Published in final edited form as:

Am J Primatol. 2009 January ; 71(1): 77–85. doi:10.1002/ajp.20626.

Intimate Social Behavior in Infant Interactions in *Cebus apella*

GAYLE BYRNE* and STEPHEN J. SUOMI

Laboratory of Comparative Ethology, National Institute of Child Health and Human Development,
National Institutes of Health Animal Center, Poolesville, Maryland

Abstract

The development and individual stability of three intimate social behaviors (Lipsmacking, Carrying Attempts, and Facial Inspection) were examined for 43 group-housed *Cebus apella* infants from birth to 2 years of age. Occurrence of these behaviors was scored from 10-min videotape samples recorded three times a week over that time. Frequency of Lipsmacking and Carrying Attempts by adult males, adult females, and juveniles were all highest in early months and decreased to low levels by the end of the first year. Facial Inspection of partners by infants, in contrast, first began at 3–4 months and increased over time, at least to adult males and juveniles. Correlational analyses indicated stable individual differences in these interactions with infants and outlined a relationship between these intimate behaviors and more general social patterns reported previously for these animals. Results suggest that adult males may play a special role in affording juveniles opportunities for social learning of foraging and manipulative skills.

Keywords

Cebus apella; capuchin; infant; development; social behavior

INTRODUCTION

Social interactions in tufted capuchins (*Cebus apella*) are generally characterized by a relatively high level of tolerance among individuals [Fragaszy et al., 2004; Izawa, 1980]. Infants, in particular, are well-tolerated by others and are often highly sought after as social partners by many group members. A number of highly intimate behaviors are characteristic of interactions with infants. Newborn infants are often approached by group members for visual, manual, and olfactory inspection, grooming, Lips-macking, etc. [Calle, 1990; De Marco & Visalberghi, 2007; Valenzuela, 1993]. Infants may be carried by other group members both in the wild and in captivity, and may be nursed by females other than their mothers [Escobar-Paramo, 1989; Izawa, 1980; Valenzuela, 1992; Weaver, 1999; Welker, 1998]. Infants and young juveniles are well-tolerated by others, even while feeding. They often closely inspect others' mouths and faces during feeding, and scrounge bits of food dropped by others during foraging [Fragaszy et al., 1997; Izawa, 1980; Janson, 1984; Ottoni et al., 2005]. This species-characteristic individual tolerance may play a significant part in

*Correspondence to: Gayle Byrne, 13906 Dowlais Drive, Rockville, MD 20853. byrneg2@aol.com.

This article is a US government work, and as such, is in the public domain in the United States of America.

young animals' social learning of dietary information, extractive foraging techniques, and tool use in this species.

We became interested in exploring these highly intimate interactions after charting the development of more general social interactions in our captive colony of *C. apella* [Byrne & Suomi, 1995]. We wanted to explore the normative developmental pattern of these behaviors and determine to what degree individual differences existed in their performance and levels. We also wanted to explore how intimate behavior patterns related to those other social and nonsocial behavior patterns previously studied.

METHODS

Subjects

Forty-three infant *C. apella* (28 males, 15 females) from nine social groups housed at the NIH Animal Center in Poolesville, MD, were observed for this study. Groups ranged in size from 4 to 20 animals and included adults and juveniles of both sexes. Most of the groups were housed in indoor cages (0.9×1.8×1.7 m) with wire mesh floors; however, the two largest groups were housed either in indoor/outdoor runs (two connecting areas, each 2.5×3×2.5 m) or in runs during fall and winter, and in an outdoor corncrib (4.2 m high, 5 m in diameter) during the spring and summer. All subjects lived with their mother in a familiar social group from birth. See Byrne and Suomi [2004] for further details on social group composition. All research was in full compliance with a protocol approved by the NICHD Institutional Animal Care and Use Committee and adhered to all mandated legal requirements.

Procedure

Videotape observations—Ten-minute videotape sessions were recorded three times/week between 0930 and 1100 hr for all infants from birth up to the age of 13 months (4-week periods). Followup 10-minute sessions were also taped three times/week for 1 month at the ages of 18 months and 2 years. Data collection took place between August of 1990 and September of 1997. The videotapes were then scored, using a keyboard event recorder, for the frequency of occurrence of three behaviors the authors believed to be indicative of intimate affiliative interactions: (1) Lipsmacking (partner's mouth close to infant's face, rapid opening and closing of the lips, often accompanied by distinctive vocalizations [Visalberghi et al., 2006; Weigel, 1978]; (2) Carry Attempts (animal in proximity to infant actively presents either its dorsal or ventral surface in an attempt to induce the infant to climb on); and (3) Facial Inspection (infant approaches another animal and closely examines its mouth/facial area)—may involve visual and olfactory inspection, licking of facial area, etc. (termed cheek-to-cheek in Oppenheimer, 1973 for *C. capucinus*, food interest in De Waal et al., 1993). This behavior could occur either when the recipient was eating or when there was no food present; no distinction was made between the two conditions. The same observer scored all of the videotapes; intraobserver reliability (percentage of agreements) was assessed for an earlier study and evaluated at 90% by repeated scoring of sample taped sessions.

Data analysis

The occurrences of the above-named intimate behaviors were separated into those involving adult males, adult females other than the infant's mother, and juveniles (under 6 years) of both sexes. Frequency of these behaviors was averaged over each month and subjected to mixed design ANOVAS with months over the 2-year study period as a repeated measure and infant sex as a between-groups factor. Individual consistency in the occurrence of intimate behaviors was examined by looking at Pearson correlations of each behavior from month to month, with an alpha level of 0.01, one-tailed. Correlations were also performed among the three types of intimate behaviors within each partner class, averaged over the first 13 months, to investigate their degree of interrelatedness.

We also wanted to relate levels of intimate behaviors to other normative social and nonsocial behaviors scored from the same tapes, in the same manner for an earlier study [Byrne & Suomi, 1995]. Intimate behaviors with each class of animal were averaged over the first year of life, and these averages were rank correlated with averages over the same time for selected behaviors, listed in Table I, using Spearman correlations with an alpha level of 0.01, two-tailed.

RESULTS

Development of Intimate Behaviors

Figure 1 shows the development of Lipsmacking to infants over the first 2 years of life by adult males, adult females, and juveniles. Lipsmacking began at infants' births, peaked in the first 2–3 months, and declined thereafter. Although there were no significant sex differences in infants receiving Lipsmacking, the figure shows that adult males continued to lipsmack to female infants after they reached 6 months of age, but not to male infants. Adult females also continued to lipsmack to female infants toward the end of their first year. Juveniles lipsmacked to infants at higher rates than did adults throughout the study period; Lipsmacking by adults had all but disappeared by 18 months of age, but there were still occasional instances of Lipsmacking by juveniles throughout the 2nd year.

Figure 2 shows the development of Carry Attempts by other group members to infants in the first 2 years of life. Attempts to carry infants began in Month 2. Adult males attempted to carry infants mostly from months 3–9. Although Carry Attempts to female infants were high in months 5–7, whereas those to male infants were comparatively low, none of the sex differences were significant. Adult females, however, solicited male infants for carrying more than they did females ($F = 4.305$, 1, 41 df, $p < 0.05$). This trend continued until well into the second year. Juvenile attempts to carry very young infants exceeded those of adults; juveniles' carrying peaked at 3–4 months and declined to stable levels by Month 13.

Figure 3 shows the development of infants' Facial Inspection of other animals. This behavior first began in Month 3 and was directed mainly to adult males and juveniles. Male infants inspected adult males more than did female infants ($F = 7.444$, 1, 41 df, $p < 0.01$), whereas female infants inspected juveniles more than did male infants ($F = 4.219$, 1, 41 df, $p < 0.05$). Levels of Facial Inspection were variable, but unlike Lipsmacking and Carry Attempts, were still evident by the end of the 2nd year of life.

Individual Consistency of Intimate Behavior

Table II presents significant Pearson correlations among months for Lipsmacking to infants by adult males, adult females, and juveniles. Lipsmacking was often significantly correlated from month to month with adult males in the first 6–9 months of life. The same was true for all classes of partners for Carry Attempts (Table III). Facial Inspection by infants to others first appeared around Month 3 (Table IV), and was not highly correlated in early months. Facial Inspection of adult females and juveniles was often significantly correlated from Month 5 onward. As infants grew older however (9 months and up), the relation of facial inspections to adult males from month to month became more highly correlated; inspections to adult females from month to month were less frequently significantly correlated.

Table V presents Pearson correlations among the intimate behavior scores. Adult male Lipsmacking was positively correlated with Carry Attempts by both adult males and juveniles. Adult female Lipsmacking was positively correlated with Facial Inspection to those females, but negatively correlated with Carry Attempts by adult males. Lipsmacking by juveniles was positively correlated with their Carry Attempts, and with Facial Inspections to them. Facial Inspection to adult females was positively correlated to their Carry Attempts.

Rank Correlation of Intimate Behavior With Other Homecage Behavior

There were two measures of interactions with mothers that were significantly correlated with intimate behavior with other animals. Lipsmacking received from adult males was positively rank correlated with proximity to mothers ($r = 0.584$) and ventral contact with mothers ($r = 0.475$). Lipsmacking from adult females was negatively correlated with proximity to mothers ($r = 0.476$).

Three of the social behaviors scored with other group members were also significantly rank correlated with intimate behavior. Total time with others was positively correlated with Lipsmacking by adult males ($r = 0.532$) and with Carry Attempts by adult males ($r = 0.491$), and juveniles ($r = 0.506$). Contact with others was positively correlated with Carry Attempts by juveniles ($r = 0.577$). Finally, social play with others was positively rank correlated with juvenile Carry Attempts ($r = 0.499$).

None of the nonsocial, exploratory behaviors listed in Table I were significantly rank correlated with intimate behavior when averaged over the entire first year.

DISCUSSION

The pattern of results seen in this study not only upholds previous findings in *C. apella* regarding attractiveness of and tolerance toward infants, but it also suggests some patterns of developmentally stable individual differences in infants' associations with others that could have implications for social learning opportunities. The attractiveness of infants is evident in attention paid to them by Lipsmacking and attempts to carry them, which are highest in early months and decline to much lower levels by the end of the first year. As reported in De Marco and Visalberghi [2007], Lipsmacking bouts were more frequent with other juveniles than with adults. As infants grow older and become increasingly independent, Facial Inspection of others appears and increases over the first year. Facial Inspection is often, but

not always, directed toward animals that are eating, and it may be a vehicle through which information on nutrition and feeding strategies is imparted. In this study, it was performed preferentially toward adult males and juveniles, who, in turn, tolerated this intimate and somewhat invasive behavior for the most part with little problem.

Intimate behaviors displayed to infants showed a high level of month-to-month consistency, suggesting a stable degree of individual differences in other group members' attention to infants, and, in the case of Facial Inspection, in infants' attention to others. This interpretation is reinforced by correlations among the intimate behaviors: infants that received Lipsmacking from adult males most also received more Carry Attempts from adult males, and the same was true with juveniles. Intimate behaviors between infants and adult females were also significantly intercorrelated. Those infants that received more Lipsmacking and Carrying Attempts from adult females, directed facial inspections more often to adult females. Infants who received the most Lipsmacking from juveniles also directed more facial inspections to juveniles.

There were only a few sex differences evident in intimate interactions. It has been reported that juvenile males interact with adult males more than do juvenile females [e.g., Agostini & Visalberghi, 2005]; in this study, male infants showed Facial Inspections to adult males more than did female infants. Welker et al. [1987, 1990] found that male infants were somewhat more attractive than females as partners for other group members. This difference was true in this study only for Carrying Attempts by adult females. The high frequency of carrying of males by adult females in our study is most likely due to idiosyncrasies in some of the smaller caged groups. There were one or two groups that had only one adult male and one adult female present, and those adult females often carried infants at extremely high rates.

Correlation patterns among intimate behavior and other social behavior shed more light on their place in the social milieu of infants. Lipsmacking to new infants is often associated with their nursing; in this study, Lipsmacking by adult males was positively correlated with infants' proximity and ventral contact with mothers. New mothers often sit in proximity to a dominant adult male after giving birth, even if they would not normally do so [Byrne, personal observation]. Nursing bouts by infants often seem to act as a trigger for Lipsmacking by all classes of partners; the present data suggest the effect most clearly manifested in adult males, who are likely to have the easiest, most uncontested access to infants. Other adult females, in contrast, lipsmacked most to infants who had lower proximity scores with their own mothers.

Many of the intimate behaviors with adult males and juveniles were positively correlated with more general social behaviors scored for these subjects in an earlier study. Total time spent with others and contact with others were all high in infants with high levels of these intimate behaviors, and social play was also correlated with intimate behaviors with juveniles. All these results suggest strong individual differences in infants' interactions with other animals. Such variation may have implications for infants' opportunities for social learning of foraging strategies, food choice and perhaps, even tool use. Infants and juveniles who are closer to some group members, and are better tolerated by them, may have more opportunities to observe new behaviors and learn new skills. Proximity to adult males may,

in particular, lead to increased opportunities, as they often have preferential access to food or novel objects [Byrne & Suomi, 1996; DiBitetti & Janson, 2001; Janson, 1984; Visalberghi, 1988]. Facial inspection to adult males in this study became more frequent (at least for male infants) and more consistent late in the first year; this is a time when weaning may begin for some infants, and their foraging demands may increase. Inasmuch as adult males are likely to be the most successful individuals in extractive foraging tasks that require muscular strength, like cracking hard nuts or tearing apart large branches, these males may have a unique role to play in the process of juveniles' learning of foraging techniques and strategies at this transitional stage of their lives.

ACKNOWLEDGMENTS

This research was supported by the Division of Intramural Research, National Institute of Child Health and Human Development, and by the University of Maryland, College Park. This study was at all times in full compliance with all applicable animal care regulations and national laws. The authors thank everyone who helped to videotape samples for this study.

Contract grant sponsors: Division of Intramural Research, National Institute of Child Health and Human Development; University of Maryland, College Park.

REFERENCES

- Agostini I, Visalberghi E. 2005 Social influences on the acquisition of sex-typical foraging patterns by juveniles in a group of wild tufted capuchin monkeys (*Cebus nigritus*). *Am J Primatol* 65:335–351. [PubMed: 15834890]
- Byrne G, Suomi SJ. 1995 Development of activity patterns, social interactions, and exploratory behavior in infant tufted capuchins (*Cebus apella*). *Am J Primatol* 35:255–270.
- Byrne G, Suomi SJ. 1996 Individual differences in object manipulation in a colony of tufted capuchins. *J Hum Evol* 31:259–267.
- Byrne G, Suomi SJ. 2004 Influences of manipulative style, age, gender, and cortisol reactivity on tufted capuchins' (*Cebus apella*) performance in a tool-using task. *Adv Psychol Res* 31:79–93.
- Calle Z 1990 A field observation of infant development and social interactions of a wild black-capped capuchin (*Cebus apella*) female and infant at La Macarena (Colombia). *Field Studies on New World Monkeys, La Macarena, Colombia* 4:1–8.
- De Marco A, Visalberghi E. 2007 Facial displays in young tufted capuchin monkeys (*Cebus apella*): appearance, meaning, context and target. *Folia Primatol* 78:118–137. [PubMed: 17303940]
- De Waal FBM, Luttrell LM, Canfield ME. 1993 Preliminary data on voluntary food sharing in brown capuchin monkeys. *Am J Primatol* 29:73–78.
- DiBitetti MS, Janson CH. 2001 Social foraging and the finder's share in capuchin monkeys, *Cebus apella*. *Anim Behav* 62:47–56.
- Escobar-Paramo P 1989 The development of the wild black-capped capuchin (*Cebus apella*) in La Macarena, Colombia. *Field Studies of New World Monkeys, La Macarena, Colombia* 2:4–56.
- Fragaszy DM, Feuerstein JM, Mitra D. 1977 Transfers of food from adults to infants in tufted capuchins (*Cebus apella*). *J Comp Psychol* 111:194–200.
- Fragaszy DM, Visalberghi E, Fedigan LM. 2004 The complete capuchin: the biology of the genus *Cebus*. Cambridge: Cambridge University Press 339p.
- Izawa K 1980 Social behavior of the wild black-capped capuchin (*Cebus apella*). *Primates* 21:443–467.
- Janson CH. 1984 Female choice and mating system of the brown capuchin monkey *Cebus apella* (Primates: Cebidae). *Z Tierpsych* 65:177–200.
- Oppenheimer JR. 1973 Social and communicatory behavior in the Cebus monkey In: Carpenter CR, editor. *Behavioral regulators of behavior in primates*. Lewisburg, PA: Bucknell University Press p 251–271.

- Ottoni EB, De Resende BD, Izar P. 2005 Watching the best nutcrackers: what capuchin monkeys (*Cebus apella*) know about others' tool-using skills. *Anim Cogn* 9:215–219.
- Valenzuela N 1992 Early development of three wild infant *Cebus apella* at La Macarena, Colombia. *Field Studies of New World Monkeys, La Macarena, Colombia* 6:15–23.
- Valenzuela N 1993 Social contacts between infants and other group members in a wild *Cebus apella* group at La Macarena, Colombia. *Field Studies of New World Monkeys, La Macarena, Colombia* 8:1–9.
- Visalberghi E 1988 Responsiveness to objects in two social groups of tufted capuchin monkeys (*Cebus apella*). *Am J Primatol* 15:349–360.
- Visalberghi E, Valenzano DR, Preuschoft S. 2006 Facial displays in *Cebus apella*. *Int J Primatol* 27:1689–1707.
- Weaver AC. 1999 The role of attachment in the development of reconciliation. Doctoral Dissertation, Emory University.
- Weigel RM. 1978 The facial expressions of the brown capuchin monkey (*Cebus apella*). *Behaviour* 68:250–276.
- Welker C 1998 Alloparental care in capuchin monkeys (*Cebus apella*) in captivity. *Folia Primatol* 69:212–213.
- Welker C, Becker P, Hohmann H, Schafer-Witt C. 1987 Social relations in groups of the black-capped capuchin (*Cebus apella*) in captivity: interactions of group-born infants during their first 6 months of life. *Folia Primatol* 49:33–47.
- Welker C, Becker P, Hohmann H, Schafer-Witt C. 1990 Social relations in groups of the black-capped capuchin (*Cebus apella*) in captivity. *Folia Primatol* 54:16–33. [PubMed: 2323687]

Fig. 1.

Frequency of Lipsmacking to infants from birth to 2 years of age by adult males, adult females, and juveniles.

Fig. 2. Frequency of Carry Attempts to infants from birth to 2 years of age by adult males, adult females, and juveniles.

Fig. 3.
Frequency of Facial Inspections by infants from birth to 2 years of age to adult males, adult females, and juveniles.

TABLE I.

Behaviors Scored From Videotape Samples

<i>With mother</i>
Dorsal contact with mother
Ventral contact with mother
Other contact with mother
Proximity to mother (within 15 cm)
Nursing
Mother groom infant
Total time with mother (all contact, proximity, grooming)
<i>With others</i>
Proximity to other animal (within 15 cm)
Contact with other animal
Groom by other animal
Social play
Total time with others (all proximity, grooming, contact, play)
<i>Nonsocial behavior</i>
Alone (out of proximity to any animal)
Tactile/oral environmental exploration (nonfood)
Complex manipulation (repetitive pounding, rubbing of food/objects)*
Self-play
Total exploration (tactile/oral plus eating)

Asterisk denotes behavior scored as frequency; all other behaviors were scored as duration measures and converted to a percentage of time infants were in sight.

TABLE II.

Significant Month-to-Month Pearson Correlations for Lipsmacking by Adult Males (Underlines), Adult Females (Bold), and Juveniles (Italics)

Month	2	3	4	5	6	7	8	9	10	11	12	13	18	24
1	<u>0.61</u>	<u>0.64</u>			<u>0.50</u>									
	0.94	0.58		0.39										
				<i>0.46</i>	<i>0.45</i>	<i>0.38</i>								
2		<u>0.42</u>	<u>0.57</u>		<u>0.49</u>	<u>0.52</u>	<u>0.41</u>	<u>0.48</u>			<u>0.50</u>			
		0.65		0.39										
		<i>0.41</i>				<i>0.28</i>								
3														
		0.42	0.40			0.46								
		<i>0.44</i>				<i>0.38</i>	<i>0.53</i>							
4						<u>0.74</u>	<u>0.65</u>	<u>0.75</u>			<u>0.72</u>			
					0.63					0.44			0.67	
5												<u>0.39</u>		
						0.52			0.72					
6					<i>0.53</i>		<i>0.44</i>	<i>0.56</i>		0.38			0.85	
						<i>0.55</i>								
7							<u>0.88</u>	<u>0.84</u>			<u>0.96</u>			
							0.89	0.58	0.61	0.74				
							<i>0.58</i>		<i>0.50</i>					
8							<u>0.73</u>				<u>0.87</u>			
9													<i>0.42</i>	
									0.46	0.46	<u>0.87</u>			
										0.81				
											<i>0.42</i>			
10										0.38				
11														<i>0.78</i>

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Month	2	3	4	5	6	7	8	9	10	11	12	13	18	24
12											0.42		0.50	
13														
18														

TABLE III.

Significant Month-to-Month Pearson Correlations for Carry Attempts by Adult Males (Underlined), Adult Females (Bold) and Juveniles (Italics)

Month	2	3	4	5	6	7	8	9	10	11	12	13	18	24
1														
2		0.38		<u>0.62</u>	<u>0.62</u>	<u>0.76</u>	<u>0.49</u>			0.50	0.67			
3		<i>0.54</i>		<u>0.90</u>	<u>0.53</u>	<u>0.57</u>	<u>0.68</u>		<u>0.41</u>					
			0.97	0.45	0.73			0.47	0.41	0.50	0.92	0.88	0.64	
			<i>0.47</i>											
4							<u>0.52</u>		<u>0.46</u>					
				0.59	0.79	0.39	0.47	0.56	0.54	0.57	0.87	0.85	0.64	
				<i>0.83</i>	<i>0.60</i>	<i>0.73</i>	<i>0.71</i>	<i>0.66</i>		<i>0.76</i>	<i>0.68</i>			
5					<u>0.86</u>	<u>0.48</u>	<u>0.64</u>							
					0.78	0.92	0.88	0.85	0.93	0.79				
					<i>0.73</i>	<i>0.79</i>	<i>0.80</i>	<i>0.72</i>		<i>0.76</i>	<i>0.82</i>			
6						<u>0.38</u>	<u>0.54</u>							
						0.68	0.78	0.83	0.74	0.86	0.74	0.41		
						<i>0.63</i>	<i>0.63</i>	<i>0.60</i>		<i>0.57</i>	<i>0.61</i>			
7							<u>0.50</u>							
							0.91	0.89	0.93	0.84				
							<i>0.80</i>	<i>0.83</i>		<i>0.71</i>	<i>0.74</i>			
8								<u>0.70</u>	<u>0.41</u>					
								0.91	0.96	0.85				
								<i>0.74</i>	<i>0.43</i>	<i>0.79</i>	<i>0.82</i>			
9									<u>0.54</u>					
									0.88	0.96	0.50			
									<i>0.47</i>	<i>0.64</i>	<i>0.72</i>			
10										0.79				
											<i>0.62</i>			

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Month	2	3	4	5	6	7	8	9	10	11	12	13	18	24
11											0.58			
											0.70			
12												0.52	0.56	0.56
												0.70	0.48	
13													0.98	
													0.78	
18														

TABLE IV.

Significant Month-to-Month Pearson Correlations for Facial Inspection to Adult Males (Underlined), Adult Females(Bold) and Juveniles (Italics)

Month	2	3	4	5	6	7	8	9	10	11	12	13	18	24
1														
2														
3														<i>0.84</i>
4				0.63										
5						0.58								
6					<i>0.46</i>		<i>0.60</i>							
7								0.50		0.54	0.32	<i>0.46</i>		
8							<i>0.42</i>	<i>0.28</i>			<i>0.38</i>			
9							0.76	<i>0.40</i>		<u>0.50</u>	<u>0.41</u>	<i>0.42</i>	<u>0.80</u>	<u>0.76</u>
10										0.51	<i>0.73</i>			
11										<u>0.47</u>				
12											0.46			
13													<i>0.42</i>	
18													<u>0.40</u>	
												<u>0.55</u>	<u>0.75</u>	<u>0.52</u>
													<i>0.43</i>	
													<u>0.39</u>	
													0.46	
														<u>0.70</u>

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Month	2	3	4	5	6	7	8	9	10	11	12	13	18	24
-------	---	---	---	---	---	---	---	---	----	----	----	----	----	----

TABLE V.

Pearson Correlations of Intimate Behavior. Significant Correlations are in Bold

	AM Lipsmack	AF Lipsmack	Juv Lipsmack	AM Carry	AF Carry	Juv Carry	AM Facial insp.	AF Facial insp.	Juv Facial insp.
Adult female Lipsmack	-0.321								
Juvenile Lipsmack	-0.007	-0.148							
Adult male Carry Attempt	0.506	-0.441	-0.058						
Adult Female Carry Attempt	-0.141	0.333	-0.221	-0.066					
Juvenile Carry Attempt	0.393	-0.346	0.431	0.078	-0.026				
Facial inspection To adult male	-0.122	0.083	-0.064	0.074	0.145	-0.209			
Facial inspection To adult female	-0.206	0.448	-0.030	-0.278	0.467	-0.089	0.257		
Facial inspection To juvenile	-0.194	-0.134	0.508	-0.061	-0.358	0.156	0.177	-0.086	