Male Personality and Fitness in a Semi-Free Ranging Group of Japanese Macaques (*Macaca fuscata*)

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Introduction

Personality is constant individual differences of behaviors over time (Freeman & Gosling, 2010). The Factor-Five Model uses behavioral traits to sort individuals into five personality domains and has been adapted for non-human primates (Goldberg, 2013). Personality differences may have varying benefits, such as increased reproductive success (Réale et al., 2010). Closely related species may be similar in personality dimensions, but distinguished by personality facets related to aggression, social structure, and affiliation (Adams et al., 2015). As such, models cannot be generalized across a single genus. For example, studies of rhesus macaque (*Macaca mulatta*) personality use the domains Dominance, Anxiety, and Confidence (Adams et al., 2015). However, Japanese macaques (*M. fuscata*) exhibit both less asymmetric aggression and more positive social interactions than rhesus macaques (Chaffin, 1995), which necessitates a Factor-Five Model adapted specifically to this species. This study aims to establish personality in adult male Japanese macaques using five domains adapted from various Factor-Five Models for rhesus macaques (Table 1) and to test whether there is a relationship between personality and reproductive success.

Subjects

This study was conducted on a semi-free ranging population of Japanese macaques at the Oregon National Primate Research Center (ONPRC). We collected data on 17 adult males who were identifiable by specific dye markings.

Methods

We used 15-minute focal follows with one-minute instantaneous scans to collected 512 hours of behavioral data. Data were collected from June-September 2018 and July-December 2019. We then sorted behaviors into five distinct personality domains based on an adapted Five-Factor Model (Table 1). Using behavioral rates, we ran a principal component analysis (PCA) to identify whether males behaviorally clustered together into the pre-identified domains. Finally, using genetic records provided by the ONPRC, we ran a two-way ANNOVA to test for a relationship between personality and reproductive success as measured by number of offspring.

Fig1. Adult grooming.

Fig2. Solitary adult male.

Fig3. Aggressive male.

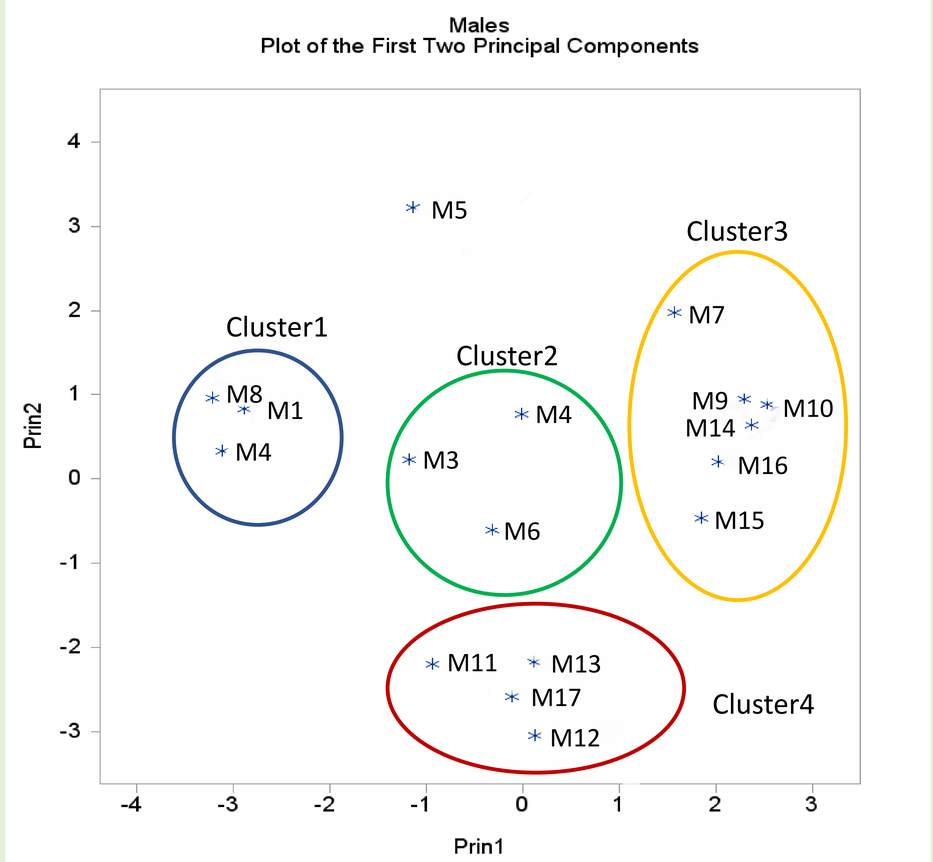

Fig4. Principle Component Analysis displaying four clusters and one outlier.

Table 1. Factor-Five Model Personality Domains

Domain	Included Behavioral Variables
Sociability	↑ grooming rate, ↑ social relationships, ↑ playfulness, ↓ solitude
Dominance	↑ received grooming, ↑ female corrections, ↑ directed aggression
Independence	↑ solitude, ↓ grooming rate, ↓ social relationships
Neuroticism	↑ received aggression, ↑ abnormal behaviors, ↑ non-reproductive socio-sexual behaviors, ↑ self-grooming
Confidence/Aggression	↑ initiated aggression, ↑ increased displacements, ↑ initiated grooming

Results

- Males clustered into four distinctive domain groups (Fig.3).
  - Cluster 1: Confidence/Aggression
  - Cluster 2: Dominance
  - Cluster 3: Sociability
  - Cluster 4: Neuroticism
- Fitness did not significantly correlate with any domain ($F=0.53$, $df=2$, $p=0.6009$) (Fig. 4).

Discussion

Japanese Macaques have higher degrees of affiliative interactions when compared to Rhesus Macaques and therefore justifies the need for species-specific models. Most of the adults in the semi-free ranging Japanese macaque group clustered into four personality domains. These domains include Sociability, Dominance, Confidence/Aggression, and Neuroticism. The males did not cluster into five distinct groups like we originally set out to test because the behaviors that define Independence were not commonly displayed among males. Furthermore the males that make up each domain can express that personality differently because a lot of the domains include rates of behaviors. Males can express similar behaviors but targeted to one individual repeatedly or display that behavior with a multitude of individuals. This creates variation of personality within each domain. We also found that fitness had no correlation to any personality domain therefore personality is not being used as an alternative mating strategy in this group of semi-free ranging Japanese Macaques. Personality is most likely being used for another benefit within the population but not to increase fitness. Also, the fitness data available was lifetime fitness data and not fitness data the directly correlated with the personality that was evaluated in the study which could have further affected the results. To fully assess Japanese Macaque personality using the adapted Factor-Five model more studies in various populations should be conducted to be able to explore how multiple factors affect the expression of personality.

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