

# Mutual Grooming in Human Dyadic Relationships: An Ethological Perspective

Holly Nelson · Glenn Geher

Published online: 15 September 2007  
© Springer Science + Business Media, LLC 2007

**Abstract** Despite its widespread practice among primates writ large, social scientists have given mutual grooming among humans little attention. This research provides an important first step in describing mutual grooming among humans. A scale was developed to measure self-reported giving and receiving of grooming. In Study 1, 184 female and 94 male participants first indicated their closest emotional relationship (for example, romantic partner, best friend, etcetera). They then completed the grooming measure pertaining to that emotionally close target person. Finally, they completed indices of relationship trust, relationship satisfaction, and parental/familial affection. Individuals who focused on their romantic partners ( $N=134$ ) reported more mutual grooming than individuals who focused on other types of relationships. Relationship satisfaction, previous experience of familial affection, and trust were positively correlated with mutual grooming for romantically involved individuals. Study 2 ( $N=71$  heterosexual couples) explored psychological correlates of mutual grooming within romantic dyads. Individuals with more promiscuous attitudes and those who scored high on the anxiety subscale of an adult attachment style measure reported grooming their partners most frequently. Findings were consistent with several proposed functions of grooming: (a) potential parental-investment indicator, (b) developing trust, and (c) courtship/flirtation—all of which play roles in pair-bonding. At first glance, humans may not appear to groom each other with the same fervor as other primates. However, we posit that humans are, in actuality, groomers par excellence.

**Keywords** Allo-grooming · Attachment behavior · Pairbonding · Courtship

---

H. Nelson (✉)  
University of New Hampshire, Durham, NH, USA  
e-mail: hnelson@cisunix.unh.edu

G. Geher  
State University of New York at New Paltz, New Paltz, NY, USA

## Introduction

Members of all species have evolved some form of ridding themselves of parasites, dirt, and other debris. Such hygiene-related processes serve a vital survival-based function. *Allo-grooming*, characterized by one individual grooming another, is an extremely important behavior seen across species. In fact, a phylogenetically diverse array of species – from insects (Moore et al. 1995), to fish (Bshary and Schaffer 2002; Poulin et al. 2002), birds (Wachtmeister 2001), ungulates (Kimura 1998; Mooring and Hart 1997; Mooring and Samuel 1998), bats (Wilkinson 1986), and primates (Smuts et al. 1987) – have evolved allo-grooming as a way to stay clean and free of parasites.

Some mutually beneficial arrangements involve grooming between members of two different species, as can be seen in birds that groom ungulates and other animals such as crocodiles. Names given to such species often reflect their occupation, such as *cattle egret*, *cowbird*, or *crocodile plover* (Egyptian plover). Other cases of grooming-relevant reciprocal altruism include *cleaner fish* (*Labroides dimidiatus*) that specialize in removing ectoparasites from other marine species.

Most often, allo-grooming occurs among conspecifics. Primates provide perhaps the richest and most noted examples of such behavior. Mutual grooming has been extensively studied in non-human primates and many non-hygienic functions have been proposed for it. Such functions include social bonding, coalition-building, appeasement, and reconciliation (Aureli et al. 1989; Lawick-Goodall 1968; de Waal 1989; Smuts et al. 1987), resource exchange (Muroyama 1994; de Waal 1997), stress and boredom relief (Schino et al. 1988), and courtship (Hill 1987; Seyfarth et al. 2001).

In comparison to the vast body of knowledge we have on mutual grooming in our closest evolutionary relatives, we know next to nothing about mutual grooming in our own species. Allo-grooming is mentioned in passing in some ethnographic (Malinowski 1929; Eibl-Eibesfeldt 1989) and anecdotal reports (Schefflen 1972, 1974). However, only one scientific study of human allo-grooming exists (Enhuber 1989). That study focuses on whether various kinds of grooming are experienced as pleasurable. Until now, no effort has been made to define, describe, and predict the occurrence of allo-grooming among humans. The purpose of this research is to gather such information about human allo-grooming and put it into a comparative evolutionary perspective.

At first glance, it might appear as though humans do not groom one another with the same fervor as other primates. Schiefenhövel (1997) proposes that allo-grooming has become repressed among humans, and there are a number of reasons to initially adopt this perspective. First, mutual grooming may go unnoticed because it can be an intimate activity that people may feel uncomfortable performing publicly. The very substances that elicit mutual grooming in other species (lice, ticks, blood, etcetera) are considered by humans to be disgusting. Therefore, forms of mutual grooming that put a person into contact with those contaminating substances may be inhibited to avoid coming into contact with potentially dangerous bodily fluids, pathogens, or parasites. The emotional reaction of disgust in response to such substances is adaptive and present cross culturally (Curtis and Biran 2001). The disgust reaction is thought to be unique to humans and may actually serve the purpose of emphasizing the distinction between other animals and ourselves (Rozin

and Fallon 1987). According to Rozin and Fallon, anything that reminds us we are animals elicits disgust and is shunned. The animalistic nature of louse-picking could elicit derision from others. The cost of performing grooming, namely the potential exposure to contaminants and derision from others, combined with Dunbar's suggestion (Dunbar 1996) that people have partially replaced grooming with gossip as a means of staying connected, may partially explain the apparent infrequency of human mutual grooming vis-à-vis other primates.

Before continuing, it is necessary to define *grooming* for the purposes of the current work. Mutual grooming in humans is actually considerably broader than stereotypical behaviors such as louse removal. Grooming can be conceptualized so as to include any behavior in which an individual removes or mimics removal of something from the skin or body. Many non-human primates often finger through one another's hair without actually removing anything. One population of chimpanzees living at Mahale Mountains National Park in Tanzania has been observed to scratch others in addition to picking parasites (Nakamura et al. 2000). Grooming and scratching were significantly correlated, occurred together, and showed similar patterns of age and rank correlation as grooming. The authors offered several hypotheses for the function of social scratching, none of which provide any reason to believe that social scratching is fundamentally distinct from grooming. Other examples of grooming, most of which are unique to humans, include: running fingers through another's hair, giving massages, washing the body or hair, shaving, removing lint or hair from another's clothing, swatting away insects, and giving manicures or pedicures, and removing pus from blemishes or wounds. Grooming for humans can also include applying something to the skin or body as with lotion, nail polish, or make-up.

Besides not recognizing these classes of behaviors as examples of grooming, grooming might appear as relatively infrequent because it is *so common* that we simply do not notice it when it occurs. We may not even realize when we do it ourselves. Another reason for the comparative lack of allo-grooming in our species is that any grooming which needs to be done is generally done by oneself. However, even among nonhuman primates, much grooming is done by oneself and only the hard to reach places are regularly presented to others for grooming (Dunbar 1996).

When humans desire grooming, they can do it themselves, but they can also pay for the services of professional groomers such as hairdressers, massage therapists, dental hygienists, nail care technicians, and a wide range of other grooming specialists. Such people are likely to provide higher quality grooming in exchange for money. Although it has been established that nonhuman primates also allo-groom in exchange for resources, the specialization of professional groomers is almost uniquely human. The only other natural occurrence of grooming specialists that has been documented include the cleaner fish who differ in quality of service provided enough that client fish choose to visit better groomers, namely those who don't cheat by helping themselves to a meal other than ectoparasites (Bshary and Schaffer 2002).

### Allo-Grooming and Human Mating

Allo-grooming in non-human primates serves several functions—including functions tied to mating (Hill 1987). Given how much of our behavior is arguably designed for

mating purposes (Miller 2000), it seems reasonable to consider allo-grooming in humans as having functions tied to mating. Among humans, the benefits of high-quality grooming services may have led to the evolution of several psychological processes that have mating functions. In early stages of courtship, allo-grooming may serve a display function, manifesting both sexual interest and hygienic efficacy. Further, given how prevalent and important allo-grooming is in childrearing, effective allo-grooming may serve as a display for judging potential parental quality. In short, the nature of human allo-grooming may have been driven by sexual-selection forces—with ancestral homonids likely having shown preferences for potential mates with allo-grooming skills that (a) encouraged hygiene, (b) fostered positive emotions, and (c) signaled effective parenting.

When humans choose mates, they simultaneously, in many instances, select a parent of their future progeny. Although extrapair copulations occur, humans around the world form pair-bonds—an adaptation which is crucial to success in raising viable offspring given the altricial nature of our species. A potential mate's parenting skills are generally more important in monogamous than polygynous species. In humans, assessments of parental-relevant skills play a key role in the psychology of mate-evaluation. One of the best ways to assess parenting potential is to witness a potential mate actively involved in childcare. However, in the absence of such data, treatment of a romantic partner may be used as a proxy—a rough indicator regarding how a potential mate may come to treat children in the future. Perhaps this is why so much of the behavior of couples in the courtship stage of a relationship mimics the caregiving exhibited by parents and their young children (Shaver et al. 1988; Eibl-Eibesfeldt 1989).

Consider foreplay in individuals who are in the throes of courtship. Members of romantically involved couples engage in prolonged eye contact. They cuddle, caress, and hold one another. They kiss and also feed one another. These same classes of behavior typify parent/offspring relationships as well. Now consider the fact that parents regularly groom their children as part of routine caregiving. Accordingly, allo-grooming, like foreplay, may occur during the courtship stage of relationships.

Titi monkeys are an interesting species to use for comparison with humans because, like us, they live in small family groups of a pair-bonded male and female with young. Mason (1974) suggested that the higher level of grooming seen among adult male and female titi monkeys helps form and maintain their pair bonds. Observations of grooming in the wild indicate that male and female titi monkeys groom each other in equivalent amounts of time (Kinzey and Wright 1982). The longest grooming bouts occur at dusk when they retire to their sleeping bough for the night. Males groom juveniles more often than do females. The authors concluded that mutual grooming in titi monkeys serves a dual role: pair-bond maintenance and parental investment on the part of the male. Whether grooming of the female signals potential male parental assistance in childcare has yet to be determined – but it remains a viable hypothesis.

According to Eibl-Eibesfeldt (1975), mammalian behavioral patterns of care for young "...for example, cuddling, feeding, clasping, and social grooming...have been taken over as precopulatory behavior" (p. 437). Schiefenhövel agrees that allo-grooming is "deeply rooted in our animal past and is based on a set of motivational mechanisms which overlap with parental care and sexual behavior" (Schiefenhövel

1997, p. 73). Mutual grooming among intimates in humans may be thought to fit the definition of an *exaptation* (Gould and Vrba 1982) which is an evolutionarily shaped feature that was not selected as an adaptation for its current function, but rather, is one that has been co-opted for a new function. Caregiving behaviors may have been initially selected for the benefits to offspring survival that they provide. However, across evolutionary time, such behaviors may have then been co-opted as a class of behaviors used in mate choice. Similarly, adult attachment processes may comprise an exaptation (rooted in parent/offspring attachment behaviors) for maintaining those relationships in the form of pair-bonds (Shaver et al. 1988).

Grooming may partially be an effective courtship tactic because it is a caregiving activity that parents use routinely in the course of childcare. As such, grooming a partner may indicate potential parental investment in the offspring the relationship produces. It may help not only to initiate pair bonds but also to maintain them. Further, to the extent that it generates trust, it may help communicate that a partner will not desert the relationship.

The first study was designed to explore the nature of grooming in intimate dyadic relationships. This study was designed to address (a) relative prevalence of allo-grooming across types of dyadic relationships, (b) sex differences in the amount of grooming (given and received) within such relationships, and (c) the degree to which several relevant psychological variables correlate with grooming frequency. The specific hypotheses of this study are as follows:

- Hypothesis One: It is predicted that allo-grooming would be more prevalent in romantic dyadic relationships compared with other relationships.
- Hypothesis Two: It is expected that females will groom others more often than males will—except in the context of romantic relationships.
- Hypothesis Three: Within romantic dyadic relationships, amount of allo-grooming given and received is predicted to be positively related to three important relationship-relevant variables: relationship satisfaction, trust, and previous experience of parental affection.

## Study 1: Method

### Participants

Two hundred seventy-eight undergraduates (184 females and 94 males; aged 17 to 35,  $M=18.7$ ,  $SD=1.34$ ) who were enrolled in introductory psychology at a university in the United States participated.

### Materials

*Emotionally Close Target Indication* Participants first were asked to indicate the relationship of the person to whom they felt closest emotionally. The person chosen was to become the target of the questions in the remainder of the survey. When participants were asked to identify the person they felt closest to emotionally (in an open-ended format), 48% indicated their romantic partner ( $N=134$ ) and 38%

indicated their best friend ( $N=105$ ). Due to the low number of individuals reporting on other kinds of relationships, analyses for Study 1 use only those people who reported on a romantic relationship or best friendship ( $N=239$ ). Of those who reported feeling closest to a best friend, 48 corresponded to same-sex friendships (41 female, seven male) while 57 pertained to cross-sex friendships. All romantic couples were heterosexual. Length of romantic relationships ranged from 2 weeks to 6 years ( $M=20$  months). Best friendships ranged in length from 2 months to 20 years ( $M=68$  months). A majority of the participants (86%) did not live with the target person.

*Measure of Mutual Grooming* A 24-item scale (12 items on frequency of *receiving* grooming, 12 items on frequency of *performing* grooming) was used to measure frequency of grooming. Items were written to reflect the wide variety of forms that grooming takes in humans. Items were scored on the following scale: 1 (never/does not apply), 2 (one or two times per year), 3 (several times per year), 4 (several times per month). Scores across items were aggregated to form two total scores for each participant: (a) giving grooming (Cronbach alpha=0.88), (b) receiving grooming (Cronbach alpha=0.81).

*Relationship Satisfaction* Relationship satisfaction was measured using a scale comprised of seven questions that asked about general satisfaction as well as satisfaction with the amount of time spent together, communication, and affection within the relationship (Hendricks 1988). Items were rated on a Likert-type scale with scores ranging from 1 (strongly disagree) to 5 (strongly agree). Items worded negatively were reverse-scored. The seven items were aggregated to form a score for each participant (Cronbach alpha=0.75).

*Parental and familial affection* Participants were asked to indicate how often they experienced affectionate touching with parents and siblings as a child. Representative examples include: “My parents ‘kissed me good night’ when I was young” and “My family likes to tickle.” Sixteen items were rated on a Likert-type scale with scores ranging from 1 (never) to 5 (very often). Negatively worded items were reverse-scored. Items were aggregated to form a score for each participant (Cronbach alpha=0.91).

*Relationship Trust* Three components of a trusting relationship were assessed using a scale developed by Rempel et al. (1985). Items that related to predictability, dependability, and faith formed a 26-item scale that was worded so that items would apply equally well to a variety of kinds of relationships. One item was dropped to improve the reliability of the scale. The remaining items were aggregated to compute a total trust score for each participant (Cronbach alpha=0.87).

## Procedure

Participants completed the survey packet in small groups of 20 to 30 in a large classroom. Upon completion of the survey, participants completed a set of optional

open-ended questions about their motivations for grooming others. They were given an envelope to enclose the survey for added anonymity. All participants were given a debriefing form that described the purpose of the study and the expected results.

## Study 1: Results

### Relationship Differences in Mutual Grooming

Giving grooming was strongly correlated with receiving grooming in both romantic ( $r=0.79$ ,  $p<0.001$ ) and best-friend ( $r=0.81$ ,  $p<0.001$ ) relationships, so the amount of received grooming was treated as a covariate for all of the analyses reported. The frequency of performing grooming differed significantly across groups,  $F(9, 278)=4.76$ ,  $p<0.001$ . People in romantic relationships recalled grooming more frequently ( $M=27.9 \pm 0.395$  SE) than individuals in cross-sex friendships ( $M=26.3 \pm 0.553$  SE,  $p=0.021$ ) and same-sex friendships (female:  $M=25.1 \pm 0.662$  SE,  $p=0.001$ ; male:  $M=23.2 \pm 1.64$  SE,  $p<0.01$ ). There were no significant differences in mutual grooming frequency among the non-romantically involved friendship groupings (e.g., cross-sex, same-sex). Thus, they were aggregated to form a single group pertaining to non-romantic friendships.

### Sex Differences in Mutual Grooming

There was a significant sex difference in reported frequency of grooming  $F(1, 273)=7.56$ ,  $p<0.01$ . As predicted, females recalled grooming significantly more often than males did (female:  $M=26.8 \pm 0.325$  SE; male:  $M=25.3 \pm 0.463$  SE) regardless of relationship type.

### Correlates of Grooming Behaviors

Pearson correlations of the variables of interest were obtained separately for individuals in romantic and best-friend relationships (see Tables 1 and 2). Grooming in romantic relationships was positively correlated with previous experience of familial and parental affection ( $r=0.35$ ,  $p<0.001$ ), relationship satisfaction ( $r=0.36$ ,

**Table 1** Correlations among variables for best friends in Study 1

Scale	1	2	3	4	5	6
1. Performs grooming	–	0.81**	0.52**	0.08	–0.08	0.07
2. Receives grooming		–	0.63**	0.07	–0.02	0.02
3. Touch frequency			–	0.22*	–0.11	0.02
4. Familial affection				–	–0.01	0.28*
5. Satisfaction					–	0.18
6. Trust						–

Among best friends grooming is not positively correlated with previous experience of affection from family members, satisfaction with the relationship in which grooming occurs, or level of trust in the person who is groomed

\* $p<0.05$ ; \*\* $p<0.01$

**Table 2** Correlations among variables for romantically involved couples in Study 1

Scale	1	2	3	4	5	6
1. Performs grooming	–	0.79**	0.53**	0.35*	0.36*	0.23*
2. Receives grooming		–	0.56**	0.21*	0.29*	0.12
3. Touch frequency			–	0.24*	0.31*	0.18
4. Familial affection				–	0.28*	0.28*
5. Satisfaction					–	0.57**
6. Trust						–

Among romantically involved individuals, grooming is positively correlated with previous experience of affection from family members, satisfaction with the relationship in which grooming occurs, or level of trust in the person who is groomed

\* $p < 0.05$ ; \*\* $p < 0.01$

$p < 0.001$ ), and trust ( $r = 0.23$ ,  $p < 0.01$ ). There were no significant correlations between these variables and grooming in non-romantic dyads. An additional point of interest pertains to a significant correlation between amount of grooming performed and relationship length ( $r = 0.23$ ,  $p < 0.01$ ) among romantically involved couples.

### Regression Analyses for Couples in Romantic Relationships

To examine the degree to which relationship satisfaction, trust, and familial affection were predictive of grooming, a standard multiple regression was computed using grooming performed as the outcome variable. The overall multiple R was statistically significant [ $R^2 = 0.838$ ,  $F(6, 95) = 37.4$ ,  $p < 0.001$ ]. However, the only predictor variable that made a statistically significant unique contribution was frequency of receiving grooming. The semi-partial correlation was 0.745,  $t(96) = 11.80$ ,  $p < 0.001$ . Because of the high correlation between giving and receiving grooming, a single grooming score was created for each person by aggregating the scores from the two scales (giving grooming and receiving grooming). The regression analysis was repeated using this aggregated grooming score as the outcome variable. The resulting regression equation was statistically significant,  $R^2 = 0.459$ ,  $F(5, 96) = 5.12$ ,  $p < 0.001$ . Several variables each uniquely explained a portion of the variance in grooming scores; however, only relationship satisfaction contributed a statistically significant proportion. The semi-partial correlation was 0.280,  $t(96) = 3.09$ ,  $p = 0.01$ . Relationship length, sex, and experience of familial affection uniquely explained about 1.9%, 1.7%, and 1.1% of the variance in grooming, respectively.

### Study 2

In light of the finding that people seem more likely to engage in grooming behaviors with romantic partners compared with friends, the second study explored the roles of potentially important psychological predictors of grooming within romantically involved dyads. In the current psychological literature dealing with intimate relationships, two of the psychological variables that seem to be importantly related to relationship-relevant outcomes are attachment style (Hazan and Shaver 1987),



which pertains to how securely and comfortably individuals attach themselves psychologically to intimates in their social world, and sociosexuality (Simpson and Gangestad 1991), which pertains to variability in preferences toward short-term mating strategies. If allo-grooming is involved in mating and pairbonding, then its frequency should be related to both adult attachment style and sociosexuality.

Regarding attachment style, the current research employed Brennan et al. (1998) index of attachment conceptualized in terms of two continuous dimensions: proclivity toward anxiety and proclivity toward avoidance in close relationships. We predicted that anxious individuals would be likely to engage in relatively high frequencies of grooming, while we predicted the avoidance dimension to be negatively related to amount of grooming.

With regard to sociosexuality, prior researchers have found that individuals who are *unrestricted* in their sociosexuality (and are, thus, defined as relatively promiscuous) display more nonverbal signs of interest during courtship than others (Simpson et al. 1993). As such, we predicted that unrestricted individuals would display more grooming behaviors compared with restricted individuals. An additional purpose of Study 2 was to gather partner reports to corroborate self-report data and validate the grooming measure.

## Study 2: Method

### Participants

Seventy-one romantically involved heterosexual couples (aged 17 to 51,  $M=18.7 \pm 1.63$  SE) who had been involved romantically for one to two hundred and 4 months prior to participation served in this research ( $M=18$  months,  $SD=27.7$ ). One or both members of each couple was enrolled in a psychology course at a university in the United States and received partial course credit in exchange for participation. A substantial amount of data was missing for three of the couples; these couples were eliminated from the analyses. Eighty-six percent did not live with their romantic partner and 86% of the couples reported the relationship was “sexual.” Ten individuals (about 7%) reported never having had sex, including in their present relationships. The current relationship was the first “sexual relationship” for 34 (24%) of the participants.

### Materials

*Measure of Mutual Grooming (Version Two)* Based on the Measure of Mutual Grooming used in Study 1, a revised 28-item scale was created (14 items each on *performing* and *receiving* grooming; See Appendix). The rating scale was changed to more sensitively measure the range of grooming frequency. Items were scored on a seven-point scale according to the following criteria: (1) never, (2) 1–6 times per year, (3) 7–12 times per year, (4) 1–3 times per month, (5) 1–3 times per week, (6) 4–7 times per week, and (7) 1 or more times per day. Items were aggregated to form two scores for each participant: (a) giving grooming (Cronbach alpha=0.81) and (b) receiving grooming (Cronbach alpha=0.85).

*Attachment Style* Two dimensions of attachment style (anxiety and avoidance) were measured using the 36-item scale developed by Brennan et al. (1998). Items were rated on a seven-point scale ranging from 1 (disagree strongly) to 7 (agree strongly). Negatively worded items were reverse-scored. Eighteen items were aggregated to form the anxiety subscale (Cronbach alpha=0.86) and 18 items were aggregated to form the avoidance subscale (Cronbach alpha=0.91).

*Sociosexuality* Individual differences in behavior and attitude toward uncommitted sex were measured with the seven-item Sociosexual Orientation Inventory (SOI) developed by Simpson and Gangestad (1991). Unit-weighted scores were obtained for each individual. Lower scores correspond to individuals who are more oriented toward long-term, committed relationships. They report less sexual experience and more restricted or conservative attitudes toward sex in the absence of a committed relationship. Higher scores describe individuals with an orientation toward casual, uncommitted sexual relationships. They have more permissive attitudes toward casual sex and report greater unrestricted sexual experience (Cronbach alpha=0.75).

*Parental and familial affection* Participants were asked to indicate how often they experienced affectionate touching with parents and siblings. This measure was identical to that used in Study 1. Items were aggregated to form a score for each participant (Cronbach alpha=0.90).

## Procedure

Participants completed the survey packet in small groups of 20 to 30 in a large classroom. Members of couples were not permitted to speak with one another and were seated at least 2 ft apart and positioned so they could not easily see one another. All participants were given the option to place their surveys in envelopes for added anonymity. Members of nine couples were unable to participate together; in their cases, one member of each couple returned the questionnaire by mail.

## Results

### Scale Validation Using Partner Reports

Because both members of each couple reported how often they gave and received grooming, there were four scores for each couple: (a) male reports giving, (b) male reports receiving, (c) female reports giving, and (d) female reports receiving (see Table 3). Agreement between partners can be viewed as a measure of scale validity. Partners tended to agree on how much grooming they do: female reports giving and male reports receiving:  $r=0.25$ ,  $p<0.05$ ; male reports giving and female reports receiving:  $r=0.34$ ,  $p<0.01$ . Accordingly, for all analyses, the amount of grooming the partner reported receiving was treated as a covariate.

**Table 3** Correlations among self-reported and other-reported allo-grooming frequency for romantically involved couples in Study 2

Report	1	2	3	4
1. Female reports giving	–	0.83**	0.22*	0.25*
2. Female reports receiving		–	0.34*	0.22*
3. Male reports giving			–	0.80**
4. Male reports receiving				–

The positive correlations seen here among partners' reports of giving and receiving grooming provide a measure of validity for self-reported grooming frequency

\* $p < 0.05$ ; \*\* $p < 0.01$

### Sex Differences in Mutual Grooming

There was no significant sex difference in the frequency of reported mutual grooming,  $F(1, 133) = 0.82$ ,  $p = 0.36$ . Contrary to the data from Study 1, females did not report grooming their partners significantly more often than males did (female:  $M = 46.9 \pm 0.72$  SE; male:  $M = 46.0 \pm 0.72$  SE).

### Sociosexuality

Consistent with past research on sociosexuality (Simpson and Gangestad 1991), males scored higher on the SOI than females,  $F(1, 130) = 17.5$ ,  $p < 0.001$ . Therefore, all subsequent statistical analyses using SOI scores statistically control for sex. As predicted, sociosexuality was correlated with frequency of allo-grooming ( $r = 0.174$ ,  $p < 0.05$ )—relatively unrestricted individuals reported more grooming. Because of the possibility that grooming might be a courtship tactic used primarily in the context of short-term mating, the analysis was re-run to see whether the association held for the 34 individuals whose relationship had lasted at least 3 years. For this subgroup, the correlation between SOI and grooming was positive and significant ( $r = 0.364$ ,  $p < 0.05$ ). Not only was allo-grooming correlated with SOI scores in longer lasting relationships, but the association between these variables was even stronger.

### Attachment Style

Allo-grooming was not significantly related to the avoidance dimension of attachment. However, it was related to attachment anxiety. Those who felt greater attachment anxiety recalled more instances of grooming ( $r = 0.245$ ,  $p < 0.01$ ). Moreover, couples in which one person was classified as “anxious” reported grooming significantly more often than couples who were both “secure,”  $F(2, 68) = 4.93$ ,  $p < 0.01$  (anxious:  $M = 49.9$ , SE = 1.98; secure:  $M = 40.5$ , SE = 2.30).

### Regression Analysis: Predictors of Mutual Grooming

Variables that were entered into the standard regression equation as predictors of grooming included: the amount of time spent together each day, score on the SOI, and the anxiety scale score from the attachment measure. The overall multiple R for

this regression was statistically significant,  $R^2=0.346$ ,  $F(3, 119)=5.39$ ,  $p<0.01$ . Predictor variables that made a statistically significant contribution were: time spent together per day and degree of attachment-related anxiety. The semi-partial correlation for time spent together was 0.236,  $t(119)=2.74$ ,  $p<0.01$ . The semi-partial correlation for anxiety was 0.236,  $t(119)=2.74$ ,  $p=0.01$ .

## Discussion

The studies described here represent an important first step in understanding the nature of allo-grooming in humans. In taking an ethological perspective, the current research is rooted in both models of grooming found in other primates as well as the logic afforded by an evolutionary analysis of behavior. From this perspective, allo-grooming in adult human dyads is seen as serving several functions in romantic relationships by (a) allowing for expressions of romantic interest, (b) providing information regarding an intimate's parental proclivities, and (c) facilitating trust and closeness among intimates.

The results from Study 1 strongly support the notion of allo-grooming as serving functions tied to romantic relationships. Participants clearly reported more grooming in the contexts of romantic relationships compared with other relationships. Further, relationship satisfaction was significantly predictive of allo-grooming in Study 1. The fact that relationship satisfaction, trust, and history of family affection seem to positively correlate with frequency of allo-grooming only within romantic dyads suggests that allo-grooming behaviors may have evolved specifically for facilitating pairbonds among intimates. Given the correlational nature of these data, it is unclear whether frequency of grooming leads to satisfaction, or vice versa. However, at the very least, the current data suggest that allo-grooming in romantic relationships seems to be part of a constellation of characteristics that correspond to closeness and happiness in intimate relationships.

In a deeper exploration of the psychology of allo-grooming in intimate dyads, Study 2 addressed how such grooming relates to the nature of adult attachment styles and to individual differences in tendencies toward short-term mating strategies. As further evidence that frequency of allo-grooming is integrally tied to the psychology of human mating, this study found that allo-grooming tends to correspond to an unrestricted pattern of sociosexuality. This finding suggests that unrestricted individuals may use allo-grooming partly as a signal of sexual interest in potential mates.

Additionally, the results from Study 2 indicate that attachment anxiety tends to correspond to high levels of allo-grooming, suggesting that frequency of allo-grooming may be used as a way of trying to reduce relationship anxiety and develop bonds in romantic relationships.

To provide a coherent framework for understanding our findings regarding allo-grooming in an ethological perspective, our discussion focuses on allo-grooming from an attachment perspective followed by a focus on allo-grooming explicitly tied to the psychology of mating. Finally, we address additional correlates of grooming followed by suggestions for future research and a conclusion.

## Attachment Theory and Human Allo-Grooming

Adult attachment theory provides a useful ethological framework for understanding the function of grooming in relationships. Building on Harry Harlow's pioneering research (Harlow 1958) on the importance of physical contact for normal infant development, John Bowlby's theory of infant attachment describes a class of attachment behaviors, including touch, that function to maintain or restore proximity to a particular individual (Bowlby 1969). "The way an individual's attachment behavior becomes organized...[determines] the pattern of affectional bonds he [sic] makes during his [sic] life" (Bowlby 1980, p. 41). Noting the similarities between infant-caregiver attachment and romantic love, Hazan and Shaver (1987) propose that adult romantic love is an attachment process guided by working models developed during childhood. These working models can influence how much affection, and (relevant to the current work) grooming, is normal and expected in a close relationship.

Attachment is repeatedly described as an affectional bond, yet relatively little research has explored affectionate touch in relation to it. Because previous studies have found that attachment style is predictive of the amount of touch in relationships (Simpson 1991; Simpson et al. 1992), it was hypothesized in the current research that adult attachment style would relate to frequency of allo-grooming. There was some support for this hypothesis. Study 2 found a significant positive relationship between allo-grooming and one dimension of attachment: anxiety. Those who scored higher on the anxiety dimension tended to allo-groom more.

Interestingly, this study found that members of relatively secure couples allo-groomed significantly less often than individuals in couples in which one person was classified as "anxious." Perhaps the couples in which both partners are secure have already pair-bonded and thus have no need to demonstrate continued commitment by allo-grooming. Conversely, those who are insecure in their pair-bond may feel a need to test their bond by allo-grooming. If this is true, allo-grooming could serve as an indication that the bond is being formed and tested but has not yet been fully cemented. Once the bond is cemented, and both parties feel secure with it, then allo-grooming can decrease to a comfortable baseline level without producing anxiety over the continuation of the relationship. Indeed, many pair-bonded monogamous animals display a variety of courtship behaviors (nesting, allo-preening, duetting, allo-grooming) for the duration of the pair-bond (Wachtmeister 2001). The grooming characteristic of pair-bond formation may simply represent an elevated level that will stabilize at a lower rate across relationship development.

## Allo-Grooming and Mating Psychology

In the domain of human mating, pair-bonding is crucial. For ancestral females, who faced the adaptive challenge of finding males who were willing to invest in children, a male's help could have increased her reproductive success by freeing up her time to forage or socialize. A strong pair-bond could have helped ensure male parental investment because such a bond would increase his paternity certainty, and males are more likely to invest in offspring when they are sure of paternity. Given the significant role within romantic dyads that allo-grooming plays, it may be useful to consider allo-grooming in the context of mating strategies in general.

There is ample evidence that both men and women pursue long and short-term mating strategies (Buss and Greiling 1999). Thus, although it has been adaptive for males, in particular, to pursue short-term, low-investment mating strategies and for women to pursue long-term, high-investment strategies, there is significant within-sex variation regarding these different general strategies (Gangestad and Simpson 2000). Thus, if allo-grooming does, indeed, play an important role in courtship, the role may be multi-faceted. In some contexts, allo-grooming may be used as an attempt to secure a short-term mate by signaling sexual interest and availability. However, given the importance of allo-grooming in parenting and in the development of healthy pairbonds among intimates, allo-grooming efforts may also serve an important signaling function in courtship that is primarily designed to attract long-term mates.

The Sociosexuality Orientation Inventory (Simpson and Gangestad 1991) used in Study 2 allowed an assessment of the relationship between individual differences in mating strategies and allo-grooming tendencies. If allo-grooming is an expression of commitment and investment, then it should correlate negatively with SOI scores because individuals pursuing short-term mating strategies are thought to be less invested and less committed to their relationships (Simpson and Gangestad 1991). However, if allo-grooming functions primarily as a courtship tactic for obtaining short-term mates, it should positively correlate with SOI scores because individuals who favor short-term mating strategies engage in more nonverbal signs of interest (Simpson et al. 1993).

Study 2 supports the short-term courtship hypothesis: SOI scores positively correlated with performing allo-grooming. There is, however, some reason to consider that grooming does function as an expression of commitment and investment (in the context of long-term courtship). Recall that in relationships lasting at least 3 years, those who favored short-term relationships maintained a high level of grooming in their relationships. It may well be the case the allo-grooming serves different functions across kinds of mating strategies and across stages of intimate relationships.

### Other Predictors of Allo-Grooming

*Biological Sex and Type of Relationship* Given that other primate studies have shown that females tend to groom others more than males do (Small 1991), it is not surprising that the results from Study 1 found sex differences in frequency of allo-grooming. Although Study 1 supported the sex-difference prediction, Study 2 did not. We suggest two possible reasons. First, Study 1 could not control for partners' reports of received grooming so it is possible that females may have over-reported the amount of grooming they perform relative to males. Second, males may groom others primarily within the context of a romantic or sexual relationship. Thus, when they form a consortship with a female, males may increase their baseline rate of allo-grooming (recall that all participants in Study 2 were in romantic relationships).

Allo-grooming occurred to some extent in all the relationship types identified by participants in Study 1. However, comparisons in our analyses were limited to best

friends and romantic partners due to the infrequent mention of other kinds of relationships. If allo-grooming operates partly as a courtship behavior, members of romantic couples should groom one another significantly more often than individuals in every other kind of relationship. This hypothesis was supported. However, Study 2 found that the amount of time a couple spent together was positively correlated with their frequency of allo-grooming. It makes sense that couples who spend more time together would also groom one another more often because they have more opportunities to do so. Thus, the results from Study 1 (that couples groomed more often than best friends) could be due to couples having spent more time together. Study 1 did not ask for that information, so it is not possible to rule this out as a rival explanation. Future studies must evaluate the amount of time individuals spend together in order to draw conclusions about what types of relationships are characterized by more allo-grooming.

*Family Affection as a Correlate of Allo-Grooming* Hazan and Shaver (1987) found that perceptions of parental relationship quality predicted attachment style. Further, the particular aspect of the parental relationship that best predicted attachment style was affection. The results of the present study may be integrated with these prior findings. If we think of allo-grooming as a manifestation of behaviors designed largely for attachment purposes, then it makes sense that an important antecedent of one's adult attachment style – history of familial affection – would relate to allo-grooming behavior in adulthood. Indeed, individuals in the current study who recalled high levels of parental affection were more likely to report grooming and being groomed by their partners. However, this relationship was found only for those who were reporting on romantic relationships. Among best friends, there was no relationship between previous experience of affection and allo-grooming. During childhood, individuals may develop working models of how much affection and caregiving are appropriate. These working models then influence this pattern of behavior in adulthood, but perhaps only in relation to romantic relationships. Further studies could test the theory that previous experience of parental affection builds working models that influence allo-grooming in romantic contexts that emerge across the lifespan.

### Limitations

Although this study provides the first analysis of empirically derived data on human mutual grooming, it relies on self-report methodology that may be biased. The nature of the behavior itself may also complicate self-reports because some people may find the activity unpleasant or even disgusting to admit doing. Rozin and Fallon (1987) offer a theory of disgust that posits it is a defense against the recognition of human animality. Certainly grooming would fit this. To the extent that the questions elicit disgust, it is expected that people will underreport grooming. Furthermore, much grooming may go unnoticed because it can be a very brief action that may not be consciously registered. It is possible that much grooming happens at an unconscious level, making self-report measurement of it difficult. Future studies could use other methods of measuring grooming, for example, daily interaction diaries, naturalistic

observation followed by interviews, and laboratory studies using planted stimuli to elicit grooming.

The nature of the sample used for these two studies is also a limitation. The individuals and couples who participated were not representative of all adults in romantic relationships. Many were describing their first serious romantic relationship, so the sample is relatively inexperienced. The study of inexperienced couples may have restricted the range of grooming. With a larger, more representative and experienced sample, the results may look somewhat different. Furthermore, many of the couples did not live with one another. Because some forms of grooming necessitate privacy, the lack of it among couples who did not live together may have constrained the frequency of mutual grooming. It would be helpful to draw participants from a sample of couples living together. Furthermore, couples who spend more time together have more opportunities to groom one another, therefore, this variable should also be considered.

### Future Directions

The data collected in this research answer many questions regarding the nature of allo-grooming in humans. However, several questions remain unanswered. In particular, this research does not address how allo-grooming is interpreted, what situations and conditions motivate it, and how its frequency changes over the course of the relationship. To help develop a more complete picture of the nature of allo-grooming in humans, future studies should address these points.

Perceptions of all-grooming signals would be particularly useful to understand from a social psychological perspective. Do people interpret allo-grooming as a signal of commitment, investment, or sexual interest? What influences whether it is perceived as an honest signal?

The findings from Study 1 suggest that targets of allo-grooming are clearly not random. Future research should seek to further understand who we target in our grooming. It is unknown whether most grooming is limited to one particular person, a number of people, or just one or a few special individuals. We believe that an approach informed by evolutionary psychology – focusing on such factors as kinship and mating – would be particularly useful in guiding research designed to systematically delineate the primary targets of allo-grooming in humans.

One important set of questions raised by the current research pertains to the competing grooming–courtship and grooming–bonding hypotheses (is grooming used more as a courtship tactic or as a relationship-bonding mechanism?). To address these competing hypotheses – both of which speak to the primary role of allo-grooming within the confines of romantic relationships – several studies could be conducted. For instance, a longitudinal study that addressed frequency of allo-grooming across the different stages of real intimate relationships (from pre-courtship onward) would allow for an assessment of the extent to which allo-grooming serves more of a courtship or a relationship-bonding function. Additionally, to address the relationship-bonding hypothesis, frequency of allo-grooming could be examined in light of several indices of relationship closeness for members of couples at varying stages of romantic relationships.



In terms of its role in sexual behavior, it would be useful to investigate whether grooming leads to sexual activity or increases its likelihood among non-intimates. Romantic films suggest that (at least in this genre of entertainment) grooming functions as foreplay. In *Bull Durham*, a man and a woman are shown engaging in sexual activity in a bathtub. Immediately before that scene, one painted the toenails of the other. In *Out of Africa*, Robert Redford washes Meryl Streep's hair. It just so happens they are having a sexual affair.

It would be interesting to compare allo-grooming in films that appeal to men with those that appeal to women, as well as the mating strategy of individuals in such films. Do people having short-term casual relationships or affairs groom one another more than individuals depicted as having a stable, pair-bonded, faithful relationship? To test the grooming–sex hypothesis, couples could be studied from the point of their first date to the point of first intercourse to see if sexual activity occurs at an earlier point in the relationship depending on allo-grooming.

## Conclusion

Although there are many remaining questions to be answered about human mutual grooming, this research shows that adults in emotionally close relationships groom one another in ways similar to grooming found in other primates. A number of ethologically important variables were related to grooming including gender, type of relationship, attachment orientation, and sexual behavior and attitudes. By investigating grooming among humans, we can appreciate our own evolutionary developments vis-à-vis other primates.

The phylogenetic legacy of humans can be readily seen not only in morphology but also the species-typical behaviors. We propose that allo-grooming in humans serves as an important example of such evolutionarily important social behaviors. The use of allo-grooming in establishing and maintaining attachments, or bonds, works well for other primates.

Overall, the present study suggests a link between grooming, mating, and attachment. Romantic couples were found to allo-groom more frequently than individuals in other types of relationships. Furthermore, those who groomed one another also had higher levels of satisfaction with their relationship and also trusted their partners more. [Study 2](#) found that individuals who were more anxious about their relationships allo-groomed more, but it is not clear why they did. Allo-grooming in romantic relationships may take on reproductive significance as courting couples use grooming to demonstrate and test the depth of their pair-bond and potential investment and skill as parents. Therefore, allo-grooming may be used to evaluate the suitability of a partner as an attachment figure and as a parent to children the relationship may produce.

An ethological lens on human behavior encourages us to look at our evolutionary past and consider our psychology as part of the animal world. When we start thinking about behavior this way, allo-grooming – heretofore a non-participant in the landscape of human psychology – suddenly stands out conspicuously as a species-typical process that comes to us directly courtesy of our primate ancestry. Further, from an empirical standpoint, the results presented here suggest that allo-grooming is a significant factor in the nature of the formation and maintenance of romantic relationships.

## Appendix

The following statements refer to a variety of “grooming” touches. For each one, please indicate how often (in the last 12 months) you have touched the person you have chosen (your “significant other”) in the way described. This should be the same person you have previously told us about.

- 1 = Never
- 2 = 1 to 6 times/year
- 3 = 7 to 12 times/year
- 4 = 1 to 3 times/month
- 5 = 1 to 3 times/week
- 6 = 4–7 times/week
- 7 = 1 or more times/day

1. *I run my fingers through my significant other's hair.*
2. *I remove dry or flaking skin from my significant other's body.*
3. I wash (shampoo) my significant other's hair/body while showering/bathing together.
4. I shave my significant other's legs/face.
5. I squeeze/pop my significant other's *pimples, blisters, or other bumps* (zits).
6. I wipe away my significant other's tears *when he or she cries*.
7. I brush *or play with* my significant other's hair.
8. I massage my significant other (non-sexually).
9. *I wipe away or dry liquid spills off my significant other.*
10. I clean/trim my significant other's nails/toenails.
11. I brush dirt, leaves, lint, *bugs*, etc. off of my significant other.
12. I scratch my significant other's back *or other body parts*.
13. I wipe food/*crumbs* off my significant other's face/body.
14. I tweeze/remove eyebrow hairs or other body hair from my significant other.

Italicized words represent changes from the first to second version of this measure. The following item appeared in version one only: “I put lotion, oil, and sunscreen on my significant other.” The scale to measure received grooming was reworded so that items took the following form: “My significant other runs his/her fingers through my hair.”

## References

- Aureli, F., van Schaik, C., & van Hooff, J. (1989). Functional aspects of reconciliation among captive long-tailed macaques (*Macaca fascicularis*). *American Journal of Primatology*, *19*, 39–51.
- Bowlby, J. (1969). *Attachment and loss: vol. 1. Attachment*. New York: Basic Books.
- Bowlby, J. (1980). *Attachment and loss: vol. 3. Loss: Sadness and depression*. New York: Basic Books.
- Brennan, K., Clark, C., & Shaver, P. (1998). Self-report measures of adult attachment: An integrative overview. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 46–76). New York: Guilford.
- Bshary, R., & Schaeffer, D. (2002). Choosy reef fish select cleaner fish that provide high-quality service. *Animal Behaviour*, *63*(3), 557–564.
- Buss, D., & Greiling, H. (1999). Adaptive individual differences. *Journal of Personality*, *67*(2), 209–243.

- Curtis, V., & Biran, A. (2001). Dirt, disgust, and disease: Is hygiene in our genes? *Perspectives in biology and medicine*, 44(1), 17–31.
- de Waal, F. (1989). *Peacemaking among primates*. Cambridge: Harvard University Press.
- de Waal, F. (1997). The chimpanzee's service economy: Food for grooming. *Evolution & Human Behavior*, 18, 375–386.
- Dunbar, R. (1996). *Grooming, gossip and the evolution of language*. London: Faber and Faber.
- Eibl-Eibesfeldt, I. (1975). *Ethology: The biology of behavior*. New York: Aldine de Gruyter.
- Eibl-Eibesfeldt, I. (1989). *Human ethology: The biology of human behavior*. New York: Aldine de Gruyter.
- Enhuber, C. (1989). Soziale Hautpflege beim Menschen. Eine Fallstudie in einer modernen Industriegesellschaft (Social grooming in humans. A case study in a modern industrialized society). Diploma, Technical University, Munich.
- Gangestad, S. W., & Simpson, J. A. (2000). The evolution of human mating: Trade-offs and strategic pluralism. *Behavioral and Brain Sciences*, 23, 573–644.
- Gould, S. J., & Vrba, E. (1982) Exaptation, a missing term in the science of form. *Paleobiology*, 8(1), 4–15.
- Harlow, H. (1958). The nature of love. *American Psychologist*, 13, 673–685.
- Hazan, C., & Shaver, P. (1987). Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology*, 52, 511–524.
- Hendricks, S. S. (1988). A generic measure of relationship satisfaction. *Journal of Marriage and the Family*, 50, 93–98.
- Hill, D. A. (1987). Social relationships between adult male and female rhesus macaques: I. Sexual consortships. *Primates*, 28(4), 439–456.
- Kimura, R. (1998). Mutual grooming and preferred associate relationships in a band of free-ranging horses. *Applied Animal Behaviour Science*, 59(4), 265–276.
- Kinzey, W., & Wright, P. (1982). Grooming behavior in the titi monkey, *Callicebus torquatos*. *American Journal of Primatology*, 3, 267–275.
- van Lawick-Goodall, J. (1968). The behavior of free living chimpanzees in the Gombe Stream Reserve. *Animal Behavior Monographs*, 1, 161–311.
- Malinowski, B. (1929). *The sexual life of savages in north-western Melanesia*. New York: Liveright.
- Mason, W. A. (1974). Comparative studies of social behavior in *Callicebus* and *Saimiri*: Behavior of male–female pairs. *Folia Primatologica*, 22, 1–8.
- Miller, G. F. (2000). *The mating mind: How sexual choice shaped the evolution of human nature*. New York: Doubleday.
- Moore, D., Angel, J. E., Cheeseman, I. M., & Robinson, G. E. (1995). A highly specialized social grooming honey bee. *Journal of Insect Behavior*, 8(6), 855–861.
- Mooring, M. S., & Hart, B. L. (1997). Reciprocal allogrooming in wild impala lambs. *Ethology*, 103(8), 665–680.
- Mooring, M. S., & Samuel, W. M. (1998). The biological basis of grooming in moose: Programmed versus stimulus-driven grooming. *Animal Behaviour*, 56(6), 1561–1570.
- Muroyama, Y. (1994). Exchange of grooming for allomothering in female patas monkeys. *Behavior*, 128, 103–119.
- Nakamura, M., McGrew, W., Marchant, L., & Nishida, T. (2000). Social scratch: Another custom in wild chimpanzees? *Primates*, 41(3), 237–248.
- Poulin, R., Bansemmer, C., & Grutter, A. S. (2002). Geographic variation in the behaviour of the cleaner fish *Labroides dimidiatus* (Labridae). *Ethology*, 108(4), 353–366.
- Rempel, J., Holmes, J., & Zanna, M. (1985). Trust in close relationships. *Journal of Personality and Social Psychology*, 49, 95–112.
- Rozin, P., & Fallon, A. (1987). A perspective on disgust. *Psychological Review*, 94, 23–41.
- Schefflen, A. (1972). *Body language and the social order: Communication as behavioral control*. Englewood Cliffs: Prentice-Hall.
- Schefflen, A. (1974). *How behavior means*. Garden City: Doubleday.
- Schieffelhövel, W. (1997). Universals in interpersonal interactions. In U. Segerstrale & P. Molnar (Eds.), *Nonverbal communication: Where nature meets culture* (pp. 71–74). Mahwah: Lawrence Erlbaum Associates, Inc.
- Schino, G., Scucchi, S., Maestripietri, D., & Turillazzi, P. G. (1988). Allogrooming as a tension-reduction mechanism: A behavioral approach. *American Journal of Primatology*, 16, 43–50.
- Seyfarth, R. M., Palombit, R. A., & Cheney, D. L. (2001). Female–female competition for male 'friends' in wild chacma baboons (*Papio cynocephalus ursinus*). *Animal Behaviour*, 61(6), 1159–1171.

- Shaver, P., Hazan, C., & Bradshaw, D. (1988). Love as attachment: The integration of three behavioral systems. In R. Sternberg & M. Barnes (Eds.), *The psychology of love* (pp. 68–99). New Haven: Yale University Press.
- Simpson, M. J. A. (1991). On declaring commitment to a partner. In P. Bateson (Ed.), *Development and integration of behavior: Essays in honor of Robert Hinde* (pp. 271–293). Cambridge: Cambridge University Press.
- Simpson, J., & Gangestad, S. (1991). Individual differences in sociosexuality: Evidence for convergent and discriminant validity. *Journal of Personality and Social Psychology*, *60*, 870–883.
- Simpson, J., Gangestad, S., & Biek, M. (1993). Personality and nonverbal social behavior: An ethological perspective on relationship initiation. *Journal of Experimental Social Psychology*, *29*, 434–461.
- Simpson, J., Rholes, W., & Nelligan, J. (1992). Support seeking and support giving within couples in an anxiety-provoking situation: The role of attachment styles. *Journal of Personality and Social Psychology*, *62*(3), 434–446.
- Small, M. (1991). *Female choices: Sexual behavior of female primates*. Ithaca: Cornell University Press.
- Smuts, B., Cheney, D., Seyfarth, R., Wrangham, R., & Struhsaker, T. (1987). *Primate societies*. Chicago: University of Chicago Press.
- Wachtmeister, C. (2001). Display in monogamous pairs: A review of empirical data and evolutionary explanations. *Animal Behaviour*, *61*(5), 861–868.
- Wilkinson, G. S. (1986). Social grooming in the common vampire bat, *Desmodus rotundus*. *Animal Behaviour*, *34*(6), 1880–1889.