

“Rule-governed call exchanges in captive gorillas: observational and experimental approach”

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The psychologists and sociolinguists agree that, even though notable cultural variations exist, comparable conversational basic phenomena appear in unrelated languages (Beach, 1990). The universality of conversations has been well illustrated by the French social psychologist Rodolphe Ghiglione in his so-called “contract of communication” that conversing interlocutors informally agree on (Ghiglione, 1986). This contract facilitates vocal coordination between interlocutors and promotes intercomprehension. Ghiglione (1986) listed several principles, amongst which “context relevance” (i.e. evaluation of context as pertinent or not to initiate a conversation), “reciprocity” (i.e. evaluation of the partner as a valid interlocutor), and “contractbased temporal rules” (i.e. the respect of the turn-taking which refers to a reciprocal exchange of alternating, short, and flexible turns between two or more interlocutors -Sacks et al., 1974- and speech overlap avoidance). Turn-taking represents the social core of human interactions (Levinson, 2016) and can be found in all languages and human societies around the world (Stivers et al., 2009). The fact that this temporal rule is universal among human cultures question its biological basis and motivates the search of parallels with the communicative interactions of nonhuman animals.

Communicative turn-taking has been found in a broad range of nonhuman species (e.g. elephants *Loxodonta africana*: Leong et al., 2003; sperm-whales *Physeter macrocephalus*: Schulz et al., 2008; common bottlenose dolphins *Tursiops truncatus*: Janik, 2000; starlings *Sturnus vulgaris*: Henry et al., 2015; naked mole-rats *Heterocephalus glaber*: Yoshida & Okanoya, 2005; bats *Diademus youngi*: Carter et al., 2008), including a number of nonhuman primates species (e.g. Campbell’s monkey *Cercopithecus campbelli*: Lemasson et al., 2011; common marmoset *Callithrix jacchus*: Takahashi et al., 2012; Japanese macaques *Macaca fuscata*: Sugiura & Masataka, 1995).

However, few studies have focused on vocal turn-taking in nonhuman great apes and their results are contradictory (bonobos *Pan paniscus*: Levréro et al., 2019; chimpanzees *Pan troglodytes*: Arcadi, 2000, but see Fröhlich et al., 2016 for gestural turn-taking in bonobos and chimpanzee). So, the current state of knowledge prevents to conclude between a convergent evolution guided by the requirements of social life or a shared inheritance, suggesting an ancient mechanism which was already present. Authors also questioned the fact that these abilities to take turns in nonhuman animals are genetically programmed or, as in humans (Ginsburg & Kilbourne, 1988; Stern et al., 1975), socially acquired. Empirical evidence is currently lacking to answer this question, although the few available studies on monkeys showed that juveniles break conversational rules more often than do adults (howler monkeys *Alouatta pigra*: Briseño Jaramillo et al., 2017; Campbell’s monkeys: Lemasson et al., 2011). Moreover playback experiments using a violation-of expectation paradigm showed that adult monkeys audience clearly discriminated between appropriate and inappropriate vocal exchange patterns, whereas socially inexperienced juveniles did not (Campbell’s monkeys: Lemasson et al., 2011). This experiment suggests that the temporal organization of vocal interactions is not a simple neurobiological guided behaviour but a social awareness of the respect of rules.

Here, we propose to complete the knowledge about existence of turn-taking in great apes by looking at western lowland gorilla (*Gorilla gorilla gorilla*) through two

complementary studies conducted on the same captive group. First we aimed to determine the social basis of vocal interactions on twelve individuals forming a unimale/multifemale group, with a social structure comparable with one found in the wild (Parnell, 2002). We found that individuals do seem to engage in socially- and temporally-ruled vocal interactions involving closed-calls named grunts (Lemasson et al., 2018). During grunt exchanges, temporal pattern seems to be respected with an average “response” delay of 0.5 seconds (maximum 3sec) and with obvious call overlap avoidance. Also preferred interlocutors are non-randomly chosen. Grunt exchanges are mainly dyadic interactions that are most frequently observed among partners close in age, regardless of kinship. Second to assess the social relevance of this two potential interactional rules (inter-call durations and the age difference of interlocutors) for the audience, we ran a violation-of-expectation paradigm using playback experiment (Pougnault al., under revision). Attentional response showed that call overlap avoidance matters to subjects, but the importance of the interlocutors’ age proximity appeared less clear. The intensity of the response varied with subjects’ age in a context-dependent way, supporting a possible role of learning. Our findings support the growing number of studies highlighting the importance of vocal turntaking in animals and a possible sociogenesis of this ability in primates.

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