

Behavioral Consistency in a Changed Social Context in Carolina Chickadees

ELLEN M. HARVEY

TODD M. FREEBERG

*Department of Psychology
University of Tennessee*

ABSTRACT. Stable personality-like influences on behavior have been documented in nonhuman animals (S. D. Gosling, 2001), but little is known about such influences within explicitly social contexts. The authors tested whether individuals of a socially complex avian species, Carolina chickadees (*Poecile carolinensis*), show consistent behavioral profiles when their social context changes. Consistency was tested using 7 groups of chickadees, each group comprising 2 female–male pairs. The 2 pairs from each group were isolated from one another until the male birds were switched between the pairs. The authors made several measures before and after the male switch, including measures of affiliative and agonistic behavior, self-maintenance behavior, and vocalizations. The authors observed strong behavioral consistency despite the major change in social context, suggesting that personality can influence this fundamental social relationship.

Key words: behavioral profile, chickadees, *Parus*, personality, *Poecile*

WHEN AN INDIVIDUAL IS EXPOSED TO NOVEL SITUATIONS, does he or she respond in a reliable and consistent manner? For example, humans characterized as shy tend to exhibit shy tendencies in the majority of environments: social outings, classrooms, and relationships (Pervin & John, 1999). Individual humans appear to be relatively consistent in their responses across a variety of contexts, and individuals differ from one another both behaviorally and in propen-

These studies were conducted under approved University of Tennessee Animal Care and Use Committee protocols 1248 and 1284. For their assistance with the establishment of field and residential sites that the authors used to capture birds, they thank Richard Evans and the staff of the University of Tennessee Forest Resources, Research and Education Center, and Lyn Bales, Pam Peiko-Seus, and the staff of Ijams Nature Center, and Ellen and Rob Mahurin. The authors thank Gordon Burghardt, Brad Bishop, Kerry Hansknecht, Jessica Owens, and Ami Padgett for helpful critiques of the article.

Address correspondence to Todd M. Freeberg, University of Tennessee, Department of Psychology, Austin Peay Building 301B, Knoxville, TN 37996; tfreeber@utk.edu (e-mail).

sities for behavior (see Marshall & Brown, 2006; McAdams & Pals, 2006; and Shoda, Tiernan, & Mischel, 2002, for further discussion of the interaction between personality or traits and social or environmental context). Many researchers acknowledge a *shy–bold continuum* as a key dimension of human behavioral variation (Wilson, Clark, Coleman, & Dearstyne, 1994). Nonhuman animals can also be ranked on a shy–bold continuum (Sih, Bell, & Johnson, 2004; Wilson et al.), exhibiting relatively consistent responses across different contexts and environments. Thus, an individual responding as bold in social interactions is expected to behave in a bold manner in threatening situations, in foraging contexts, and in mating situations.

Researchers have recently begun to test for personality, or behavioral profiles, in a wide variety of nonhuman animals (reviewed in Gosling, 2001; Sih, Bell, Johnson, & Ziemba, 2004; e.g., guppies: Budaev, 1997; birds: Both, Dingemanse, Drent, & Tinbergen, 2005; Groothuis & Carere, 2005; nonavian reptiles: Cote & Clobert, 2007; Herzog & Burghardt, 1988; hyenas: Gosling, 1998; non-human primates: Suomi, Novak, & Well, 1996). A *behavioral profile* is a classification that describes individuals' consistent and predictable responses to a variety of stimuli, helping to explain behavioral differences among individuals. If an individual exhibits consistent responses, researchers can predict its future behavioral outcomes when the context changes.

An alternative hypothesis to explain behavior across changes in environmental context involves *behavioral plasticity*, the flexibility that one has to adjust one's behavior to the present situation or context (Coleman & Wilson, 1998; Dall, Houston, & McNamara, 2004; Neff, 2003; Pfennig, Reeve, & Sherman, 1993). Under this hypothesis, when the context for an individual changes, its patterns of behavior may change dramatically. This notion can be traced back to the earliest decades of psychological science (e.g., Watson, 1914). There is much evidence to support this idea of behavioral plasticity and the influences from the social environment. For example, Coleman and Wilson found consistent individual differences among pumpkinseed sunfish, *Lepomis gibbosus*, but did not find strong individual consistency in behavior when compared across contexts, suggesting these individual differences are context specific. White, King, and West (2002) found that when the social context changed for adult male brown-headed cowbirds, *Molothrus ater*, differences in both communicative behavior and mating patterns resulted. Dingemanse and de Goede (2004) found that, in a population of wild great tit (*Parus major*), a species with a linear-dominance hierarchy organization, dominant behavior was dependent on both the individual and the social and physical characteristics of the environment. If social or other environmental stimuli strongly affect behavioral responses, then researchers cannot necessarily predict an individual's behavior when its context changes.

Great tits have been key subjects for comparing behavioral profiles and the consistency of behavior with the idea of behavioral plasticity (Both et al., 2005; Carere, Drent, Privitera, Koolhas, & Groothuis, 2005; Dingemanse & de Goede,

2004; Groothuis & Carere, 2005). These researchers have documented that individuals are fairly consistent in their behavioral profiles over time and in different contexts, and this consistency is associated with reproductive outcomes. Although these studies, as well as studies in other species, have addressed some social behavior, behavioral consistency of individuals has rarely been tested in explicitly social contexts. In the present study, we investigated the reliability of behavioral responses across a major shift in the social context in a species with a complex social structure, the Carolina chickadee (*Poecile carolinensis*). Chickadees, members of the *Paridae* family, as are great tits, form stable flocks of individuals in the overwintering months (Smith, 1991). In the present study, we tested for behavioral consistency in a situation that we designed to mimic a natural process in these flocks, specifically how an individual behaves when it loses a mate or flock member and is then involved in substantial social interaction with a new individual joining the flock. We also tested for behavior consistency across a change in social context in terms of mean responses of individuals and their variabilities in response, given that variability in behavior itself may be a personality characteristic explaining differences among individuals (Fleeson, 2001, 2004; Moskowitz & Zuroff, 2004). If behavior in chickadees is strongly influenced by personality, as predicted by the behavioral profiles hypothesis, we would expect individuals' behavior patterns after this change in social context to be similar to their behavior patterns prior to the social change. However, if behavior in chickadees is strongly dependent on the social context, as predicted by the behavioral plasticity hypothesis, then individuals' behavior patterns after this change in social context should not correlate with their behavior patterns prior to the social change.

Method

Subjects

Our sample consisted of 28 wild-caught adult male ($N = 14$) and female ($N = 14$) Carolina chickadees. The birds were captured from one of two locations: Ijams Nature Center (INC), Knoxville, Tennessee; and the University of Tennessee Forest Resources, Research and Education Center (UTFRREC), Oak Ridge, Tennessee. Of the subjects, 7 male birds and 7 female birds were from INC, and 7 male birds and 7 female birds were from UTFRREC. The female and male birds of each pair were captured from the same site at the same time and day. This capture method made it highly likely that the two birds were flockmates, because of the social stability and territoriality of overwintering flocks of chickadees (Mostrom, Curry, & Lohr, 2002). INC and UTFRREC are approximately 35 km apart. Individuals captured from these two locations would not be familiar with one another because of the limited dispersal distances of the species (Mostrom et al.). Upon capture, we uniquely color-banded all birds for identification. Birds were sexed on the basis of wing chord measurements that were taken at time of capture. An individual with

a wing chord of ≤ 60 mm was classified as a female; an individual with a wing chord of ≥ 62 mm was classified as a male (Thirakhupt, 1985). Following the study, we moved four pairs to four independent aviaries at UTFRREC during the spring months, and all successfully mated and produced fertile eggs, supporting this method of distinguishing between the two sexes.

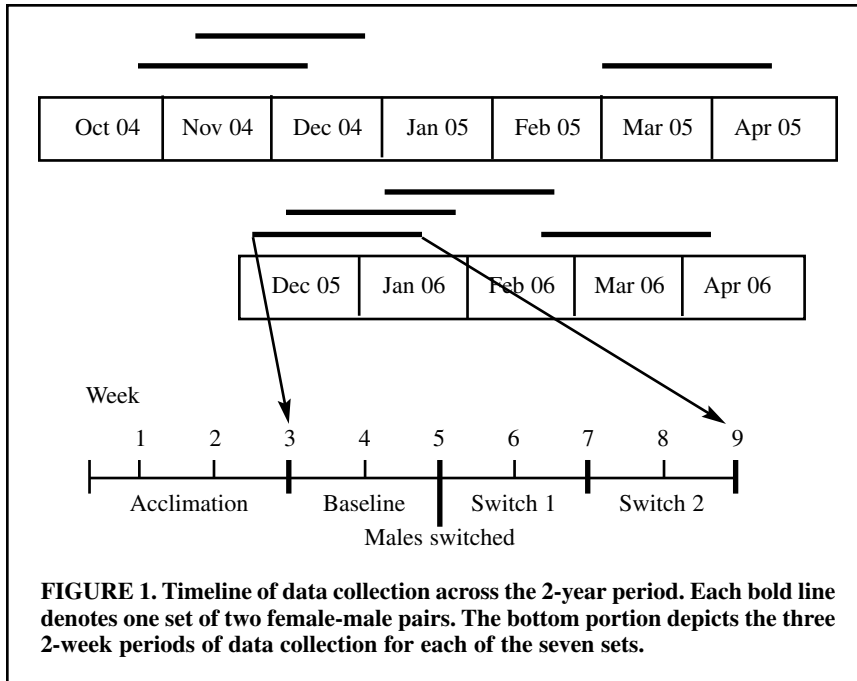
Housing and Maintenance

We housed female–male pairs in cages (0.5 m \times 0.5 m \times 1 m) inside MED-Associates' large monkey cubicles. These chambers were located in four separate rooms. All chambers were both vocally and visually isolated from one another. Cages inside the chambers had three wooden perches (two near the top of the cage and one near the floor of the cage). We provided the birds with ad libitum food (a 1:1 mix of black oil sunflower seed and safflower seed, crumbled suet, and crushed oyster shell and grit) and daily gave them Bronx Zoo diet for omnivorous birds mixed with sprouted seed, chopped fresh fruit and vegetables, 1–2 mealworms each, and fresh vitaminized water. Birds were maintained on a light–dark cycle matched to that of the local environment. The average high temperature across all rooms was 23.8°C, $SD = 2.5^\circ\text{C}$, and the average low temperature across all rooms was 21.8°C, $SD = 2.0^\circ\text{C}$.

Design and Procedure

One female–male pair from INC and one female–male pair from UTFRREC constituted a set. The present study involved seven sets, totaling 14 female–male pairs. Three sets occurred between October 2004 and April 2005, and the final four sets occurred between December 2005 and April 2006 (see Figure 1). Each pair was brought into the laboratory and housed for approximately 3 weeks before the start of data collection, allowing the birds to adjust to their new surroundings. Observations occurred during the next 6 weeks, split into three phases of 2 weeks each: Baseline, Switch 1, and Switch 2. During each of these three phases, we observed each individual with his or her cage mate for eight 15-min focal periods, totaling 672 sampling periods across the 28 birds. For data collection, the observer sat outside the chamber in the darkened laboratory room, looked through a clear plastic observation window into the chamber, and recorded behavior of focal individuals in lab notebooks. The observation window (14 cm \times 14 cm) was covered with black cloth, which was lifted during each observation period. Observations started no earlier than 30 min after the chamber lights turned on in the morning and ended by 1400 hours. Ellen M. Harvey collected 440 of the focal samples, and Todd M. Freeberg collected the remaining 232 samples.

Prior to each focal observation was a 6-min acclimation period during which the observer collected no data. After this period, we recorded data for 15 min in five 3-min increments. At the end of each 3-min segment, we recorded where each



individual was in relation to the other individual (denoted in Table 1 as point sample affiliation score; a higher score indicated the two individuals were found frequently near one another during these 3-min sample points). Other measures (13 total: see Table 1) that we collected during the 15-min focal samples were instances of and time spent in close proximity (< 15 cm); preening behavior; supplants; and eating and drinking behaviors. We also documented three of the major vocalizations of chickadees: the chick-a-dee call, which they use in a wide range of social contexts; the feebee-feebe song, which is used primarily by males in territorial signaling; and the gargle, which is used commonly in agonistic interactions (Ficken, Ficken, & Witkin, 1978; Hailman, Ficken, & Ficken, 1985).

At the end of the 2-week baseline phase, we switched the male birds of each set. Such a male-switching manipulation placed each bird in a novel social context with an unfamiliar member of the opposite sex. For analyses, we split the switch period into two phases: Switch 1 and Switch 2 (Figure 1).

Statistical Analyses

We conducted a factor analysis with our 13 behavioral measures, using a principle component analysis with Varimax rotation, with Kaiser normalization (SPSS v. 14.0). To explore the possibility of an effect of sex on factor scores across each phase of the study (Baseline, Switch 1, Switch 2), we used Mann-

TABLE 1. Definition of Measured Behavior Patterns in Carolina Chickadees

Behavior	Description
Perched close	Birds perched within 15 cm of each other for at least 2 s
Perched close time	Amount of time to the nearest second birds perched close, if longer than 2 s
Point sample affiliation score	Aggregation score of two birds measured every 3 min: including when the birds were located on same perch, perched within 15 cm of one another, or found within the same level of the cage (top vs. middle vs. bottom). A higher point sample affiliation score represents two birds frequently observed near one another during the 3-min point samples
Preen	Bird pecks, fluffs, smooths feathers, or cleans self
Preen time	Amount of time to the nearest second spent preening, if longer than 2 s
Supplant	Bird moves toward other individual, forcing other to move from perch; takes other bird's position; typically an aggressive behavior
Gargle	Aggressive vocalization made by individual in agonistic interactions
Drink	Consumption of water
Eat	Pecks at and consumes seed or other food type
Chick-a-dee call	Characteristic vocalization of the chickadee used in diversity of contexts related to social cohesion
Feebee-feebeay song	Territorial vocalization made by an individual, typically produced during the breeding season
Was supplanted	Individual is forced off perch by other bird; relocates within the cage
Flights	Relocation in cage via jumping lightly or flying quickly

Whitney tests. To test for behavioral consistency of both mean responses and variation in responses, we used Spearman's rank correlations to compare mean factor scores of birds in baseline phase (B) to both postswitch phases (S1 and S2) and coefficients of variation of the factor scores within each phase. We used sequential Bonferroni tests to correct for the six factors being compared in each test (Rice, 1989).

Results

Factor Analysis

We observed the birds for 672 15-min observational periods, resulting in 168 hr of behavioral data. Factor analysis identified six primary factors: Affiliation, or Proximity; Preening; Aggressive Behavior; Eating or Drinking; Nonagonistic Vocalizations; and Being Supplanted. Table 2 displays all factor loadings $\geq .700$, as well as the total variance explained by each of the six factors. These six factors account for nearly 70% of the total variance. Our activity measure (flights) loaded most strongly onto Factor 6 but was not included because of a factor score of .456. We found no significant differences in mean factor scores or correlations of mean factors scores when comparing birds captured at UTFRREC with birds captured at INC. We also found no correlations between females' mean factor scores and their male flockmates' mean factor scores.

Sex Differences Among the Six Factors

We found few sex differences. Sex differences were only detected for Factor 3, Aggressive Behavior, during S1 and S2; and for Factor 5, Nonagonistic Vocalizations, during S1 (Table 3). In each of these cases, male factor scores were higher than female factor scores: Male birds supplanted and produced gargle vocalizations (an aggressive vocal signal) more than did female birds during the S1 and S2 phases, and male birds produced more feebee–feebay songs and more chick-a-dee calls than did females during the S1 phase.

Behavioral Consistency Across Phases

We compared mean factor scores between B and S1 (Figure 2) and between B and S2 (Figure 3) and found strong behavioral correlations in the 28 birds. The comparison of B to S1 tested whether an individual behaves consistently with a new social partner immediately after losing its original social partner. We found significant positive correlations, indicating such behavioral consistency, for Factors 3, 4, 5, and 6 (Figure 2). The comparison of B to S2 tested whether an individual behaves similarly to the way it did with its original social partner after 2 full weeks of interaction with its new social partner. We found significant posi-

TABLE 2. Behavioral Variables, Factor Loadings, and Variance Explained for Studied Carolina Chickadees

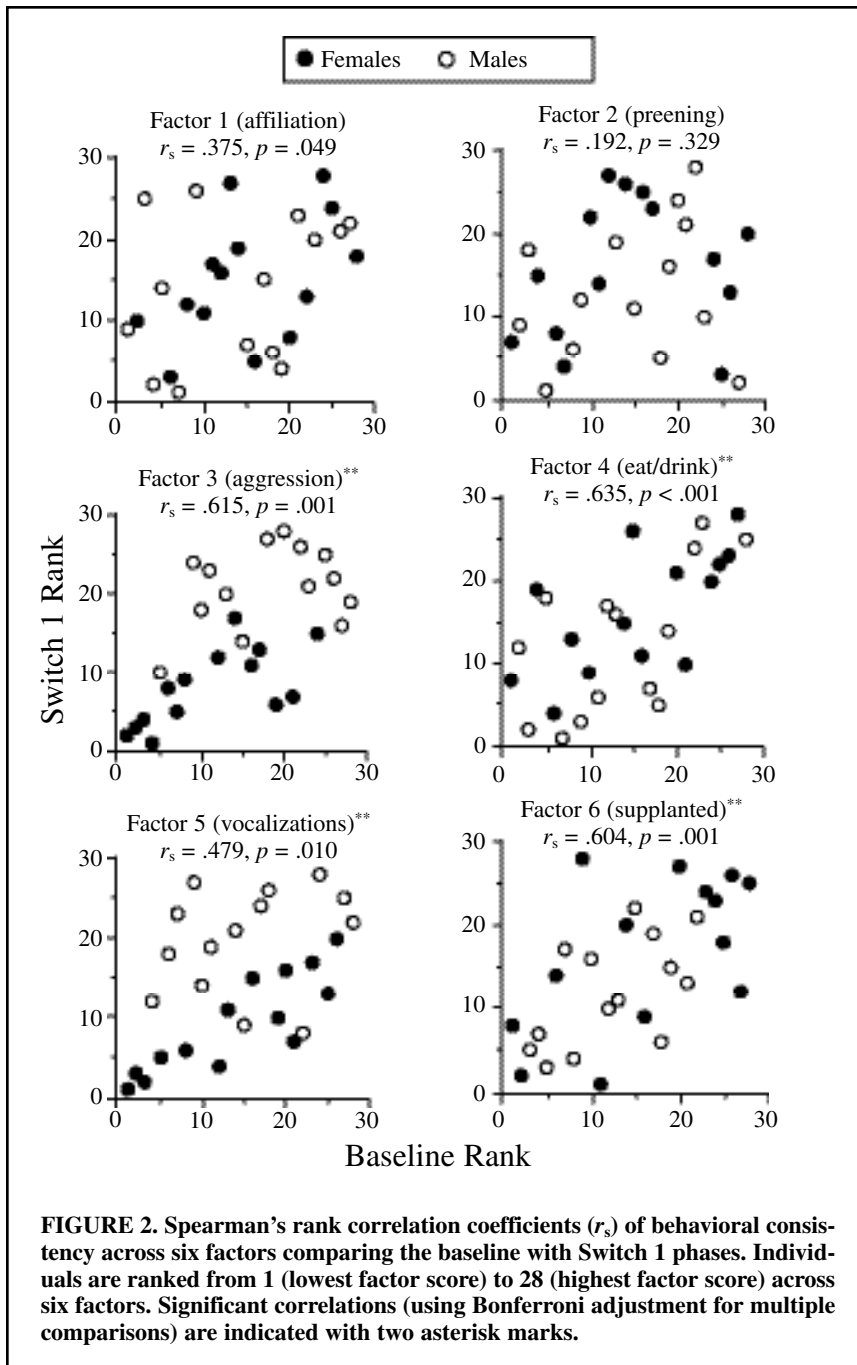
Behavior	Factor					
	1	2	3	4	5	6
Perched close time	.815	-.013	-.071	-.055	-.050	-.070
Perched close	.742	.121	.037	.153	.219	.093
Point affiliation score	.708	-.112	.052	-.317	-.009	-.042
Preen time	-.007	.916	-.006	.021	-.013	.011
Preen	.006	.909	-.038	-.011	.031	-.029
Supplant	-.050	-.029	.852	-.079	.005	-.081
Gargle	.083	.010	.787	.159	-.058	-.017
Drink	.002	.108	.081	.817	.081	-.014
Eat	-.123	-.102	-.022	.789	-.009	.059
Chick-a-dee call	.138	.042	.052	-.002	.762	-.035
Feebee-feebeay song	-.027	-.018	-.075	.069	.721	-.032
Was supplanted	.042	.031	-.143	.086	-.138	.904
Eigenvalue	1.832	1.749	1.555	1.478	1.271	1.05
Variance	14.089	13.452	11.961	11.367	9.779	8.102
Cumulative	14.089	27.541	39.502	50.869	60.648	68.749

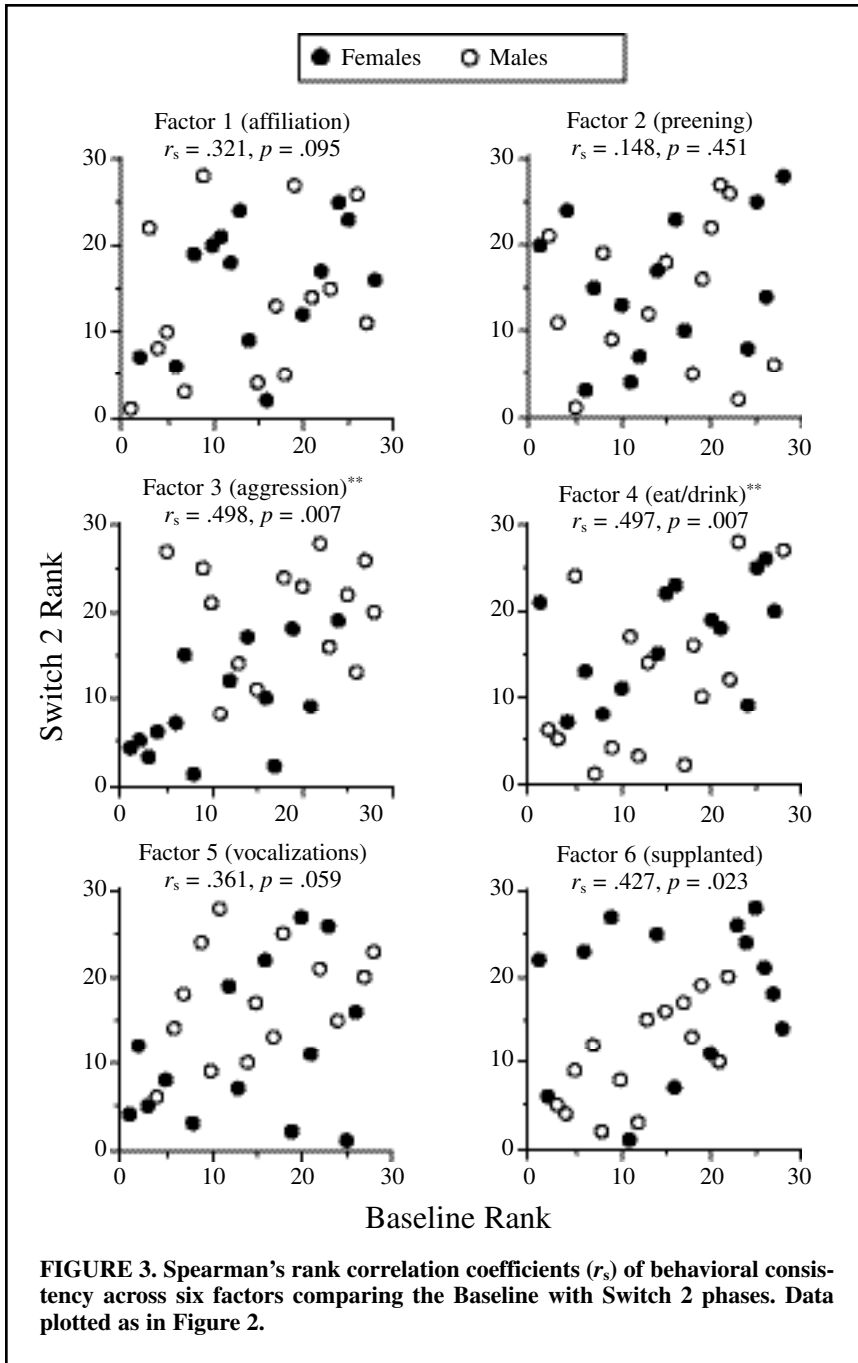
Note. One variable, flight activity, did not load onto a factor at the .700 criterion.

TABLE 3. Tests of an Effect of Sex (*N* = 14 Females; *N* = 14 Males) Using Mann-Whitney Tests Across All Six Factors and Each of the Three Phases: Baseline (B), Switch 1 (S1), Switch 2 (S2)

Factor	B			S1			S2		
	<i>U</i>	<i>W</i>	<i>p</i>	<i>U</i>	<i>W</i>	<i>p</i>	<i>U</i>	<i>W</i>	<i>p</i>
1	90.0	195.0	.713	90.0	195.0	.713	82.0	187.0	.462
2	96.0	201.0	.927	77.0	182.0	.335	90.0	195.0	.713
3	49.0	154.0	.024	8.0	113.0	<.001	23.0	128.0	.001
4	84.0	189.0	.520	72.0	177.0	.232	64.0	169.0	.118
5	89.0	194.0	.679	25.0	130.0	.001	58.0	163.0	.066
6	69.0	174.0	.183	64.0	169.0	.118	48.0	153.0	.022

Note. Statistical significance after sequential Bonferroni correction for multiple comparisons is denoted by bold text. *U* = statistic for the Mann-Whitney *U* Test; *W* = the statistic for the Wilcoxon test in SPSS.





tive correlations for Factors 3 (aggression) and 4 (eat/drink; Figure 3). We also detected consistency when testing the B-to-S1 and B-to-S2 phases within each sex, even with the loss of statistical power. Female birds exhibited significant consistency for Factor 3, 4, and 5 scores in comparisons of B with S1 phases, and males exhibited significant consistency for Factor 6 scores in comparisons B with S2 phases (Table 4). Finally, we did not detect much consistency in individuals' variability in responses across the three phases. The only significant correlation that we found was in comparing Factor 1 scores from B with S1 phases: Birds that were highly variable in their affiliation scores during the B phase tended to be highly variable in their affiliation scores during the S1 phase, and those that showed little variation during B showed little variation during S1 for Factor 1 (Table 5).

Discussion

We observed consistent behavioral responses in Carolina chickadees despite the dramatic shift in the birds' social environment, in accordance with a behavioral-profiles prediction. In the 2-week period immediately following their housing with a novel individual of the opposite sex (S1 phase), individuals exhibited patterns of aggressive behavior, eating and drinking, vocal behavior, and being supplanted that were similar to their patterns prior to the change in social partner. Therefore, our results suggest that individuals' personalities may play an important role in social behavior and potentially in regulating social interactions among individuals. We brought chickadees in our study into the laboratory in opposite-sex pairs from the same capture site. Those two individuals from the same flock did not exhibit similar patterns of behavior. In addition, our data indicate that sex differences do not seem to be a major influence on the behavior patterns that we measured. We found a sex effect on only two factors, and the effect was not detected across all phases of the study for these two factors.

In their natural environment, chickadees form stable flocks with conspecifics during nonbreeding months. Flocks are composed of four to six individuals, typically comprising two to three female–male pairs (Smith, 1991). Because of predation and mortality, chickadees may have to form one or more new relationships with unfamiliar conspecifics, and such an establishment of a new social bond may be a difficult transition. We found that behavior seemed to be more strongly correlated immediately following the introduction of the novel conspecific. That is, correlations between Baseline phase and Switch 1 phase tended to be greater than correlations between Baseline and Switch 2 phases (particularly for all birds combined and for female birds). One reason for this finding may be that behavioral profiles are stronger in unfamiliar social contexts (i.e., Switch 1), when an individual has no history of social interactions with the other individual. With additional time and social interaction (i.e., Switch 2), the social context may begin to play a stronger role in individual behavior, although we still detected significant behavioral corre-

TABLE 4. Spearman's Correlation Coefficients of Six Factors Across All Individuals and by Sex Across Three Observation Phases: Baseline (B), Switch 1 (S1), and Switch 2 (S2)

Factor	Females (N = 14)						Males (N = 14)					
	B-S1		B-S2		B-S1		B-S1		B-S2		B-S2	
	r_s	p	r_s	p	r_s	p	r_s	p	r_s	p	r_s	p
1	.516	.059	.248	.392	.248	.392	.248	.392	.407	.149	.407	.149
2	.204	.483	.231	.427	.231	.427	.231	.427	.073	.805	.073	.805
3	.705	.005	.543	.045	.134	.648	.134	.648	-.059	.840	-.059	.840
4	.697	.006	.508	.064	.604	.022	.604	.022	.451	.106	.451	.106
5	.886	< .001	.226	.436	.305	.288	.305	.288	.376	.185	.376	.185
6	.433	.122	.095	.748	.547	.043	.547	.043	.714	.004	.714	.004

Note. Statistical significance after sequential Bonferroni correction for multiple comparisons is denoted by bold text. r_s = Spearman rank-order correlation coefficient.

TABLE 5. Spearman's Correlation Coefficients for the Coefficients of Variation for the Six Factor Scores for All Individuals Across Three Observation Phases: Baseline (B), Switch 1 (S1), and Switch 2 (S2)

Factor	B-S1		B-S2	
	r_s	p	r_s	p
1	.513	.005	-.056	.778
2	.147	.456	.183	.350
3	.397	.037	.321	.095
4	.304	.116	.158	.423
5	.274	.159	.067	.734
6	-.159	.418	.141	.475

Note. Statistical significance after sequential Bonferroni correction for multiple comparisons is denoted by bold text. r_s = Spearman rank-order correlation coefficient.

lations when comparing B to S2 phases. This finding indicates that social interactions between two chickadees may be influenced initially by personality differences and subsequently (and perhaps increasingly over time) by the specific nature of the social relationship, although further studies are needed to test this idea. Another potential explanation for the high consistency in factor scores across the three phases is that the change in social context—although substantial—was not large enough to significantly affect individuals' behavioral profiles. Ongoing studies should be able to address this latter possibility because researchers are varying contexts (rather than changing the companion within the social context that we manipulated here) and are modifying the social environments of individuals in more diverse ways.

Dall et al. (2004) presented an interesting, ongoing debate concerning behavioral strategies and state-versus-dynamic behavioral responses. One side of this debate argues that context dependent behavior (responses that are determined by the current conditions) is the most adaptive strategy for an organism. Specifically, individuals should constantly modify or adjust their behavior depending on current conditions. However, behavioral stability may also be an adaptive strategy: If an individual is aggressive or bold in one biologically important context (such as feeding behavior), such consistent, stable behavior will likely help it perform well in other more diverse contexts (e.g., male–male conflict, male–female interactions, and antipredation behaviors). Recent researchers have documented that if an individual is too aggressive or too shy; however, there may be negative consequences (Coleman & Wilson, 1998; Johnson & Sih, 2005; Sih & Watters, 2005). If so, then a slight degree of behavioral flexibility may be most adaptive when contexts change. One interesting question in chickadees would be to examine the consistency of behavior across both threatening and survival-related con-

texts (i.e., foraging, courtship, mating), to determine the most adaptive strategies.

We found significant correlations between six mean factor scores comparing B with S1 and B with S2 phases (Figures 2 and 3), but found only one significant correlation between variability in factor scores comparing the same phases (Table 5). One possible explanation for this difference is that the change in social partner had relatively minimal influence on an individual's average behavioral profile across the phases of the study, but had a large impact on the individual's behavioral variability within the phases of the study. Another potential explanation, and one that seems more likely at this point, is that our focal samples of each individual were too few to provide an adequately sensitive measure of behavioral variability. We sampled each bird's behavior eight times during each phase. In contrast, Fleeson (2001) collected roughly 50–75 reports from individuals in the three experiments of his study of variability in personality. To address the question of behavioral variability and how it may change when an individual's context changes, future researchers should collect substantially larger data sets than we have done in the present study.

Work with humans has indicated that behavioral patterns of individuals may be fairly consistent within social contexts despite significant changes to the social setting (e.g., Epstein, 1979; but see Mischel & Peake, 1982). For example, Strayer (1992) found that preschool children (aged 1–5 years) were fairly stable in their group structures of aggressive and affiliative interaction when comparing the winter term with the spring term. Snyder and Monson (1975) demonstrated that individuals exhibiting low self-monitoring (Snyder, 1974) were highly consistent in responding to questions that varied social settings. Work in nonhuman primates has also indicated an important role of personality-like influences in generating behavioral consistency in different social contexts (Clarke & Boinski, 1995; Seyfarth, 1980; Suomi et al., 1996). Behavioral profiles appear independent of rank order in some cases (Suomi et al.), but appear strongly correlated with dominance rank in others (Seyfarth). Seyfarth's work with adult female vervets, *Cercopithecus aethiops*, and our present study with chickadees, have focused on behavioral consistency via correlational comparisons of the same individuals encountering changed social contexts. To our knowledge, our study is the first to demonstrate behavioral consistency in individuals following a change in a close social companion of the opposite sex. By testing these ideas with chickadees, we hope to contribute to the understanding of social and vocal complexity in this group of species (Freeberg, 2006) and also to the understanding of some of the biological and social bases for behavioral differences in humans (Groothuis & Carere, 2005).

AUTHOR NOTE

Ellen M. Harvey is a PhD student in the Department of Psychology at the University of Tennessee. Her research aims to understand how personality-like influences affect behavior and communication. **Todd M. Freeberg** is an assistant professor in the Department of Psychology at The University of Tennessee. His

research focuses on how social processes influence vocal communication.

REFERENCES

- Both, C., Dingemanse, N. J., Drent, P. J., & Tinbergen, J. M. (2005). Pairs of extreme avian personalities have highest reproductive success. *Journal of Animal Ecology*, *74*, 667–674.
- Budaev, S. V. (1997). “Personality” in the guppy (*Poecilia reticulata*): A correlational study of exploratory behavior and social tendency. *Journal of Comparative Psychology*, *111*, 399–411.
- Carere, C., Drent, P. J., Privitera, L., Koolhaas, J. M., & Groothuis, T. G. (2005). Personalities in great tits: Stability and consistency. *Animal Behaviour*, *70*, 795–805.
- Clarke, A. S., & Boinski, S. (1995). Temperament in nonhuman primates. *American Journal of Primatology*, *37*, 103–125.
- Coleman, K., & Wilson, D. S. (1998). Shyness and boldness in pumpkinseed sunfish: Individual differences are context-specific. *Animal Behaviour*, *56*, 927–936.
- Cote, J., & Clobert, J. (2007). Social personalities influence natal dispersal in a lizard. *Proceedings of the Royal Society of London, B*, *274*, 383–390.
- Dall, S. R. X., Houston, A. I., & McNamara, J. M. (2004). The behavioral ecology of personality: Consistent individual differences from an adaptive perspective. *Ecology Letters*, *7*, 734–739.
- Dingemanse, N. J., & de Goede, P. (2004). The relation between dominance and exploratory behavior is context-dependent in wild great tits. *Behavioral Ecology*, *15*, 1023–1030.
- Epstein, S. (1979). The stability of behavior: I. On predicting most of the people much of the time. *Journal of Personality & Social Psychology*, *37*, 1097–1126.
- Ficken, M. S., Ficken, R. W., & Witkin, S. R. (1978). Vocal repertoire of the black-capped chickadee. *Auk*, *95*, 34–48.
- Fleeson, W. (2001). Toward a structure- and process-integrated view of personality: Traits as density distributions of states. *Journal of Personality and Social Psychology*, *80*, 1011–1027.
- Fleeson, W. (2004). Moving personality beyond the person-situation debate: The challenge and the opportunity of within-person variability. *Current Directions in Psychological Science*, *13*, 83–87.
- Freeberg, T. M. (2006). Social complexity can drive vocal complexity: Group size influences vocal information in Carolina chickadees. *Psychological Science*, *17*, 557–561.
- Gosling, S. D. (1998). Personality dimensions in spotted hyenas (*Crocuta crocuta*). *Journal of Comparative Psychology*, *112*, 107–118.
- Gosling, S. D. (2001). From mice to men: What can we learn about personality from animal research? *Psychological Bulletin*, *127*, 45–86.
- Groothuis, T. G., & Carere, C. (2005). Avian personalities: Characterization and epigenesis. *Neuroscience and Biobehavioral Reviews*, *29*, 137–150.
- Hailman, J. P., Ficken, M. S., & Ficken, R. W. (1985). The “chick-a-dee” calls of *Parus atricapillus*: A recombinant system of animal communication compared with written English. *Semiotica*, *56*, 191–224.
- Herzog, H. A., Jr., & Burghardt, G. M. (1988). Development of antipredator responses in snakes: III. Long-term stability of litter and individual differences. *Ethology*, *77*, 250–258.
- Johnson, J. C., & Sih, A. (2005). Precopulatory sexual cannibalism in fishing spiders (*Dolomedes triton*): A role for behavioral syndromes. *Behavioral Ecology and Sociobiology*, *58*, 390–396.
- Marshall, M. A., & Brown, J. D. (2006). Trait aggressiveness and situational provocation: A test of the traits as situational sensitivities (TASS) model. *Personality and Social Psychology Bulletin*, *32*, 1100–1113.
- McAdams, D. P., & Pals, J. L. (2006). A new big five: Fundamental principles for an inte-

- grative science of personality. *American Psychologist*, 61, 204–217.
- Mischel, W., & Peake, P. K. (1982). Beyond déjà vu in the search for cross-situational consistency. *Psychological Review*, 89, 730–755.
- Moskowitz, D. S., & Zuroff, D. C. (2004). Flux, pulse, and spin: Dynamic additions to the personality lexicon. *Journal of Personality and Social Psychology*, 86, 880–893.
- Mostrom, A. M., Curry, R. L., & Lohr, B. (2002). Carolina chickadee (*Poecile carolinensis*). In A. Poole & F. Gill (Eds.), *The birds of North America*, No. 636, (pp. 1–28). Philadelphia: The Birds of North America.
- Neff, B. D. (2003). Decisions about parental care in response to perceived paternity. *Nature*, 416, 716–719.
- Pervin, L., & John, O. P. (1999). *Handbook of personality: Theory and research* (2nd ed.). New York: Guilford.
- Pfennig, D. W., Reeve, H. K., & Sherman, P. W. (1993). Kin recognition and cannibalism in spadefoot toad tadpoles. *Animal Behaviour*, 46, 87–94.
- Rice, W. R. (1989). Analyzing tables of statistical tests. *Evolution*, 43, 223–225.
- Seyfarth, R. M. (1980). The distribution of grooming and related behaviors among adult female vervet monkeys. *Animal Behaviour*, 28, 798–813.
- Shoda, Y., Tiernan, S. L., & Mischel, W. (2002). Personality as a dynamical system: Emergence of stability and distinctiveness from intra- and interpersonal interactions. *Personality and Social Psychology Review*, 6, 316–325.
- Sih, A., Bell, A., & Johnson, J. C. (2004). Behavioral syndromes: An ecological and evolutionary overview. *Trends in Ecology and Evolution*, 19, 372–378.
- Sih, A., Bell, A. M., Johnson, J. C., & Ziemba, R. E. (2004). Behavioral syndromes: An integrative overview. *Quarterly Reviews of Biology*, 79, 241–277.
- Sih, A., & Watters, J. V. (2005). The mix matters: Behavioral types and group dynamics in water striders. *Behaviour*, 142, 1417–1431.
- Smith, S. M. (1991). *The black-capped chickadee: Behavioral ecology and natural history*. New York: Cornell University Press.
- Snyder, M. (1974). Self-monitoring of expressive behavior. *Journal of Personality and Social Psychology*, 30, 526–537.
- Snyder, M., & Monson, T. C. (1975). Persons, situations, and the control of social behavior. *Journal of Personality and Social Psychology*, 32, 637–644.
- Strayer, F. F. (1992). The development of agonistic and affiliative structures in preschool play groups. In J. Silverberg & J. P. Gray (Eds.), *Aggression and peacefulness in humans and other primates*, (pp. 150–171). New York: Oxford University Press.
- Suomi, S. J., Novak, M. A., & Well, A. (1996). Aging in rhesus monkeys: Different windows on behavioral continuity and change. *Developmental Psychology*, 32, 1116–1128.
- Thirakhupt, K. (1985). Foraging ecology of sympatric parids: Individual and population responses to winter food scarcity. Unpublished doctoral dissertation, Purdue University, West Lafayette, IN.
- Watson, J. B. (1914). *Behavior: A textbook of comparative psychology*. New York: Henry Holt & Co.
- White, D. J., King, A. P., & West, M. J. (2002). Plasticity in adult development: Experience with young males enhances mating competence in adult male cowbirds, *Molothrus ater*. *Behaviour*, 139, 713–728.
- Wilson, D. D., Clark, A. B., Coleman, K., & Dearstyne, T. (1994). Shyness and boldness in humans and other animals. *Trends in Ecology and Evolution*, 9, 442–446.

Manuscript submitted November 22, 2006

Revision accepted for publication January 17, 2007



Quality of Life...

Assuring access to quality care for all patients — especially those with serious and life-threatening illness — is critical. People with cancer need the support and protection that only federal law can provide. At the American Cancer Society, we are working hard to give a voice to people with cancer, survivors, and their families — especially those communities least hit by cancer.

Congress must take action to improve the quality of life for those dealing with cancer.

... Everyone must have basic patient protections

- ✓ Ensure access to clinical trials for innovative cancer treatments
- ✓ Increase access to specialists
- ✓ Provide quick, strong and enforceable grievance and appeal procedures
- ✓ Support easy to understand health plan policy information

... People with cancer must have pain management services

- ✓ Allow people with cancer necessary pain treatment
- ✓ Assure access to pain and symptom management services
- ✓ Advance pain and symptom management knowledge
- ✓ Assure health care professionals are trained to assess, treat and monitor pain

For more information on how you can assist us in improving not just the quality of life — but life overall — for those dealing with cancer, call us!

(202) 661-5715 • (877) 2 FIGHT IT

**AMERICAN
CANCER
SOCIETY**

Copyright of *Journal of General Psychology* is the property of Heldref Publications and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.