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ARTICLE

Blanket stealing in captive chimpanzees (*Pan troglodytes verus*): An observed case of spontaneous fairness related behavior

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ABSTRACT

Stealing behavior in captivity, namely of items such as blankets remains an underreported topic in non-human primate behavior. This paper seeks to help filling this gap. The current study presents an observed case of spontaneous fairness related behavior among captive chimpanzees in a context where a blanket was stolen and then replaced. Additionally, after the observed case, all successful blanket takeovers where recorded ad libitum. The case of "*targeted helping*" here reported may help to potentiate the argument that chimpanzees are capable of possessing a sense of fairness and to inspire new ways of testing it out experimentally.

Keywords: Object theft, kleptobiosis, inequity aversion, empathy, justice.

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RESUMO

Os comportamentos de roubo em cativeiro, particularmente de itens como mantas, constituem um tópico pouco estudado em primatas. Este artigo pretende ajudar a colmatar essa lacuna. O presente estudo reporta um caso observado de comportamento relacionado com equidade entre chimpanzés cativos envolvendo o roubo e posterior substituição de uma manta. Adicionalmente, após o caso observado, todos os roubos de mantas foram registados *ad libitum*. O caso de "*ajuda direccionada*" aqui reportado pretende potenciar o argumento de que os chimpanzés são capazes de um sentido de equidade. São também propostas novas formas de o testar experimentalmente.

Palavras-chave: Furto de objectos, cleptobiose, aversão à desigualdade, empatia, justiça[i].

Introduction

The natural world is filled with examples of competition, exploitation and full-on aggression but also instances of cooperation, empathy and altruism all resulting from the same evolutionary mechanism: natural selection. Emerging from the physical and social environment dynamics, we see individuals acting towards others of the same group that arguably fall within the morality and justice continuum. These rare events, although recorded as single observations, are important because they inform and direct attention towards behavioral patterns that are present but remained yet unrecognized. Such anecdotes, as defined by Bates and Byrne (2007) (i.e. single observations carried out *ad libitum* by researchers with previous experience on the focal species), may in turn allow for the conceptualization of new hypotheses to be explored. This paper presents one such anecdote on a fairness-related behavior involving chimpanzees, to which we will try to present a satisfactory explanation as well as additional alternatives. Definitions of the behaviors involving theft, possession and equity are explained below.

Kleptobiosis and kleptoparasitism

On the competition/exploitation spectrum we have what is called kleptobiosis, which is understood as an "*ecological relationship in which members of a species steal food, nesting materials or items of value from another*" (Breed *et al.*, 2012 p.1). This behavior emerges as an alternative to foraging, where animals maximize their fitness by taking things from others (Iyengar, 2008). In particular to object stealing, which is the focus of this paper, there are very few accounts of such interactions in the wild and most data comes from birds who take nest material from each other (Fisher and Lockley, 1954). These include, for instance, satin bowerbirds (*Ptilonorhynchus violaceus*) who steal feathers from each other (Borgia and Gore, 1986; Wojcieszek *et al.*, 2007) and chinstrap penguins (*Pygoscelys antarctica*) who do the same with stones (Moreno *et al.*, 1995). In the primate order, this behavior is thought to be rare (Torii, 1975). Nevertheless, nest usurpation, a behavior

seen in birds (Breed *et al.*, 2012) has also been reported, if sparsely, in the great ape literature, including orangutans (*Pongo pygmaeus*) (Russon *et al.*, 2007) and chimpanzees (*Pan troglodytes*) (DeVore, 1965) both in juvenile apes.

Another relevant form connected to the above mentioned interaction is kleptoparasitism. Although similar to kleptobiosis, it refers only to the taking of food from one individual to another. Kleptoparasitism, either inter- or intra-specific, is a common type of exploitation among animals (Rothschild and Clay 1952), seen among and across several taxa such as arthropods (Vollrath, 1984), fish (Dominey and Snider, 1988), reptiles (Auffenberg, 1981), birds (Furness, 1987) and mammals (Curio, 1976). While there are a few obligate kleptoparasites, these are restricted to the phylum of arthropods with most animals being facultative kleptoparasites since they only engage in this behavior opportunistically. Feistner and McGrew (1989) drew attention to the definition of theft interactions in intraspecific food transfer among non-human primates. Under the form of anecdotes, we also have the account of Allison Jolly of a female baboon grooming a male and then stealing meat from him (*in* Heyes, 1993). Moreover, one of our closest relatives, the chimpanzee, has been known to take prey from other predators such as baboons (Morris and Goodall, 1977) and eagles (Boesch and Boesch-Achermann, 2000). These interactions have been termed "piracy" (Goodall, 1986; Uehara, 1997) and "plundering" (Newton-Fisher, 2007) or "confrontational scavenging" (Watts, 2008) but are functionally the same as kleptoparasitism. Some researchers have proposed that scavenging has been an important factor in human evolution. The main support for this comes from the hunter-gatherer Hadza tribes which have been studied by O'Connell and colleagues (1988) where they found that this tribe would track vultures and predators such as lions and at some point would steal their prey (termed power scavenging) (Bunn, 2001; O'Connell *et al.*, 2002). Apparently a contradiction to general kleptoparasitism, stealing in this sense (just as in the hunting chimpanzees of Täi forest, (Boesch and Boesch-Achermann, 2000) not only benefits the individual but the whole group, involving cooperation and coordination from several individuals towards a common goal.

Possession and ownership

As mentioned above, there are several definitions for the act of taking food/objects from another. For this paper, stealing behavior was chosen for these interactions in non-human primates, mainly for the sake of simplicity and because it is the most parsimonious approach and suggests an evolutionary continuity of its psychological aspects (*sensu* Pierce and Bekoff, 2012).

But should it be called stealing if it is not clear whether the animal has or lacks a sense of property? If we broaden our definition of property to include territories then the answer is yes. As Gintis (2007) points out, an animal owns a territory if it occupied or altered it in some way either by building a

nest/burrow/hive/dam/web or by marking its limits with its own urine or faeces (i.e. signaling it with its scent). Indeed, several non-human species from arthropods to birds and mammals do this (reviewed in Gintis, 2007; Brosnan, 2011). With regard to property, the terms ownership and possession are useful for this discussion. Where objects are concerned, McGrew (1975) operationally defined possession as whenever the object is in physical contact with the individual. On the other hand, ownership is about maintaining property without direct physical contact such as nests or borrows (Brosnan, 2011). Research in possession illustrates how primates respect possession and how the bystander-possessor dynamics relate to hierarchy. In hamadryas baboons (*Papio h. hamadryas*) which have a harem social system, males have been observed to respect females belonging to other males (Kummer *et al.*, 1974). Also with the same species, a study using objects with food resource (food cans) showed that males tended to respect possession from other males, dominant males would steal from subordinate females about two-thirds of the time and dominant females stole from subordinate females half the time (Sigg and Fallet, 1985). Similarly, Kummer and Cords (1991) did a study with long-tailed macaques (*Macaca fascicularis*) where the possessor had a tube with raisins inside. They found that when the object was attached to the ground and the individual could not carry it, possession was disputed far more often than in a condition where the object was movable. Also, when dominant individuals attempted to steal (takeover) from subordinates in the presence of other group members the subordinate tended to scream causing the dominant to cease. This is a particularly important study since (1) it demonstrates that object possession by itself is not as respected if there is no control over the mobility of the object as compared to when an object can be carried and (2) it suggests that social norms regulated by third parties are at work.

Human interactions with possession of objects have too been researched. Building upon the seminal work of Bakeman and Brownlee (1982), Fasig (2000) and Friedman and Neary (2008) suggest that a basic understanding of ownership in children appears to emerge sometime in the second year of life.

Justice, fairness and empathy

Non-human animals have rules of social conduct and adjust their behaviors accordingly during social interactions. (Bekoff, 2004). In stable social groups when such expectations are challenged, conflicts soon emerge (Clutton-Brock and Parker, 1995). In these social dealings, we find behaviors that seek to repair these so-called social norms that suit the term justice. Justice, according to Pierce and Bekoff (2012) is an umbrella term that encapsulates among other terms, a sense of equity and the emotional reactions when that sense is challenged by other elements within a group. Additionally, socially stabilizing behaviors such as food-sharing (Feistner and McGrew, 1989), reconciliation and consolation (de Waal and van Roosmalen, 1979), and

punishment (Clutton-Brock and Parker, 1995) among others are connected with this sense of equity. In fact, we know that both monkeys and apes engage policing behavior, intervening in fights, which in turn, promote social stability (Flack *et al.*, 2006; von Rohr *et al.*, 2012).

The first study to test inequity aversion in primates was done more than a decade ago with brown capuchin monkeys (*Cebus apella*) (Brosnan and de Waal, 2003). In essence, they involved subjects performing a task and getting rewarded for it, then, the researchers would document the reaction of one of the subjects being rewarded unequally in comparison to its partner. Since then, further studies were made, with a few variations, and 9 more species have been researched within this topic (see Brosnan, 2013; Brosnan and de Waal, 2014 for a review). The results have been mixed; some found positive results for so-called inequity aversion in chimpanzees (Brosnan *et al.*, 2005; Hopper *et al.*, 2014) capuchin monkeys (Silberberg *et al.*, 2009), rhesus macaques (Hopper *et al.*, 2013); others found negative results for chimpanzees, orangutans (Bräuer *et al.*, 2009; Brosnan *et al.*, 2011), squirrel monkeys (Talbot *et al.*, 2011) and tamarinds (Neiworth *et al.*, 2009). What these reveal collectively, is a weak evidence for so-called inequity aversion in primates. If that is due to a lack of cognitive abilities or motivational issues, it yet remains to be known. According to some researchers, instead of inequity aversion we are observing a loss of aversion, or a reaction to a violation of expectation by the "under-rewarded" individual (Silk & House, 2011). This is because in situations where the same individual is "over-rewarded" there is no clear reactive behavior to inequality (second order inequity aversion) now committed to its partner. Despite the different definitions, there seems to be an evolutionary continuum between reactions to unequal rewards and a full developed sense of fairness (Brosnan and de Waal, 2014).

Also, in the case of chimpanzees, studies using the pro-social task paradigm, have yielded negative results: when a chimpanzee was presented with two options, one that was mutually beneficial and one that was selfishly beneficial, it made no difference if a conspecific was either present or absent during the experiment with some authors making claims such as chimpanzees not being other regarding[1] (Silk *et al.*, 2005; Jensen *et al.*, 2006; Vonk *et al.*, 2008).

Research involving the targeted helping paradigm, however, has shown a clearer picture. These test whether the subject offers help or not to an experimenter (or conspecific) who cannot reach an object or needs a tool to perform a task. Chimpanzees frequently aided (Warneken and Tomasello, 2006; Warneken *et al.*, 2007; Melis *et al.*, 2010; Yamamoto *et al.*, 2012) while capuchin monkeys regularly did not (Barnes *et al.*, 2009; Skerry *et al.*, 2011). It might be that chimpanzees excel in perspective taking (an

[1] Other regarding behavior is a term that depicts helping behavior rooted on empathy rather than benefit-cost calculations by the actor (Brosnan and Bshary, 2010). It is theoretically supported by the perception action mechanism (P.A.M.) whereupon the helping act itself is categorized as "empathic perspective taking", the most cognitively demanding of all three levels of P.A.M. (Preston & de Waal, 2002; de Waal, 2008).

ability central for this test) in comparison to capuchin monkeys since targeted helping tasks involve an understanding of the goals of the other partner (de Waal, 2008).

Lastly, still on the experimental level, two studies are worthy of mention since they involve theft in their design. That chimpanzees react strongly to active challenges for their food both in the wild (Muller and Mitani, 2005) and the lab is a known fact (Jensen *et al.*, 2007) but how do they react as witnesses of such interactions? Riedl *et al.* (2012), in an experiment with chimpanzees where the ape that witnessed a theft could collapse the food tray impeding the thief from eating, reported that there was no significant third party punishment. As the results of Riedl *et al.* (2012) and Jensen *et al.*, (2007) suggest, instead of proactively discouraging behaviors that are unjust, chimpanzees are better at actively coercing others into compliance. Similarly, Liebal *et al.* (2014) carried out a test to assess whether great apes displayed sympathy towards a conspecific whose food had been stolen by a human experimenter, but the results were mostly negative.

These results seem to be at odds with observations in the wild, especially in cases of altruism and other-regarding behaviors. For instance, Pruetz (2011) reported an interaction where following the return of a captured chimpanzee infant to her wounded mother, an adolescent male helped carrying the infant for two days. According to the author, this form of targeted helping was based on the male recognition of a need from the mother, arising from empathy. There is also surprising data from Boesch *et al.* (2010) reporting 18 adoptions of orphaned chimpanzees, 10 of which performed by adult males. Moreover, high ranking males have been seen intervening, albeit unsuccessfully, against resident females from committing infanticide on the infants of immigrant females (Townsend *et al.*, 2007). It can be argued that in most of these observations, the behaviors are motivationally autonomous, that is, not bounded by selfish motivations of immediate and predictable potential returns, thus genuinely altruistic (de Waal and Shuchack, 2010). Also, in the lab we are dealing with what could be described as low level altruism/costs while in the wild the examples were of high level altruism/costs: there may be a qualitative difference in these wild interactions that spur other regarding behaviors which cannot be fully tested in captive primates for ethical reasons.

Concerning the matters of possession, theft and equity/justice, this paper focuses on an observation made during a social object play interaction (Shimada, 2006), followed by a theft of the same object by a third individual, and finally a replacement of an equal object (a blanket) by a fourth individual to the original owners.

The only previous observation relating to a primate describing the stealing of a blanket by a non-human primate is from an unpublished report (Pusey, 1998 cited in Matsumoto-Oda, 2000) in Rubondo Island, Tanzania. It involved a female chimpanzee, though it was most likely not an active stealing (the blanket was lying unattended

with no clear possessor) (Pusey, pers. comm., 2015). In captivity, blankets somewhat replace what tree or ground nests in the wild do in terms of comfort. The apes sit on them most of the time, but they are as well part of object-play interactions where an individual will cover himself in a sort of *blindman's bluff* (de Waal, 1989) and chase the other play partner. They are also used against other group members during conflicts as a whip (pers. ob., 2013). The observation here described contributes to answer the question of whether chimpanzees possess or not a sense of equity and justice, while also attempting to identify the factors that may be involved in such related behaviors. Additionally, new suggestions are made that hopefully will develop new ways to test the sense of equity in an experimental setting while keeping a naturalistic approach.

Case Study

Study subjects and housing

This observation was made while a conflict resolution research was being carried out on a group of West African chimpanzees (*Pan troglodytes verus*) all born in captivity. The group was comprised of 16 individuals (three adult males, nine adult females, two adolescent males, one adolescent female and one juvenile male), housed at the Wolfgang Köhler Primate Research Center in the Leipzig Zoo, Germany, since 2001. They had access to sleeping rooms, a semi-natural indoor area as well as an outdoor enclosure, both with many structures especially designed to allow climbing. They were fed a variety of fruits and vegetables, occasionally supplemented by meat, eggs and yoghurt and had access to water *ad libitum*. Enclosures were equipped with environmental enrichment resources such as artificial termite mounds. Additional, enrichment materials were provided for each subject every afternoon.

The subjects of the interaction where Kara (KA) (adolescent female), Kofi (KO) (adolescent male), Bangolo (BG) (juvenile male), Swella (SW) (adult female), Corrie (CO) (adult female) and Dorien (DO) (adult female). Following this interaction, frequencies of events in which an individual took an object from another were registered, coded as either neutral, ambivalent or aggressive takeovers None of the individuals described in the interaction were directly related (*i.e.* maternal siblings) with the exception of DO and BG (mother and son). All the adult females and adolescents were of medium rank.

Observations

The observed event (Fig. 1) occurred in the indoor enclosure on Friday, 15th of March, 2013, between 17:00h and 17:20h. The three youngest members of the group KO, KA and BG were playing with a blanket that had been previously in possession of DO who was sitting close by, against the wall. Sitting across them, in the metal grid were two adult females; SW who was sitting under a blanket on a stool log, and next on her left was CO lying on her side, resting, herself without a blanket (Fig. 1a).

Figure 1 - Recreation of the observed event: A) the youngsters playing with the blanket; B) Swella pursuing Kara; C) Swella taking the blanket; D) Corrie throwing the blanket, previously left by Swella, onto the log.

After a couple of minutes of this social play among the youngsters, SW left the log and the blanket on it, came down to where the social play was occurring and tried to steal their blanket, KA changed her posture, turning towards SW and grunt barking (coded as "grunt/protest"). This was met with aggressiveness from SW who instantly charged against KA (now screaming), and chased her around the indoor enclosure (Fig. 1b).

Upon returning from the chase, seconds later, SW went to the place where the blanket had been left by the others, took it, and went up to the artificial tree at the center of the enclosure (Fig. 1c). Right after this, CO got up, took the blanket left by SW on the log, emitted a few grunts, and threw it in the direction of where the first blanket had been. DO got up and took it almost immediately and a few minutes later, both KO and BG were playing with it again and KA soon followed (Fig. 1d).

After this observation, whenever witnessed, all successful blanket takeovers were recorded *ad libitum*. These were coded as peaceful transitions (when neither taker nor possessor showed signs of distress) and ambivalent transitions (when the possessor displayed fear grins or side waving) and aggressive transitions (involving a conflict between possessor and taker). Frequencies are shown in Figure 2. The chimpanzee displaying the highest frequency of stealing behavior was SW.

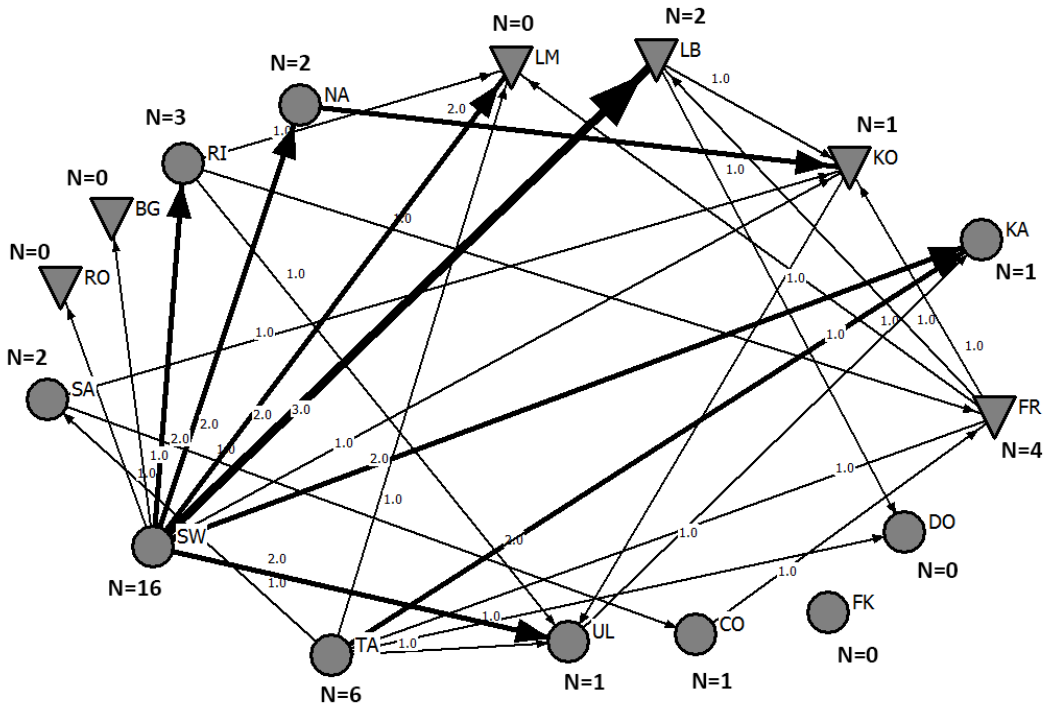

Figure 2 - The stealing network of the whole group of captive chimpanzees. Females shown as circles, males as triangles. Total amount of stealing events N=39. Highest individual stealing frequency: SW, N=16.

Figure 3 - Swella steals a blanket from the highest ranking female, Riet. An example of ambivalent takeover where both females displayed signs of distress (grinning and side waving).

Discussion

Anecdotes, as defined by Bates and Byrne (2007), are informative of a species behavioral capacities and a starting point for generating suitable hypotheses (Byrne and Whiten, 1988; Bates and Byrne, 2007). It is crucial that the observer has had previous experience with the focal species and as such is familiar with its behavioral repertoire. There should also be an immediate recording after the observed events, this is to avoid what William C. McGrew has qualified as observer error, misattribution, coincidence, or a hoax (McGrew in: Sarringhaus *et al.*, 2005). For all of these procedures and implications, this paper meets the complete requirements for a valid single observation, save for a potential coincidence (that is, an accident originated by the focal animal), but this alternative, as will be argued later, is quite unlikely.

First explanative hypothesis: the adult female CO, exhibited a fairness-related behavior. Having observed the whole incident, she got up from her lying position and threw the blanket SW had left as a replacement for the one that had been stolen. According to this description, it can be said that CO acted in an altruistic manner (albeit the only cost was getting up and throwing an object), she arguably displayed other-regarding behavior. Furthermore, although the blanket ended up first in possession of DO, (the blanket was at about 2

meters from her), it is not likely CO intended to throw the blanket at DO, especially when looking at data from a previous study on grooming network cohesion (Kanngiesser *et al.*, 2011) and subsequent study on conflict resolution and grooming exchange (Gonçalves, 2015)., suggest that these females were not particularly close. This explanative hypothesis is also reinforced by CO being close to the adolescents. In 350 hours of observation, CO was seen playing with either KA or KO more frequently than other adult group members.

Second explanative hypothesis: CO exhibited scent repulsion towards the blanket. This means that it was only by chance that she threw the blanket in the direction of KO and BG, her primary motivation being to set a distance between her and the blanket. Nevertheless, the chimpanzees in this group were frequently observed urinating on the blankets. This was done unintentionally by either the current owner or individuals close by. It is unlikely, however, that an aversion to urine had taken place since these apes (CO included) were seen at occasions engaging in urophagia. Although the apes avoid coming into direct contact with each others urine, they were observed in close proximity and were apparently indifferent to it.

Third explanatory hypothesis: the ape was mimicking a task from a previous experiment. It remains a possibility that CO made an associative learning from a previous training of a social cognition experiment. The most similar design to the observed occurrence is Liebal *et al.* (2014). This explanation, however is ruled out since CO was not among the experimental subjects. Another potential study (Kaiser *et al.*, 2012) is ruled out for the same reason as the previous. One more possible study is Riedl *et al.* (2012), but it is unlikely. While CO participated in it, she never once collapsed the trapdoor, thus CO not exhibiting third party punishment is not conducive to the premise that she learned by association from this study and applied it in the afternoon of the 15th of March of 2013.

When we look at the behavioral dynamics present in the observation described in this paper, a pattern emerges (aggressor-victim-bystander) that is often seen in chimpanzees both in the wild (Kutsukake and Castles, 2004; Watts, 2006; Wittig and Boesch, 2010) and in captivity (Palagi *et al.*, 2006; Koski and Sterck, 2007; Fraser *et al.*, 2008; Romero *et al.*, 2010; Gonçalves, 2015) which is that of triadic affiliation/consolation behaviors. Therefore, it would not be surprising to find justice or fairness related behaviors in a socially complex species such as the chimpanzee. On the matter of their lack of occurrence in the lab, it is possibly due to problems regarding the experimental design or might indicate that these behaviors, albeit existent, are statistically rare even in nature. However, we should be careful since absence of evidence is not evidence of absence.

If we take the observed event as a model, an experimental design to test fairness based interactions could be made well in the realm of chimpanzee cognitive capabilities. Hypothetically it could involve two human players play-fighting over a blanket, an additional human "aggressor" taking the

blanket from one of the two and a chimpanzee observant that could be given a choice to offer another blanket to one of the human players. Variables as aggression/no aggression occurring and asking/not asking could be involved. This would contrast to Liebal *et al.* (2014), in that, while implementing a chimpanzee-human interaction in detriment to a chimpanzee-chimpanzee interaction[2], it would present a clearer aggressor/victim dynamic, though ethical concerns might need addressing. In the observation here reported, it could be that aggression suffered by KA from SW was an important variable shaping the behavior of CO. Not all the apes showed a clear preference for blankets. Regarding SW, there may have been a personal preference for blankets at play (i.e. see Fig. 3). Most of the transitions were peaceful with only three recorded conflicts over blankets, two of which started by SW.

Object stealing behavior in primates remains quite unreported and for the most part, circumstantial since it is not considered a main variable (*i.e.* Fragaszy and Mason, 1983; Russon *et al.*, 2007; Shimada, 2006, *but see* Thierry *et al.*, 1989 *for a notable exception*). In the wild, one could posit that stealing occurs among species that happen to engage in tool use or have a greater interaction with objects in general that are more prone to create disputes. This would be the case of non-human primate species using stones in the case of brown capuchins (Fragaszy *et al.*, 2004) and long tailed macaques (Gumert *et al.*, 2009), as well as leaves, sticks, stones and spears in the case of chimpanzees (Sousa *et al.*, 2009; Humle and Matsuzawa, 2002; Carvalho *et al.*, 2008; Pruetz and Bertolani, 2007). Also, stick or "log doll" playing which has been observed in chimpanzees (Kahlenberg and Wrangham, 2010; Matsuzawa, 2011) is another candidate interaction for a possession dispute. Moreover, it would be valuable to start taking account of nesting behavior which has been studied across several sites with specific interest on the ontogeny of nest usurpations among great apes.

The evolutionary pressures acting on stealing behavior are not yet fully understood. While on the food department there is a clear advantage of taking the food of a conspecific as it diminishes time spent foraging (Iyengar, 2008), on the object department, when not related to nest building (itself associated to mate choice or infant survival in birds), or food acquisition (as in tool-use) the question still remains unanswered.

Conclusion

We look to non-human primates in order to find cues that inform us of the foundations of human cognition, as well as its evolutionary pressures both ecological and social. Research on cognitive processes such as

[2] In fact, Liebal *et al.* (2014) has a human-ape-ape interaction ("aggressor", "victim" and bystander, respectively). This study was carefully designed to allow for a great ape interacting with a conspecific thus providing, in theory, a better window on chimpanzee/bonobo/orangutan social interactions. The proposed experimental design has a limitation being interspecific, in line with the first experiment of Warneken *et al.* (2007) which involved a human-chimpanzee interaction.

empathy, sense of equity, cooperation, altruism or punishment has yet to show its full potential. There have been two approaches in exploring these topics, one experimental and another one observational. Observing behaviors that are particularly related to justice and fairness has the benefit of being the most natural, arguably, and providing a better understanding of how these are manifested in each species characteristic interactions (Brosnan, 2013). This paper presents one such observation which might inform and lead a pathway towards testing fairness and justice in an experimental setting. Starting from the naturalistic approach and then combining it with the insights obtained from the experimental ground should provide the most scientifically sound results.

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[i] O autor optou por redigir o resumo e as palavras-chave sem acatar o Acordo Ortográfico de 1990.