

Empathy, Altruism and the African Elephant

Empati och altruism hos den afrikanska elefanten

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SUMMARY

The quest to determine if non-human animals have emotional lives similar to man goes a long way back and is yet to result in a clear answer. The aim of this particular literature study is to determine whether or not the African elephant may host feelings of empathy and display altruistic behaviour. In search for an answer to this question, scientists have chosen to first evaluate the cognitive abilities of said species. They have done this through the testing of tool use, mirror self-recognition, memory and the ability to coordinate with another when performing a task etc. It is generally thought, that in order for complex emotion to exist within an individual, cognition, as an awareness of the self and others, must first be present. The African elephant has been found to perform at the same high level of cognition as chimpanzees.

Empathy, although defined somewhat differently by different researchers, can be said to be the emotional state whereby an individual recognises and experiences the emotions of another. Probable evidence of empathy has been observed in both Asian and African elephants. For instance, consolation behaviour amongst Asian elephants in captivity and the apparent mourning of lost conspecifics seen amongst wild African elephants are strong indicators of such emotion. Also, the obvious, and to elephants unique, interest shown for the bones and ivory of their deceased, imply that elephant empathy is real.

Altruism in elephants is more easily observed than empathy as it is a social behaviour directed outward towards another individual. The concept may be defined as: a selfless act (with or without risk for the performer) aimed at aiding another (related or non-related) individual in (perceived or actual) need. Variations of this behaviour have been thought to have been observed amongst African elephants. The attempts of a matriarch to help another, severely injured, unrelated matriarch is one example of such an act. Another is the removing of foreign objects, such as darts, spears, arrows or sharp branches, from the pierced body of a conspecific.

In addition to behavioural studies, investigations of the neurological make up and internal communicational routes of the elephant brain have also been conducted. Despite their purpose not being the analysis of empathy and/or altruism specifically, the results of said studies may be discussed in relation to these concepts nonetheless. Empathy and altruism have in humans been found to occupy certain loci of the cerebellar cortex. This is interesting as the human cortex greatly resembles that of other mammals, elephants included, and the results might therefore be extrapolated onto other species. Furthermore, the elephant cortex has been shown to consist of a more intricate neuronal network, possibly potentiating a more delicate and rich signal transfer of emotions.

In conclusion, there can be no firm conclusion. Empathy amongst African elephants is probable albeit not certain. As for altruism, the recorded examples of such behaviour performed by elephants are simply too few to provide a reliable answer. Further research is thus demanded.

SAMMANFATTNING

Strävan efter ett svar på frågan om djur har känslor likt de hos människan har länge pågått och pågår än idag. Syftet med denna litteraturstudie är att undersöka och klargöra om empati och altruism går att återfinna hos den afrikanska elefanten. För att ge svar på denna fråga har vetenskapen ofta valt att först utvärdera den kognitiva förmågan hos denna art. Detta har gjorts genom tester av: om och hur väl verktyg används; om djuret känner igen sin egen spegelbild och kan samarbeta med andra för att klara av en uppgift; samt hur väl det kan minnas saker som skett för länge sedan. Det är inom beteendevetenskapen allmänt erkänt att kognition, definierat som förmågan att skilja på sig själv och andra, utgör grunden som komplexa känslotillstånd vilar på. Den afrikanska elefanten har i tester uppvisat en imponerande kognitiv förmåga motsvarande den hos schimpanser.

Empati kan definieras som det emotionella tillstånd som innebär att ett djur eller en människa inte bara identifierar känslorna hos en annan individ, utan även sätter sig in i dessa och känner det den andra känner. Både afrikanska och asiatiska elefanter tros ha just denna förmåga. Till exempel så har man sett asiatiska elefanter i fångenskap tillsynes trösta varandra i stressfyllda situationer, och afrikanska elefanter i det vilda har observerats ge uttryck för vad som verkar vara sorg över förlusten av en artfrände. Studier har även visat att elefanter som ges tillgång till elfenben eller elefantkranier uppvisar ett unikt intresse för och beteende kring dessa objekt jämfört med andra liknande material.

Altruism är ett utåtriktat socialt beteende med en tydlig utförare och en eller flera mottagare. Konceptet i sig kan definieras som: en osjälvisk handling (med eller utan risk för den handlande) med syfte att hjälpa en annan (med handlaren släkt eller icke släkt) individ som befinner sig i (verklig eller upplevd) nöd. Beteenden av denna sort tros ha setts utföras av afrikanska elefanter vid ett flertal tillfällen. Fallet med matriarken Eleanor som blev hjälpt av en obesläktad elefant efter att hon fallit och skadat sin snabel är ett exempel på en situation som sägs illustrera sann altruism. Även det flertalet gånger observerade beteendet då elefanter dragit ut bedövningspilar, spjut eller vassa grenar som spetsat en annan individ anses vara exempel på altruism.

Utöver strikt beteendevetenskapliga studier så har även neurovetenskapen uppmärksammat unika drag hos den afrikanska elefanten. Bland annat så är det känt att elefanter har ett mer invecklad dendritiskt kommunikationsnätverk. Detta möjliggör en mer detaljerad signaltransduktion och därigenom kanske även ett rikare emotionellt spektrum. Undersökningar av den mänskliga hjärnans anatomi har visat att empati och altruism kan kopplas till specifika områden i hjärnbarken. Områden som troligtvis går att återfinna hos den afrikanska elefanten, vars hjärnbark är mycket lik den hos andra däggdjur. Ytterligare studier krävs dock för att veta detta med säkerhet.

Sammanfattningsvis kan man dra slutsatsen att någon egentlig slutsats är svår att dra. Det är högst troligt, men inte helt otvivelaktigt, att empati går att återfinna hos afrikanska elefanter. Altruism, å andra sidan, präglas helt enkelt av en för invecklad definition och för få noterade exempel för att med vetenskaplig säkerhet kunna sägas existera hos denna art.

INTRODUCTION

Background

In recent years, scientific discoveries have been made advocating that some animals may have feelings much like those of man (Edgar *et al.*, 2012). Even the more intricate emotions, such as empathy, are said to have developed well before the emergence of human kind (de Waal, 2008). Not all animals are ascribed the ability to feel empathy or other conscious emotional states, however. A certain level of cognition is commonly demanded (Dawkins, 2000). Monkeys, apes, dolphins, pigeons and rats have so far been ascribed a higher level of awareness and elephants, both African and Asian, have exhibited cognitive reasoning equivalent to that seen in primates (Byrne *et al.*, 2009; Hampton, 2010). The debate of whether or not these animals consequentially feel empathy is however still ongoing. Often associated with empathy is the act of altruism. The existence of altruism amongst animals has only recently been verified and its role and evolutionary importance is yet to be fully understood (Cela-Conde *et al.*, 2010; Bester & Güth, 1998; Kruger, 2003).

Aim of Study

The aim and strive of this literature study is to explore and clarify the debate of whether or not African elephants (the African bush Elephant *Loxodonta africana* and the African forest Elephant *L. cyclotis*) experience empathy. If so, can they display this outwardly through altruistic behaviour? Furthermore, I investigate if empathy is always followed by altruism and altruism always caused by motivational feelings of empathy or if perhaps one can exist without the other? In order to answer these questions I will examine how empathy and altruism have been defined throughout the history of science and to what extent human medical and behavioural research and its conclusions within these fields can be translated and applied to the animal kingdom. Likewise, I will investigate how studies performed on other animal species can be deciphered and applied to the African elephant.

MATERIALS AND METHODS

To gather the information needed for the completion of this literature study I have spent most of my research time obtaining articles through Google Scholar and the databases available through SLU:s library and home page, e.g. PRIMO. I have attempted to search for data using both British and American spelling and/or phrasing. The words I have most frequently used to narrow down my field of research (here with British spelling) have been: African elephant, *Loxodonta africana*, *Loxodonta cyclotis*, empathy, empathic behaviour, altruism, altruistic behaviour, animal behaviour, animal cognition, cognitive behaviour, animal self-perception, and the like.

Due to their phylogenetic closeness, studies of African and Asian elephants (*Elephas maximus*) are often treated as interdependently applicable and will thus be considered as such for this literature study as well (Plotnik & de Waal, 2014). This is also especially necessary for this particular paper as African elephants are seldom kept in captivity and therefore are difficult and expensive to study. Simply put, there is too little research done on wild African elephants within applicable fields.

LITERATURE REVIEW

Studies of cognition, empathy and altruism in animals

There have been numerous studies investigating the possible existence of empathy and altruism within the animal kingdom. Not seldom have these studies also been studies of animal cognition as cognition is commonly deemed a prerequisite for empathic emotion and altruistic behaviour. Arguably, there can be no perception without self-awareness and thus one cannot have emotion without cognition (Gallese, 2003; de Waal, 2011).

Cognition

Cognition can be assessed in a variety of ways, and different species can be expected to display some but not necessarily all aspects of cognition and still be considered in possession of the so called “higher order brain functions” that are said to potentiate empathy and altruism (Hart *et al.*, 2008; de Waal & Ferrari, 2010).

Elephant cognition

Tool use is widespread among animals and often tested as a tell-tale sign of higher levels of cognition (Hart *et al.*, 2008; Byrne *et al.*, 2009). However, tool use in itself need not necessarily be a reliable indicator of advanced cognition and instead, the active process of creating or manipulating tools for a certain purpose should be seen as significantly more complex and cognitively demanding. Only a few species known to man are capable of just such craftsmanship, elephants included (Hart *et al.*, 2001; Hart *et al.*, 2008; Byrne *et al.*, 2009; Foerder *et al.*, 2011).

Elephants have also been tested to see if they demonstrate the ability to coordinate with each other by simultaneously pulling on a string to obtain a reward. Not only did elephants coordinate when given the choice, they also did not attempt to tug at the string if they were on their own, apparently knowing that this would have no effect (Plotnik *et al.*, 2011).

Mirror self-recognition is considered indicative of cognition and of higher forms of empathy and altruistic behaviour (Plotnik *et al.*, 2006). The most classic test for this is the “mark test” when a spot is painted on the head or face of an animal that is then placed in front of a mirror. Any attempts to touch the spot by first recognising its position through use of the mirror indicates that the animal is able to both realise that the image in the mirror is in fact that of an animal and that the animal is them (Hart *et al.*, 2008). Several studies of this kind have been conducted with elephants with both successful and less successful outcomes (Plotnik *et al.*, 2006; Hart *et al.*, 2008; Nissani, 2008). In a mark test carried out by Plotnik *et al.* (2006) one out of the three elephants tested displayed the self-directed behaviour indicating self-awareness whilst the other two explored the mirror, attempted to look behind it and socially interact with the reflection but were seemingly unable to grasp that they were interacting with themselves. The results obtained through elephant studies correspond well to those of tested chimpanzees (Plotnik *et al.*, 2006; Hart *et al.*, 2008).

Yet another strong indication of cognition is the ability to place and recall actions and events on a time line. In other words: the forming and retrieving of memories. When it comes to

memory (long-term, spatial, temporal and social), elephants outshine most animals with whom they have been compared (Hart *et al.*, 2007; Markowitz *et al.*, 1975). One great example, illustrating long-term, spatial and temporal memory in elephants, was recorded during the severe drought of 1993 in Tanzania. Older matriarchs were seen leading their clans out of the arid national park to search for water and forage, while groups led by younger matriarchs stayed put, and, as a result, lost many group members to famine and thirst. It was concluded that the older females must have had memories of how to survive previous droughts, whereas the younger females had no such experience to draw knowledge from (Foley *et al.*, 2008). The capacity for long-term memory may be indicative of future planning and thus the forming of anticipation and expectations (de Waal & Ferrari, 2010). Social memory amongst elephants is highly sophisticated and allow individuals to discriminate between conspecifics and heterospecifics, relatives and non-relatives and friends and foes with great precision (Hart *et al.*, 2008).

Empathy

To discuss the question of whether or not animals are capable of empathy and altruism one must first look at how these concepts have traditionally been described and defined. An exact and world renowned definition of empathy has yet to be established but most definitions of the term fall in close range of each other.

Deutsch and Madle (1975) have somewhat paved the ground for subsequent definitions and described empathy as “*the ability to understand and identify with the feelings and emotions of others... comprising both affective and cognitive components*” (Cox *et al.*, 2012). The most emphasised aspect here being the categorization of empathy into affective empathy (AE), and cognitive empathy (CE) (Edgar *et al.*, 2012). Studies have shown that AE and CE occupy different loci in the brain and that balance or imbalance between the two, on an individual basis, can be directly correlated to connectivity between and dynamics within the regions of the brain involved in cognition, processing of emotions, mentalizing, interoception and autonomic monitoring (Cox *et al.*, 2012). It may therefore be possible to feel affective empathy, defined as the ability to share the emotional experiences of others, while at the same time lack the cognitive empathy that enables an individual to take the mental perspective of others. This imbalance may go both ways (Cox *et al.*, 2012).

Another definition of empathy quite similar to that of Deutsch and Madle above defines the construct simply as a capacity for feeling the emotional dynamics of another’s current situation (Hoffman, 2000).

Batson (2010), on the other hand, is careful to distinguish empathic concern, which he believes may induce altruistic motivation and behaviour, from several other uses of the term empathy that, at first glance, seem almost identical but due to subtle dissimilarities are not. Instead, most of the other terms are explained by Batson as cognitive or perceptual states that act as precursors to, or facilitators of, empathic concern. According to Batson (2010), empathic concern can be defined as “*the other-oriented emotion elicited by and congruent with the perceived welfare of someone in need*”. If taken apart, the definition becomes clearer. *Congruent*, in Batson’s words, refers to the valence of the empathic emotion meaning that a perceived positive emotion in an

observed other will evoke a positive empathic emotion within the observer, whilst a perceived negative emotion will conjure a mirrored negative such. Furthermore, the idea that the observed other is apparently *in need*, is, according to Batson, necessary for the empathic concern to trigger altruistic behaviour. The need of the other does not, however, have to be real but must be *perceived* as real by the observer. Batson also points out that empathic concern is any emotion felt *by* the observer *for* the observed. Thus, the appropriate psychological distinction is made by whose (perceived) welfare lies at the focus of the emotion as supposed to how the emotion is labelled (Batson, 2010).

Elephants and empathy

A manifestation of empathy may be the expression of consolation behaviour (Preston & de Waal, 2002). In a study of consolation amongst Asian elephants, distressed individuals referred to as “victims” were seemingly comforted by other elephants termed “bystanders” (Plotnik & de Waal, 2014). The bystanders were seen touching the face, mouth and genitals of the distressed animals while producing vocalizations of various sorts. The close proximity sound labelled as “chirping” (a sound used by elephants for reassurance) was heard. The consolation behaviour took place only after the “victim” had displayed signs of anxiety and their reactions were thereby not thought to be reactions to the distressing stimulus in itself. Because of the limitations of captivity, however, the animals were somewhat restricted in their social interactions and any conclusions as to how the consolation behaviour might differ, depending on degree of relationship between victim and bystander, could not be made with any degree of certainty (Plotnik & de Waal, 2014).

Another expression of empathic emotion amongst elephants can be seen when the animals come across the remains of a diseased conspecific and show what is by some recognised as grief. Although the existence of explicit elephant graveyards has yet to be proven as something other than a coincidental gathering of bones (often near a water hole or some other place that elderly or sick individuals are hesitant to move away from), the behaviour elicited by these sites is highly predictable and unique to elephants compared to other non-human animals (Nicol, 2013). The elephants will slowly approach, sniff at and touch the remains using their trunk and feet (Douglas-Hamilton *et al.*, 2006). If the dead is only recently diseased, the elephants will sometimes attempt to push at or rock the body from side to side. On one occasion, investigators were able to monitor the travel of elephants from at least three unrelated families to the corpse of a diseased matriarch known as Eleanor, some visitors lingering by the body for hours and/or returning several times during the course of the study (Douglas-Hamilton *et al.*, 2006). Elephants may also pick up and move dead individuals or partial remains. Mothers have been seen carrying the remains of their diseased calves draped over their tusks for days at an end before laying their bodies to rest. Elephants have also been discovered covering the corpses of deceased conspecifics with vegetation in a manner resembling human burial traditions (Hart *et al.*, 2008).

Furthermore, elephants have been proven able to distinguish ivory from other materials and elephant skulls from the skulls of other species. In a study conducted at the Amboseli National Park in Kenya, several separate elephant family groups were presented with dried, cleaned and bleached ivory amongst other correspondingly treated materials. Significantly more time was

spent investigating the ivory than the other materials. When the animals were in turn given skulls of elephant, buffalo and rhinoceros, the elephant skulls were inspected twice as long as the other and handled much like the natural remains described above (McComb *et al.*, 2006).

Altruism

Altruism, similarly to empathy, is a term with which many have wrestled over the years, both regarding its measurability and its actual meaning. “True” altruism may simply be described as “*altruism without obvious advantages for the actor*” (de Waal & Ferrari, 2010). It is however often more intricately explained when dealt with in scientific studies.

The aforementioned Batson (2010) declares that altruism is “*a motivational state with the ultimate goal of increasing another’s welfare*”. It is essentially the exact opposite of egoism whereby one strives to increase one’s own welfare (Batson, 2010). Just as with his definition of empathy, Batson’s idea of motivational altruism can be dissected for clarification. The *motivational state* Batson speaks of is a goal-directed motivation in which the individual desires a change and will only be fully satisfied when this change has taken place. The individual is, for lack of a better word, “drawn” towards this goal and will seek alternate solutions so as how to achieve set goal should obstacles arise (Batson, 2010). The fact that *the ultimate goal* is the increase of another’s welfare means that this is an end in itself as supposed to a means to an end. That being said, Batson does not exclude the possibility that the one performing the altruistic act may well obtain pleasure from this, only that this pleasure should be seen as a secondary consequence of reaching the goal for which motivation arose in the first place. Batson further stresses the distinction of his motivational altruism from what he refers to as helping behaviour. Due to a lack of obvious other-oriented motivation, helping behaviour is, in his opinion, merely when an individual acts in a way that benefits another without the reason necessarily being altruistic in nature (Batson, 2010).

Altruism can be divided into evolutionary altruism and psychological altruism (Sober & Wilson, 1998; Batson, 2010). Evolutionary altruism proposes that the behaviour of an individual decreases the reproductive fitness of that individual whilst increasing the reproductive fitness of the individual(s) at the receiving end of the behaviour. Psychological altruism on the other hand, is altruism as Batson defines it: a goal-oriented motivational state with the aim of increasing another individuals welfare (Sober & Wilson, 1998; Batson, 2010) There need not necessarily be a connection between the two concepts and the self-sacrifice involved in evolutionary altruism is not a required aspect of psychological altruism. Therefore, an individual may very well act altruistically per definition, without needing to induce cost to self. Altruism is as follows not, as many assume, always evolutionary damaging to the performer (Batson, 2010).

A slightly different description of what altruism entails is given by Trivers (1971) who describes what he labels reciprocal altruism as “*behavior that benefits another organism, not closely related, while being apparently detrimental to the organism performing the behavior*”. The benefit and detriment involved here being the gain or loss of inclusive fitness. Within the concept of inclusive fitness lies both direct and indirect fitness, meaning that the passing on of an individual’s genes may be through survival of that individual specifically, or the survival of

another carrier of said genes, such as a brother, sister, son or daughter. Through which of these paths the genes are inherited by the next generation is not important, simply *that* they in some way are (Hamilton, 1964a, 1964b). Trivers' model dictates that it is the degree of relationship between two individuals that determine if a seemingly altruistic behaviour is in fact so or perhaps simply an expression of kin selection whereby the individual performing the behaviour is directly, or indirectly, attempting to protect their own genes. Therefore, altruistic behaviour between different species, such as that of interspecies cleaning among fish, ought to give undeniable evidence of reciprocal altruism (Trivers, 1971). Another good example of reciprocal altruism is the system of warning calls in birds. The fact that a warning call directly benefits neighbouring, but not necessarily related, birds more than it does the caller, may be what labels the behaviour itself as altruistic, but is of less importance when it comes to the behaviour's survival over generations than the fact that it outcompetes groups where no warning calls are made at all. In areas where there is no warning that danger is approaching, natural selection will strike harshly and the "silent" birds of these areas will thus be selected against (Trivers, 1971). It is hence thought that this form of altruism has been favoured throughout evolution, specifically because it benefits the performer in the long run, despite this not having been the performer's intention when deciding to act (Trivers, 1971). Reciprocal altruism could also be viewed as a symbiosis of sorts, where time plays a crucial role. After delivering a "helping hand", the giver must wait in order to receive something in return. This demands a natural selection against individuals that are unwilling to return the favour such as fish who eat their cleaners or the "silent" birds discussed above (Trivers, 1971).

The so called theory of social exchange postulates instead that each action performed in aid of another individual is accompanied by a silent but irrevocable condition that the action be repaid (Homans, 1958). The theory explains that social behaviour is nothing more than an exchange of goods and that these goods may be material ones, such as money, or non-material ones of a more symbolic value, such as love, status, approval and prestige (Homans, 1958; Cropanzano & Mitchell, 2005). The end result of these exchanges is in general a self-regulated balance between what has been given and what has been received. Exceptions to this rule may arise when individuals attempt to "cheat" and not repay what has been given. Those that do not comply are, however, very likely to be punished for their deviancy as reciprocity is, in most societies, a norm dictating how the members of said assembly should behave in order to fit in and be accepted (Cropanzano & Mitchell, 2005). This is hence, similarly to Trivers' model of reciprocal altruism, a matter of natural selection where compliance is favoured before deceitfulness.

Elephants and altruism

A case that well illustrates altruism amongst wild elephants is that of the injured elephant Eleanor, mentioned briefly under *Elephants and empathy* above (Douglas-Hamilton *et al.*, 2006). The matriarch Eleanor had fallen and badly injured her trunk while her clan was a great distance away. A matriarch, Grace, from a clan other than Eleanor's was within minutes seen to approach the injured female and after carefully touching her body, lifted her onto her feet. When Eleanor came close to falling again, Grace supported and pushed her in an attempt to help her walk. This went on for some time and when Eleanor died the next day, Grace stayed by the body. Over the course of the next few days, more elephants gathered by Eleanor's

remains and displayed what was perceived by the observers as compassion and grief (Douglas-Hamilton *et al.*, 2006).

“Targeted empathic helping” is a term used by some to describe the frequently observed behaviour in African elephants towards disabled conspecifics (Hart *et al.*, 2008). Numerous observations of elephants removing tranquilizing darts, spears or other foreign objects from another individual have strengthened the hypothesis that elephants do in fact recognise the need for help and are willing to provide it, regardless of the danger that handling of the foreign object may pose to the helper (Hart *et al.*, 2008; Bates *et al.*, 2008).

Neurological studies

Aside from observations of outwardly expressed characteristics, such as behaviour, studies investigating the anatomical structures and inner workings of the elephant brain have also been conducted with thought-provoking results. A study by Herculano-Houzel *et al.* (2014), found that the cerebral cortex of African elephants contained only one third of the number of neurons of that of the human cortex, despite measuring approximately twice the size. The group concluded that these findings validated the hypothesis that the superior cognitive abilities of man directly correspond to the greater total number of neurons present in the cortex of humans, compared to other species. A study challenging this view presents results that instead suggest that the cerebral cortex of African elephants constitutes a more complex interneuronal network than that of other mammals, and thereby potentiates a greater transfer of information with each reached action potential, allowing for “*the emergence of greater behavioral sophistication*” (Maseko *et al.*, 2013). Which function that benefits from this complexity remains somewhat unclear, although speculations have been made regarding the infrasonic vocalisations and fine motor skills of the trunk (Maseko *et al.*, 2013; Jacobs *et al.*, 2014).

Studies of brain structure in humans and primates have revealed that empathy and altruism can be directly linked to specific locations in the brain. One study documented that CE leads to activation of the inferior frontal gyrus, supramarginal gyrus and superior temporal sulcus, whilst AE instead activates the precentral gyrus, medial orbitofrontal cortex, insular cortex, brainstem, inferior parietal lobule and thalamus (Cox *et al.*, 2012). It was also discovered that the release of oxytocin (a hormone involved in prosocial and caring behaviour) stimulates AE but not CE. Fieldman-Hall *et al.* (2015) have found that altruism, defined as empathically biased goal-directed behaviour, is anatomically located in the sgACC (subgenual anterior cingulate cortex), the caudate nucleus and the VTA (ventral tegmental area). These areas have for a long time been known to regulate emotion, learning, social behaviour and the reward system of the brain. The sgACC was, furthermore, noted as an important part of oxytocin release (Fieldman-Hall *et al.*, 2015).

Pain, both personal and pain observed in another, leads to intense activity of the insular cortex (one of the locations of AE) as well as the sgACC and brainstem (two of the sites involved in altruism) (Singer *et al.*, 2004). This knowledge has led to the conclusion that the sharing of another’s emotional state, i.e. empathy, occurs by means of activated “mirror neurons” (Gallese, 2001; Bates *et al.*, 2008). Empathy can thus be argued to pass “*from body to body rather than*

from mind to mind” in much the same way as with simple motoric mimicry (de Waal & Ferrari, 2010). Others denote the existence of different kinds of “mirror neurons” and claim therefore that empathy is roused through the stimulation of *affective* neuronal signalling pathways, as supposed to motor pathways (de Vignemont & Singer, 2006).

DISCUSSION

The greatest obstacle this report has been faced with has been the lack of consistency amongst the definitions of empathy and altruism. This dilemma is however not a new one but has always been and will always be until uniform definitions of the two constructs are made and accepted. Deutsch and Madle (1975) wrote as far back as 40 years ago: “*While evidence of reliability for empathy measures is emerging, evidence for construct validity is not. Without information on construct validity, comparing the results from various studies is difficult, since the measures may not be assessing the same construct. The extent to which empathy measures actually assesses empathy, as opposed to other constructs, is a question that remains unanswered.*”. I am, sadly, prone to agree and do recognise the possible flaws this may have led to in my conclusions. It is, furthermore, also important to note that regardless of the definition chosen, one must be aware that all concepts are social constructs influenced by culture, tradition and personal beliefs and that even a world renowned definition will be partial to interpretation.

Cognition and empathy are, as stated above, often regarded as mutually exclusive. This is, I believe, quite a crude simplification of a not so simple matter. One could instead argue that cognition is not an ultimate requirement for empathy but simply what enables an individual to better process and understand said emotion (de Waal, 2011). Empathy could, in my opinion, in fact be said to exist within all animals living in groups where the survival of the species relies on strong social bonds and cooperation (de Waal, 2008). The concept has, as far as I know, yet to be ascribed to any species of solitary animals (Hampton, 2010; Edgar *et al.*, 2012). The *level* of empathy present in different groups may however clearly vary (Bates *et al.*, 2008). Therefore, to say that humans and some species of animals, such as elephants, experience a more sophisticated kind of empathy may in my opinion well be accurate.

Empathy could be seen as the “emotional trigger” for choosing to act (Batson, 2010). Empathy does, however, not always have to lead to altruistic behaviour. When it does not, but could have (the ability being present), feelings of guilt and remorse may arise instead and so the possible second reason one may have had for acting (personal distress) is increased and the cost of not acting becomes greater than if one had acted. Fear of this anticipated guilt may thus drive altruism (de Waal, 2011). A recent study by Fieldman-Hall *et al.* (2015), has, however, concluded that an individual’s willingness to help is decided primarily by the individual’s trait levels of empathic concern and not by their trait levels of personal distress.

Altruism is, I believe, seemingly rather straightforward. Altruism is a behaviour that an individual voluntarily chooses to perform in aid of another and it is indeed cognition that enables this active choice of action. However, there lies a certain danger in assuming that a particular behaviour is altruistic (and thereby consciously performed) as one can only observe the act itself and not the motivational force behind it. The inevitable risk of misinterpretation is the elephant in the room that is behavioural science.

When referring to altruism one must clarify if one’s chosen definition describes an individual’s particular behaviour and its underlying motive (psychological altruism), or the reason for why the particular behaviour has survived throughout evolution (evolutionary altruism) (Sober &

Wilson, 1998). It would seem that psychological altruism may be either detrimental (such as receiving an injury when removing a foreign object from another) or neutral (such as the case of the injured matriarch Eleanor) to the performer and thereby damaging, inconsequential or even beneficial to the performer's inclusive fitness. As put forward by de Waal and Ferrari (2010), the individual is not aware if the act may benefit him/her in the long run. The behaviour itself will, however, only be passed on to coming generations if it in some way benefits the direct or indirect fitness of the performer in accordance with the theory of Darwinism (Cela-Conde *et al.*, 2010; Kruger, 2003). Alas, I believe it is important to emphasise that the definition of altruism may differ despite describing one and the same act depending on the perspective from which the act is viewed.

Altruism in elephants is in this way seemingly truly selfless when seen from the perspective of the performer but most probably beneficial when analysed from an evolutionary standing point. This being said, too little research has been done on wild elephants to indisputably demonstrate altruistic behaviour between non-relatives in accordance with Trivers' (1971) more strict definition of the term. If another definition is used, however, altruism amongst elephants suddenly becomes evident and one could argue that: "*Models that attempt to explain altruistic behaviour in terms of natural selection are models designed to take the altruism out of altruism*" (Trivers, 1971).

Several of the areas of the brain listed in the literature study above as areas of empathy and altruism, are located in the cortex (Cox *et al.*, 2012; Fieldman-Hall *et al.*, 2015). Although there have not yet been any dissections of similar sort and with similar aim performed on elephant brains, one could possibly still draw parallels from the studies. The elephant cerebellar cortex is in most part indistinguishable from the cortex of other mammals, with a few exceptions (Maseko *et al.*, 2013; Jacobs *et al.*, 2014). As previously stated, elephants are, for instance, in possession of a significantly greater dendritic complexity (Maseko *et al.*, 2013). I would like to speculate that these intricate synapses perhaps not only enable the fine motor skills of the trunk and/or infrasonic speech, but also a broader emotional spectrum enveloping empathy and altruism? Based solely on the information to date, the possibility exists. A demand for further research is however advised in order to be able to say for certain.

The role of oxytocin in empathic emotion and altruism has yet to be determined. Speculations could, however, be made, I believe, as to if this peptide is perhaps involved in some form of positive feed-back mechanism regulating empathy-based altruism. If oxytocin is released when an altruistic act is performed, as claimed by Fieldman-Hall *et al.* (2015), it is my belief that this consequentially ought to stimulate AE as proposed by Cox *et al.* (2012). The empathy felt for the individual at focus of the altruistic act should, logically, thereby increase. Could this mean that regardless of whether or not the provided help was motivated by empathy or something other, perhaps even egoism, a feeling of affective empathy will inevitably be felt? That an action benefitting someone else, without being selfless in nature, could in fact convert itself to true altruism and thereby turn the initially egoistic into an altruist? I do realise that these speculations are quite far-fetched and that they disagree somewhat with the idea that altruism follows empathy, and not the other way around. If a situation requires that an individual offers to help over an extended period of time, however, I do believe that this altruism-triggered empathy

could arise. This being said, the initial act of altruism could in such a case not be empathically motivated and may thus be argued to be false altruism. Once again, it all comes down to a choice of definition.

CONCLUSIONS

It seems plausible, albeit not entirely certain, that African elephants feel empathy. The existence of elephant altruism, on the other hand, remains uncertain. Although instances of apparent altruism have been observed and both studies of cognition and brain composition tip the scales in favour of its existence, there are simply too few records of African elephants behaving altruistically in ways that cannot be explained by kin selection or inclusive fitness to provide a clear answer to this question.

Empathy and altruism are not exclusively co-dependent. Empathy may elicit altruistic behaviour, and often does. However, an individual with the sufficient cognitive ability enabling them to act on their impulses may likewise decide to refrain from action. Also, depending on choice of definition, altruism need not always be selflessly motivated by empathic emotion.

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