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Authors

Highfill, Lauren
Fad, Otto
Makecha, Radhika
[et al.](#)

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Brief Report: Asian Elephants (*Elephas maximus*) may Demonstrate Stable Personalities

Lauren Highfill
Eckerd College, U.S.A.

Otto Fad
Busch Gardens Tampa, U.S.A.

Radhika Makecha
The College of The Bahamas, The Bahamas

Stan Kuczaj
University of Southern Mississippi, U.S.A

Pioneering studies of animal personality appeared in the 1970s (e.g., Adamec, 1975; Buirski, Plutchik, & Kellerman, 1978; Stevenson-Hinde & Zunz, 1978). These studies proposed personality differences and examined behavioral tendencies that would be predicative of those personality traits. These studies began a surge of interest in consistent individual characteristics among individuals of various species, and during the past few years, research has begun to focus on animal personality more seriously. This line of research has resulted in a number of studies revealing individual differences in personality traits in such diverse species as primates, marine mammals, insects, fish, invertebrates, and birds (Gosling, 2001). Animal personality is defined as an individual animal's unique and stable patterns of behavior (Gosling, 2001). Based on this definition, there are often two main goals of animal personality research: 1) determine if individuals within a species exhibit distinctive patterns of behavior and 2) determine if these patterns are consistent and stable over time and in a variety of contexts.

Elephant Personality

Stable individual variability in all three species of elephants, Asian elephants (*Elephas maximus*), African elephants (*Loxodonta africana*), and African forest elephants (*Loxodonta cyclotis*) is likely. Individual variability may be most evident in the dominance interactions of elephants. For example, Freeman, Schulte, and Brown (2010) found differences in the types of behaviors exhibited by female elephants at various facilities in North America. Dominant females were more likely to engage in more assertive behaviors, such as displacing, hitting, leaning on, or pushing another elephant, while subordinate individuals were more likely to exhibit submissive behaviors, such as backing away and raising their tails (Freeman et al., 2010).

In an earlier study, Freeman, Weiss, and Brown (2004) found that dominance status was positively correlated with temperament (which ranged from submissive being the lowest possible rating of temperament and aggressive being the highest possible rating), supporting the notion that personality may play a role in the establishment and maintenance of elephant social hierarchies. Individual differences have also been observed in the exploratory behaviors of elephants. Pinter-Wollman (2009) reported that relocated elephants engaged in less habitat exploration the closer they were to human observers and man-made roads. She suggested that

We thank the trainers at Busch Gardens Tampa for their thoughtful ratings of the elephants. Correspondence concerning this article should be addressed to Lauren Highfill, Eckerd College, 4200 54th Avenue South, St. Petersburg, FL, 33711, U.S.A. (highfile@eckerd.edu)

assessing factors such as boldness in elephants, could aid in the selection of elephants whose exploratory behaviors are better suited for the translocation environment.

One striking example of behavioral variability in elephants involved the reactions of 129 elephants that came across a dead yearling elephant calf (Payne, 2003). Exploratory behaviors were the most frequently reported, but ‘helping’ behaviors (efforts to lift the dying calf), body-guarding reactions, and in one case, aggression towards the body, were also seen. Payne (2003) suggested that these behaviors were reminiscent of personality differences and were independent of the elephants’ age, sex, and relatedness.

A more recent study explicitly explored the personality traits of a well-studied group of wild African elephants (Lee & Moss, 2012). Human raters which had much experience observing a herd of wild elephants were asked to rate 11 adult females using a list of 28 behavioral adjectives. From these adjectives, a principal components analysis was conducted and four components emerged: family leadership, playfulness, gentleness, and constancy (Lee & Moss, 2012). These particular traits may be related to a female elephant’s social and reproductive success, and specifically in the role of matriarch (Lee & Moss, 2012).

Stability of Personality

While many animal personality studies have focused on the first tenet of personality – determining if individuals within a species exhibit distinctive patterns of behavior, fewer studies have examined whether these patterns are consistent and stable over time and across a variety of contexts. Stability among personality traits has been demonstrated in other species, including rhesus monkeys (*Macaca mulatta*; Capitanio, 1999; Suomi, Novak, & Well, 1996), great tits (*Parus major*; Carere, Drent, & Privitera, 2005), and bottlenose dolphins (*Tursiops truncatus*; Highfill & Kuczaj, 2007). Many studies examining consistency in behavioral traits explored the consistency after elapses of time, but not after changes to physical and/or social environments. For example, Suomi and colleagues (1996) found that the personality traits of rhesus monkeys remained consistent over the course of 14 years. However, the physical and social environments changed very little for these subjects. A limited number of studies have examined the stability of an individual’s personality over time and after significant changes to its environment or social group. In one such study, Highfill and Kuczaj (2007) had two sets of human raters assess dolphin personality 14 months apart. During this time lapse, the dolphins had endured drastic changes to both their physical and social environments as a result of Hurricane Katrina. In this study, the personality ratings of 12 of the 15 dolphins were similar across both assessments suggesting that dolphin personality is relatively stable.

Current Study

For the present study, caretakers of a group of captive Asian elephants rated each elephant using a modified version of the measure that was previously used to examine personality characteristics in bottlenose dolphins (Highfill & Kuczaj, 2007). The questionnaire was based on the Five Factor Model and contained 30 behavioral characteristics, six for each of the five factors (see Table 1). The stability of these ratings was assessed by asking a different group of human judges to rate the elephants approximately 28 months later, during which time the leader of the social group had died.

Table 1
List of Adjectives used for Elephant Personality Measure

Adjective	Operational Definition
Curious	Appears to be interested in new situations or objects.
Demanding	Requires much effort or attention from other elephants and/or humans.
Inconsistent, variable	Erratic or inconsistent in behaviors and activities.
Comfortable, complacent	Self-satisfied, content, appears free from anxiety.
Alert, vigilant	Ready, attentive, watchful, appears to pay attention to surroundings.
Aggressive	Threatens or causes harm, high frequency of hitting other animals and/or humans.
Lazy	Resistant to work or exertion
Unexcitable	Not readily roused into action, relatively unresponsive to stimuli.
Affiliative, companionable	Agreeable and sociable. Appears to like the company of others. Seeks out social contact with another animal or person.
Creative, imaginative	Approaches situations and addresses problems in novel, creative ways. (E.g. finds various ways to play with a toy)
Selfish	Self-centered or concerned chiefly with itself and its own needs.
Quiet, non-vocal	Does not vocalize often.
Simple	Engages in routine behaviors. Does not have a complex behavioral repertoire.
Friendly, gentle	Friendly, amicable, and congenial toward other animals and humans. Responds to others in an easy, kind, manner.
Undependable, unreliable	Not easily relied or depended on. Not a “go-to” animal.
Relaxed, calm	Assured or at ease. Not tense or highly sensitive.
Unoriginal, conforming	Not inventive or original, does not produce new and unusual actions.
Intelligent	Animal appears to learn easily. Quick to understand.
Diligent, attentive	Animal monitors its actions and exhibits a willingness to please.
Careful, cautious	Animal exhibits caution in its actions.
Obedient, cooperative	Obeys, cooperates with instructions, not defiant.
Active, energetic	Moves around a lot. Locomotion can include swimming, running, fast-walking, playing, active exploration, etc.
Inflexible, incontinent	Stubborn or headstrong. Not willing to adapt or change.
Temperamental	Displays frequent mood swings.
Timid	Hesitant, apprehensive, tentative.
Jealous	Resentful or envious of another elephant.
Tolerant and easy-going	Inclined to be relaxed and tolerant.
Playful	Engages in play behavior.
Not exploratory or inquisitive	Does not seek out nor investigate novel situations or objects.
Assertive	Self-assured, not easily intimidated.

Method

Assessment 1- May 2006

Subjects. Subjects consisted of six female Asian elephants (*Elephas maximus*) housed at Busch Gardens, Tampa, FL (BGT). The BGT elephant herd was a stable female group, ranging in age from 19 years to over 60 years (est.). Since 2004, the herd has been managed under a positive-reinforcement based protected contact management program, with principles borrowed from SeaWorld’s successful animal training program. For the majority of their day, BGT’s elephants socialized as a herd in their outside display area, with free access to food and water. This group of six females had a well-established dominance hierarchy. At the time of assessment 1, M was the most dominant animal within the dominance hierarchy (see Table 2 for the hierarchy at this time).

Table 2
BGT Elephant Dominance Hierarchy at the time of Assessment 1 and 2

Position	Assessment 1 Elephant/Age	Assessment 2 Elephant/Age
1	M/64	T/40
2	T/38	S/41
3	S/39	K*/18
4	K*/16	R/39
5	R/37	C/37
6	C/35	

*Daughter of C

Measure. An elephant personality measure was created specifically for this study. This measure was based on the Five Factor Model used in human personality research (Goldberg, 1990), and consisted of 30 behavioral descriptions, six for each of the Five Factors. For example, an adjective representing the factor Extraversion was “Active, Energetic: Moves around a lot. Locomotion can include swimming, running, fast-walking, playing, active exploration, etc.” All terms were operationally defined to increase consistency among assessments (see Table 1). Each adjective was scored on a seven-point rating scale, ranging from (1) “very inaccurate description” to (7) “very accurate description.”

Raters. People who work closely with animals (e.g., animal caretakers, trainers) are considered to be accurate predictors of the behavior of individual animals (e.g., Carlstead, Fraser, Bennett, & Kleiman, 1999; Carlstead, Mellen, & Kleiman, 1999; Freeman et al., 2010; Less, Kuhar, Dennis, & Lukas, 2012; Wielebnowski, Ziegler, Wildt, Lukas, & Brown, 2002). Therefore, personality ratings were completed by BGT trainers. Assessment 1 was completed for each elephant in May 2006 by nine BGT trainers. Each rater had similar daily experiences with the animals (e.g., extensive behavioral observations and a variety of daily interactions, including husbandry and learning sessions, as well as playtimes and relationship sessions). The average length of time each rater had interacted with these elephants under the protected contact management program was 18.8 months. One rater was a trainer before the transition to the protected contact program in 2004. All raters were directed to complete their assessments independently and were asked not to discuss their assessments with other raters.

Assessment 2 – 28 months later

Subjects. Subjects consisted of five of the six female Asian elephants (*Elephas maximus*) included in assessment 1. Approximately 21 months after the first assessment, M passed away. When the most dominant group member dies, one of the elder herd members will often assume the position of leader (Payne, 2003). Therefore, after M’s death, T assumed the most dominant position (see Table 2 for the hierarchy and ages of subjects during assessments 1 and 2).

Raters. The second personality assessment was conducted 28 months after the first assessment. The raters for this second assessment consisted of five BGT trainers who were not involved with the first personality assessment. The average length of time each rater had been interacting with the elephants was 18.6 months. These new raters also worked with the animals daily during husbandry and training procedures. We chose to recruit raters who were blind to the first assessment, so that their observational period was not influenced by their experiences with the elephants prior to M’s passing.

Statistical Analyses. The results of the two personality assessments were compared for each of the five elephants rated in both assessments. Since each elephant was rated by more than two trainers, Intraclass correlations coefficients (ICCs) were used to compute inter-rater reliability. ICCs are a measure of consistency when multiple raters are used (Müller & Büttner, 1994). Due to the fact that a correlation simply demonstrates that the results from assessment one trend in the same direction for assessment two, a related samples Wilcoxon signed rank test was also conducted. Specifically, the Wilcoxon test examines whether the results from the first ratings did or did not differ from the second set. For these tests, all 30 adjectives were compared across the two assessments for each elephant.

Results

Overall, the personality profiles supported the hypothesis that elephants possess distinct individual personalities (Figure 1). Intra-class correlations were large for both assessments (May 2006 range: 0.83 to 0.96; September 2008 range: 0.83 to 0.92; see Table 3). These correlations indicated a high level of agreement among raters for each subject for assessments 1 and 2. Furthermore, overall inter-rater reliabilities were calculated across both assessments. The ICCs (range: 0.92 to 0.97) indicated a high level of consistency between the two sets of ratings (see Table 3). For each assessment, the raters' scores were averaged for each personality trait. As a result, each subject had one value per trait from each assessment. Test-retest reliabilities were determined from these average ratings. All five elephants had significant positive correlations, which demonstrated that the ratings were stable despite the lapse in time, change in most dominant animal, and different raters (range: 0.62 to 0.87), see Table 4. Finally, related samples Wilcoxon signed rank tests for each elephant demonstrated that the median differences between assessment one and assessment two equaled zero (see Table 4).

Table 3
Intraclass Correlations (ICC) for Assessment 1 and 2, individually and across both assessments

Elephant	Assessment 1 (α)	Assessment 2 (α)	Assessments 1 & 2 (α)
C	0.87	0.92	0.94
R	0.93	0.84	0.94
K	0.96	0.89	0.97
T	0.83	0.91	0.92
S	0.91	0.83	0.92

Table 4
Related samples Wilcoxon tests

Elephant	<i>p</i> -values
C	<i>p</i> = 0.21
R	<i>p</i> = 0.07
K	<i>p</i> = 0.65
T	<i>p</i> = 0.11
S	<i>p</i> = 0.78

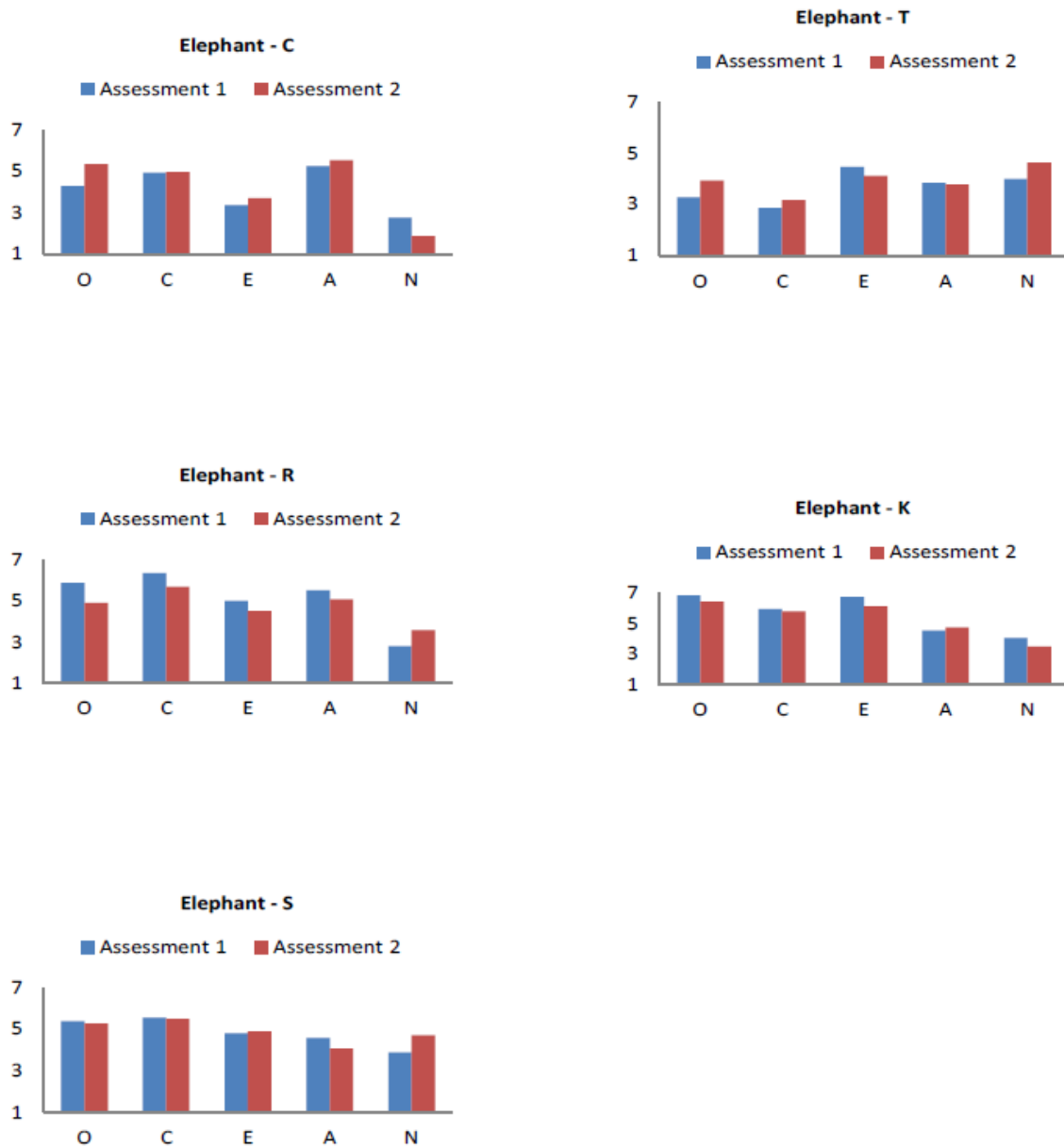


Figure 1. Personality profiles for each elephant based on the Five Factor Model (O=Openness to experience; C=Conscientiousness; E=Extraversion; A=Agreeableness; N=Neuroticism)

Discussion

Animal personality is defined as an individual's distinguishing pattern of behavior, which remains consistent over time and across situations (Pervin & John, 1997). This definition has two criteria: (1) An individual's distinguishing pattern of behavior and (2) consistency over time and across situations. To address the first component of the definition, a measure was created to assess possible differences in elephant personality. Inter-rater scores were reliable. The

descriptive statistics also demonstrated that individual personalities emerged from this group of elephants. If all elephants shared the same personality, they should have rated similarly on each of the factors. This was not the case, however. The personality profiles that were found for each elephant were distinct, indicating personality differences among the individual elephants. However, were these individual differences between elephants stable over time and across situations? The circumstances that surrounded the loss of the herd's most dominant animal provided a unique opportunity to assess the effect of such a loss on the surviving elephants' personalities. Despite the change in social order, the ratings for all five elephants were stable across the two assessments.

The present study provides a necessary first step in assessing personality traits in elephants. For this study, the Five Factor Model was used as a beginning framework. Support for using the Five Factor Model comes from Makecha, Fad, and Kuczaj's (2012) study on the tactile interactions of our study group. For example, Makecha et al. (2012) reported that K directed the second highest rate of tactile behaviors, apart from M, towards other group members, and directed the highest rate of nonaggressive tactile behaviors towards other group members (see Makecha et al., 2012 for definitions). The tactile patterns that K displayed can be argued to lend observational support to the high rating on extraversion she received (see Figure 1). Similarly, C was rated high on agreeableness (Figure 1). Makecha et al. (2012) never observed C directing any aggressive tactile behaviors towards other group members and also noted that she received very few aggressive tactile behaviors from M. It was speculated that perhaps C's lack of aggressive tactile behaviors represented submission. Although it was also observed that C engaged in low tactile interactions in general, the aforementioned patterns seem to provide observational support to the high rating she received on agreeableness.

In order to better understand elephant personality, more elephants need to be studied to assess the relationship of human ratings of elephant personality to spontaneous elephant behavior, such as the patterns mentioned above. Future studies should therefore focus on compartmentalizing elephant personality into species-specific factors (see Lee & Moss, 2012), as well as comparing personality ratings to the direct observation of elephants in both captive and wild settings. Further studies are warranted.

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