

Personality Structure and Polymorphisms of Personality-Related Genes in Wild Bonobos (*Pan paniscus*)

(野生ボノボ (*Pan paniscus*) のパーソナリティ構造とパーソナリティ関連遺伝子の多様性)

Ph. D. Thesis
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Personality refers to individual differences in behavior that are consistent across time and situations. Studying personality in animals can have implications in the progress of research on stress and health implications of personality in humans, personality evolution, conservation, animal welfare and captive management. Due to the similarities and differences in social system between chimpanzees and bonobos, comparing their personalities would further our knowledge on personality evolution. However, little study has been conducted on bonobo personality, and none in the wild. The following studies attended to different domains of the field of personality in wild bonobos at Wamba, Luo Scientific Reserve, Democratic Republic of the Congo.

Using behavioral observations and questionnaire ratings, I examined personality in 16 bonobos. Applying factor analysis, I extracted five personality dimensions (Unemotionality, Friendliness, Aggressiveness, Irritability, and Activity) from 31 items from the 54-item Hominoid Personality Questionnaire, and three dimensions (Grooming, Playfulness, and Introversion) from observed behaviors. I established convergent and discriminant validity of the questionnaire-derived factors by examining their correlations with observation-derived factors. Comparing my results with that of chimpanzees and other great apes – e.g. the absence of clear dominance, neuroticism and openness factors in bonobos – can bring us closer to understanding the interplay between social system and personality. The sex differences in bonobos – i.e. males being more introverted, while females more friendly – differed from those in chimpanzees, reflecting the differences in the social system of the two species, such as closer bonds between female bonobos than female chimpanzees.

A number of studies have found that personality traits have a genetic basis in humans. Based upon these findings, I examined some candidate genes in bonobos to determine if they are polymorphic and if they might be related to differences in behavior between chimpanzees and bonobos. Androgen receptor gene (*AR*), monoamine oxidase A gene (*MAOA*) and monoamine oxidase B gene (*MAOB*) have been found to have associations with behavioral traits, such as aggressiveness, and disorders in humans. I examined the loci *AR* glutamine repeat (*ARQ*), *AR* glycine repeat (*ARG*), *MAOA* intron 2 dinucleotide repeat (*MAin2*) and *MAOB* intron 2 dinucleotide repeat (*MBin2*) in 32 wild bonobos, and compared them with those of chimpanzees and humans. All the four loci were polymorphic in bonobos, and loci

MAin2 and *MBin2* showed a higher diversity than in chimpanzees, which may be associated with the differences in aggression between the two species. The field of personality would benefit from revealing association between aggressiveness, and other personality traits, and polymorphisms documented in this study in bonobos.

This study is the first to examine personality in wild bonobos, and it increases our understanding of the evolution of personality, as well as of bonobo behavior, by focusing on domains of personality research that need more attention, such as establishing personality structure in a wider variety of species, and examining genetic polymorphisms that are candidate for personality association. In conclusion, bonobos in the wild display individual personality structures, some aspects of bonobo personality that differ from chimpanzee personality can be associated with differences in the details of their social systems, and genes that underlie personality differences among people are polymorphic in bonobos and might also influence variation in bonobo behavior.