Disorder or PTSD (Bradshaw 2005; Bradshaw et al 2005; Bradshaw & Schore 2007). African elephants (*Loxodonta africana*) who experience one or more traumatic events, injury or death of self or conspecifics from poaching, culling, translocation, maternal separation, and/or capture for captivity, exhibit damaged social and emotional functioning consistent with symptoms found in human survivors of trauma (Bradshaw, 2009a).

While prior scientific analysis has diagnosed epidemic PTSD in free-living African elephants, only a limited number of assessments of the psychologically-mediated health of captive-held Asian elephants has been effected (Bradshaw. 2009a,b). Crucially, the institution of captivity is more prevalent for Asian elephants (*Elephas maximus*) than for African elephants. The capture and use of Asian elephants for logging, entertainment, and religious practice has been widely practiced in Southeast Asia and India for at least 4,000 years (Sukumar, 2011). In some countries, such as Thailand, the number of elephants in captivity now equals or exceeds the wild population. Although numerous studies have examined indictors of physical health in captive-held Asian elephant populations (e.g. Chatkupt et al., 1999; Gairhe, 2012; Mandal and Khadka, 2013; Schmidt-Burbach et al., 2015), psychological health is not considered in this scholarship. The open recognition of elephant sentience and consciousness and scientifically robust diagnosis of PTSD in elephants who have sustained trauma compel a comparable ability to assess the psychological (mental and emotional) wellbeing of Asian elephants. Not only is Asian elephant captivity widespread, but the pernicious and devastating effects of trauma constitutes a profound threat to the species and to successive generations. PTSD transmits across generations

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socially and neurobiologically and causes lifelong mental and physical health issues (Bradshaw, 2009a). Critically, prior assessment of individual captive-held elephants provides evidence of Complex Post-Traumatic Stress Disorder (c-PTSD, Bradshaw, 2009a, b).

Psychiatrist Judith Herman created the diagnosis of c-PTSD to address conditions experienced by prisoners of war and survivors of torture and domestic violence (Herman, 1992). Generally, traumas associated with c-PTSD are relational (involving the disruption of social bonds), multiple and prolonged. Genesis of c-PTSD is associated with chronic, perceived and actual life-threatening environmental stress in an atmosphere of fear, unpredictability, and lack of control over self or environment, which often entails a state of physical and emotional captivity (Herman, 1992). Near constant fear of harm or death and the *deprivation of agency*- the inability for an individual to make his or her own life-impacting decisions – are definitive characteristics of the traumas that lead to symptoms of c-PTSD (Bradshaw, 2009b). Captive-held Asian elephants subjected to attachment ruptures such as premature weaning and maternal separation, psychological and physical torture (i.e., abuse, physical deprivation and hardship, and domination-based training designed to eliminate elephant agency), social isolation and socio-emotional deprivation, and the chronic constriction of movement and freedom are common factors responsible for c-PTSD development (Bradshaw, 2009b). Here, we report on the first formal population-level study and psychological assessment on captive-held Asian elephants.

Methods

Present methods employed to assess psychological human health are applicable across species (Capaldo and Bradshaw, 2012). Utilizing methodological tools validated for assessment of c-PTSD in nonhuman animals (Bradshaw et al., 2008), we conducted a psychiatric analysis of 53 Asian elephants in two elephant sanctuaries located in Thailand. These facilities prohibit elephant riding, shows, and domination-based training or management, promote the cessation of such practices, and provide lifetime care for elephants rescued from abusive or inadequate captive conditions.

The elephants we examined ranged from age seven to seventy and were predominantly (85%) female. Although a small percentage (4%) of these elephants were born at our observation sites (where natural breeding is permitted) the majority had previously been used for riding, street begging, logging, and/or circus-type shows. Similar to comparable human assessments, qualitative clinical evaluation encompassed structured interviews with caregivers, direct observations, and documentation of the elephants' trauma exposure (e.g. incidents of physical abuse, forced breeding, rupture of social bonds), presenting problems, medical and social history, and behavior. Prior work on cross-species psychological evaluation (Fabrega, 2006) specifies that symptoms qualify as pathological when "behavior and psychological states are: (1) relatively persistent and express exclusive of any given specific context; (2) cause an interruption or significant change in an individual's life arc; (3) comprise identifiable psychological and somatic distress; and/or (4) constitute significant behavioral alterations relative to an understood social and cultural space" (Bradshaw et al., 2008, p. 13). We define "pathological" as unhealthy presentations relative to a species-normative baseline. The elephants were assessed based

on five symptom clusters (Table 1) characteristic of c-PTSD: altered self-capacities, cognitive symptoms, mood disturbances, overdeveloped avoidance responses, and posttraumatic stress (Briere and Spinazzola, 2005).

Table 1: C-PTSD Symptoms			
C-PTSD Symptom Cluster	*Specific Symptoms*	*Examples of Behavioral Indicators*	*Prevalence in Sample*
Altered self capacities	• Altered stress regulation • Altered emotional regulation • Impaired socialization	• Unpredictability (abrupt altered affect) • Lack of impulse control • Inability to discern and communicate social cues	53%
Cognitive symptoms	• Overestimation of environmental danger • Hyper-vigilance	• Charging at mahout without provocation • Flinching (expectation of cruelty) in absence of physical force • Distrustful of humans • Unrealistic assumption of danger • Easily startled	42%
Mood disturbances	• Anxiety • Aggression	• Intense social anxiety/agoraphobia (retreating/remaining in confined space) • Physical aggression towards humans and/or elephants	53%
Avoidance behaviors	• Tension reduction behaviors • Avoidance of social contact	• Self injurious behavior • Stereotypies • Avoidance of other elephants	38%
Posttraumatic stress	• Fear at trauma-related stimulus	• Distress vocalizations, avoidance, and/or violent response to trauma-related stimulus such as mahout or bull elephant	34%

Table 1: C-PTSD Symptoms

Results and Discussion

Symptoms of altered self capacities (e.g. impaired socialization; severely diminished ability to regulate stress) and mood disturbances (e.g. anxiety; aggression) were exhibited by 53% of the elephants. Hyper-vigilance or an overestimated sense of environmental danger was demonstrated by 42%, 38% showed avoidance or tension reduction behaviors (e.g., stereotypies; self-injury), and 34% exhibited post-traumatic stress (fear at a trauma-related stimulus).

Elephants who were known to have experienced developmental traumas exhibited the most persistent and numerous symptoms in all five symptom clusters. Developmental trauma (that which occurs in the first years of life, particularly prior to normative weaning) severely damages psychophysiological, neurological and neuroendocrine development, is long lasting, and severely compromises the individual's resilience and ability to cope with successive traumatic events and chronic stress (Schore 2001; Wilson et al., 2009). Similar to all organisms, Asian elephants are evolutionarily adapted to a particular normative social and ecological milieu that, for this species, includes multi-tiered lifelong social bonds between related individuals and communities and a suitable, healthful environment (i.e., healthy and species-appropriate food, healthful temperatures, substrates, and boundless space). In social species as the Asian elephant, attachment (mother-child attachment and foundational relational experience) is crucial to psychophysiological development and functioning. Deviations from this baseline environment seed trauma and lead to the suite of symptoms characteristics of relational trauma and later, if further traumatization occurs, c-PTSD (e.g. Lyons-Ruth et al., 2006). Practices that rupture the attachment milieu yield a traumatic stress response that reduces resilience and that predisposes individuals to emotional, behavioral, and cognitive difficulties (Wilson et al., 2009). An elephant who has experienced maternal separation is, from a neuropsychological perspective, less equipped to cope with additional traumas such as domination-based training and the distress of *phajaan* and is therefore more likely to develop c-PTSD in the face of repetitive trauma exposure.

However, longitudinal studies in humans and other animals show that, provided with appropriate post-trauma intervention, symptoms of some individuals attenuate. Indeed, it has been documented that, in sanctuaries that embrace principles of trauma recovery, post-trauma intervention is able in many cases to attenuate c-PTSD symptoms (Bradshaw, 2009). In this study, rescued elephants in sanctuary who were able to form positive social bonds with mahouts and other elephants demonstrated partial alleviation of symptoms relative to their symptom profiles upon first arrival in sanctuary. Critically, prosocial mahout interactions, attitude, and demeanor facilitated trauma recovery. This suggests the potential of the mahout-elephant relationship and the restoration of species-normative socialization as powerful mechanisms of trauma recovery. The key features of trauma recovery in these settings are the absence of threat or harm and the restoration of elephant *agency*, the ability to make decisions about selfhood, social relationships, and environment that is eroded by chronic stress and trauma. These sanctuaries are distinguished from other settings not only by the absence of fear and domination, but also by the *presence* and *cultivation* of elephant prosociality and self-determination. Elephants at these sites are given a wide array of choices about the parameters of their activities (e.g., with whom they socialize, freedom of movement, choice of when, what and how they wish to eat). From the perspective of trauma recovery, these conditions eliminate re-traumatization and in a safe environment

allow the trauma survivor to redirect his or her energies from defense to healing. This leads to a reduction in symptoms through the psychological restoration of the elephant's sense of independence and self-efficacy, or the ability to influence the events that affect one's life (Bandura, 1994).

Restorative mahout-elephant relationships were classified in the present study by qualities that also define and nurture a secure attachment (Benoit, 2004): the bond between a mother elephant and infant that is marked by a balance of security and autonomy, patience, responsiveness and creating opportunities for social bonding, knowledge of emotional and physical needs and limits, and nurturance. Trauma exposure alters internal working models and socio-ecological expectations, thereby distorting an individual's sense of self and others (Siegel and Solomon, 2003). By cultivating a secure attachment in sanctuary, the healthful infant-parent bond that was damaged through trauma or was never experienced because the infant elephant was prematurely weaned, the elephant trauma survivor is provided with a corrective emotional experience that can "retune" an elephant's neuropsychology in a manner that restores trust and emotional regulation and reduces trauma symptoms (Schore, 2003). Thus, the mahout, who in other contexts may be an instrument of control and domination, and hence agent of trauma, transforms into a healer and instrument of trauma recovery.

This study offers an empirical analysis of the link between human cultural practices and elephant psychophysiology. Our results formally describe in the concept and methods of neuropsychology and traumatology how capture and captivity effected to control and exploit elephants causes severe psychological suffering and breakdown: in technical terms, c-PTSD. The terror and pain experienced by elephants during violent forms of the *phajaan*, in addition to the psychophysiological damage caused by separation from mother, family and community, profoundly damages elephant minds, bodies, and society. Capture and domination-based training precipitate c-PTSD, which, like PTSD in free-living African elephants, yields social, cognitive, and emotional transmits across generations. If effected for the purpose of exploitation, captivity and captive breeding can yield institutionalized trauma that reduces genetic, psychological, social, and physical resilience through elephant generations. It is important to remember that c-PTSD is not reversible. However, its symptoms can be attenuated and the survivor able to recuperate joy, security, and dignity to some measure. Human attitudes and demeanors and human-elephant interactions that are patterned on a prosocial secure attachment have the potential to both repair and prevent trauma in Asian elephants.

References

Bandura, A. (1994). *Self efficacy*. John Wiley & Sons, Inc.

Benoit, D. (2004). Infant-parent attachment: Definition, types, antecedents, measurement and outcome. *Paediatrics & Child Health*, *9*(8), 541–545.

Bradshaw, G.A. (2009a). *Elephants on the edge: What animals teach us about humanity*. New Haven: Yale University Press.

Bradshaw, G.A. (2009b). Inside looking in: Neuroethological compromise effects in elephants in captivity. In *An elephant in the room: The science and well-being of elephants in captivity* (pp. 55-68). North Grafton, MA: Tufts Center for Animals and Public Policy.

Bradshaw, G. A., Capaldo, T., Lindner, L., & Grow, G. (2009). Developmental context effects on bicultural posttrauma self repair in chimpanzees. *Developmental Psychology*, *45*(5), 1376.

Bradshaw, G. A., Capaldo, T., Lindner, L., & Grow, G. (2008). Building an inner sanctuary: complex PTSD in chimpanzees. *Journal of Trauma & Dissociation*, *9*(1), 9-34.

Bradshaw, G.A., & Schore, A.N. (2007). How elephants are opening doors: developmental neuroethology, attachment, and social context. *Ethology, 113*, 426-436.

Bradshaw, G. A., Schore, A. N., Brown, J. L., Poole, J. H., & Moss, C. J. (2005). Elephant breakdown. *Nature*, *433*(7028), 807-807.

Briere, J., & Spinazzola, J. (2005). Phenomenology and psychological assessment of complex posttraumatic states. *Journal of Traumatic Stress*, *18*(5), 401-412.

Capaldo, T., & Bradshaw, G.A. (2012). The bioethics of Great Ape well-being: Psychiatric injury and duty of care. Ann Arbor: Animals and Society Institute.

Chatkupt, T. T., Sollod, A. E., & Sarobol, S. (1999). Elephants in Thailand: Determinants of health and welfare in working populations. *Journal of Applied Animal Welfare Science*, *2*(3), 187-203.

Fabrega, H. (2006). Making sense of behavioral irregularities of great apes. *Neuroscience & Biobehavioral Reviews*, *30*(8), 1260-1273.

Foerder, P., Galloway, M., Barthel, T., Moore III, D. E., & Reiss, D. (2011). Insightful problem solving in an Asian elephant. *PloS one*, *6*(8), e23251.

Gairhe, K.P. (2012). Veterinary care and breeding of elephants in Nepal. *Gajah, 3*7, 27-30.

Hart, B. L., Hart, L. A., McCoy, M., & Sarath, C. R. (2001). Cognitive behaviour in Asian elephants: Use and modification of branches for fly switching. *Animal Behaviour, 62*, 839–847.

Herman, J. L. (1997). *Trauma and recovery*. New York, NY: Basic Books.

Irie-Sugimoto, N., Kobayashi, T., Sato, T., & Hasegawa, T. (2008). Evidence of means–end behavior in Asian elephant (Elephas maximus). *Animal Cognition*, *11*(2), 359-365.

Irie-Sugimoto, N., Kobayashi, T., Sato, T., & Hasegawa, T. (2009). Relative quantity judgment by Asian elephants (Elephas maximus). *Animal Cognition*, *12*(1), 193-199.

Lyons-Ruth, K., Dutra, L., Schuder, M. R., & Bianchi, I. (2006). From infant attachment disorganization to adult dissociation: relational adaptations or traumatic experiences? *Psychiatric Clinics of North America*, *29*(1), 63-86.

Mandal, R. K., & Khadka, K. K. (2013). Health status of captive Asian elephant in Chitwan National Park, Nepal. *Gajah*, *39*, 37-39.

McComb, K., Moss, C., Durant, S. M., Baker, L., & Sayialel, S. (2001). Matriarchs as repositories of social knowledge in African elephants. *Science*, *292*(5516), 491-494.

Plotnik, J. M., & de Waal, F. B. (2014). Asian elephants (Elephas maximus) reassure others in distress. *PeerJ*, *2*, e278.

Plotnik, J. M., de Waal, F. B., & Reiss, D. (2006). Self-recognition in an Asian elephant.

Proceedings of the National Academy of Sciences, *103*(45), 17053-17057.

Schmidt-Burbach J., Ronfot D., & Srisangiam R. (2015). Asian elephant (Elephas maximus),

pig-tailed macaque (Macaca nemestrina) and tiger (Panthera tigris) populations at tourism venues in Thailand and aspects of their welfare. *PLoS ONE* 10(9): e0139092.

Schore, A. N. (2001). The effects of early relational trauma on right brain development, affect

regulation, and infant mental health. *Infant mental health journal*, *22*(1-2), 201-269.

Schore, A. N. (2003). *Affect Regulation and the Repair of the Self (Norton Series on*

Interpersonal Neurobiology) (Vol. 2). WW Norton & Company.

Siegel, D. J., & Solomon, M. (Eds.). (2003). *Healing Trauma: Attachment, Mind, Body and*

Brain (Norton Series on Interpersonal Neurobiology). WW Norton & Company.

Sukumar, R. (2011). *The story of Asia's elephants*. Mumbai: The Marg Foundation.

Wilson, K. R., Hansen, D. J., & Li, M. (2011). The traumatic stress response in child

maltreatment and resultant neuropsychological effects. *Aggression and Violent Behavior*, *16*(2), 87-97.