

## Original Article

### The Effect of Attractiveness on Food Sharing Preferences in Human Mating Markets

Michael Stirrat, School of Psychology, University of St. Andrews, St. Andrews, UK. Email: [michael@perceptionlab.com](mailto:michael@perceptionlab.com) (Corresponding author).

Michael Gumert, Division of Psychology, School of Humanities and Social Sciences, Nanyang Technological University, Singapore. Email: [gumert@ntu.edu.sg](mailto:gumert@ntu.edu.sg).

David Perrett, School of Psychology, University of St. Andrews, St. Andrews, UK. Email: [dp@st-andrews.ac.uk](mailto:dp@st-andrews.ac.uk) (Corresponding author).

**Abstract:** The current study explored how physical attractiveness affects food sharing by studying payment preferences for hypothetical romantic dinner dates (a hypothetical mating market). We analyzed payment preferences, self-rated attractiveness, and rated attractiveness for hypothetical dates in 416 participants. We hypothesized that (1) men would be more likely to prefer to pay than would women, (2) attractive individuals of both sexes would be less willing to pay, and (3) preferences to enter an exchange would be influenced by the attractiveness of prospective partners such that (3a) men would prefer to pay for attractive women, and (3b) women would prefer to be paid for by attractive men. All hypotheses were supported by our results. Individuals with higher self-rated attractiveness were more likely to prefer that their date would pay for the meal, and we found clear sex differences in how the attractiveness of potential dates affected payment preferences. Male participants preferred to pay for dates that had higher facial attractiveness, while female participants preferred that attractive men would pay. Individuals show condition dependent financial preferences consistent with the provisioning hypothesis in this mating market that are adaptive to evaluations of their own quality and that of prospective partners.

**Keywords:** food sharing, mating market, facial attractiveness, dating, mate choice, sexual selection, condition dependence

---

## Introduction

### *Provisioning*

The provisioning hypothesis (Buss, 1999) suggests that female attraction to males willing to provision them has evolved because provisioning increases the likelihood that the pair's offspring will develop to reproductive maturity (Lovejoy, 1981). As a result, males that provision females and females attracted to provisioning males would have reproduced more successfully over human history propagating the genetic basis underlying our courtship behavior.

There is sufficient evidence that human males share food in cooperative exchange relationships in mating contexts. Men who can provision better are more likely to be chosen by women as mating partners (Bliege Bird, Bird, Smith, & Kushnick, 2002; Gurven, 2004; Moore, 1984). Hunter-gathering men use their hunting spoils to 'show off' to attract mating attention prior to having any offspring (Wood & Hill, 2000), and successful hunters are preferred by women as mating partners and ultimately have more offspring (Gurven & von Rueden, 2006; Smith, 2004). There is also evidence of a direct meat-for-sex trade in traditional societies such as the Sharanahua of the upper Río Purus (see Gurven, 2004; Siskind, 1973, p. 103). Early human feeding ecology organized human family units into systems where a man provided food sources, particularly meats, to a woman and the woman cooked the food and maintained the household and family (Carmody, Cone, Wrangham, & Secor, 2009; Carmody & Wrangham, 2009; Wrangham, Jones, Laden, Pilbeam, & Conklin-Brittain, 1999). In the present day, human mate choice patterns are still affected by these past conditions and women have retained a preference selected through evolution for men who have a higher ability and willingness to provide resources.

In contrast, men tend to have evolved preferences for youthful women expressing characteristics related to fertility and fecundity because any traits that favored men choosing women with a higher capability of successfully reproducing would have increased male reproductive success (Buss, 1989; Li, Bailey, Kenrick, & Linsenmeier, 2002).

The exchanges involved in courtship and mating suggest that human romantic relationships could be partially affected by economic forces. Trade during courtship provides the basis of a "mating market" affected by supply and demand. Partners will be invested in and chosen based on their quality relative to others, and the demographics of potential partners available in the market (e.g. Pawlowski & Dunbar, 1999). Such a market of living organisms has been referred to as a biological market, and is characterized by competition through outbidding competitors to obtain the cooperation of the most valued partners available (Noë & Hammerstein, 1994, 1995).

#### *Facial attractiveness and mate quality*

Attractive people are reported to have greater reproductive success (Jokela, 2009), which may have a basis in underlying healthy genes and a higher reproductive potential. Some features related to facial attractiveness include perceived health (Rhodes et al., 2007), symmetry, averageness (see Rhodes, 2006 for review), and weight (Coetzee, Chen, Perrett, & Stephen, 2010). Facial attractiveness and health are related, supporting a functional basis to attractiveness. For example, symmetrical faces are judged more attractive and to have a healthier appearance (Jones et al., 2001). Symmetry may also be a reproductive quality predictor because individuals are more symmetrical when they have experienced fewer

developmental stressors and challenges during their life, and thus would be in better health and reproductive condition (Palmer & Strobeck, 2003). Overall, facial attractiveness could signal information about mate quality, and therefore could affect exchanges that occur during courtship.

*Conditional dependence of attractiveness*

Individuals may evaluate their own mate value relative to others, and this could provide a subjective gauge of one's ability to attract a romantic partner. A number of studies have shown that an individual's attractiveness relates to his or her ability to obtain romantic dates (De Vries, Swenson, & Walsh, 2008; Kurzban & Weeden, 2005; Walster, Aronson, Abrahams, & Rottman, 1966; Woll & Young, 1989). Another study showed that more attractive people rate the attractiveness of others more critically and less attractive people are more lenient (Montoya, 2008). These findings suggest a conditional response in how people gauge others attractiveness based on their own perceived mate value.

A female's own attractiveness can affect the qualities she seeks from a partner. Research indicates women with lower waist-to-hip ratios (an attractive, healthy feature) showed a higher preference for long-term relationships with men showing a healthy physical appearance (Jones et al., 2005) and masculine face (Penton-Voak et al., 2003). In addition, self-rated attractiveness in women also relates to higher preferences for attractive male features, such as facial masculinity and symmetry (Little, Burt, Penton-Voak, & Perrett, 2001). Women also modify their self-ratings down when shown attractive images or up when shown unattractive images of other women. Furthermore, this condition also affects their preferences for male masculinity (Little & Mannion, 2006). Conditional dependence is not restricted to facial attractiveness but also occurs in other domains. Female voice pitch (a salient feature of vocal attractiveness), for instance, relates to higher female preferences for male masculinity (Vukovic et al., 2010).

Men also show condition-dependent mate preferences. For example, as with women, more attractive men also rate the attractiveness of others more harshly than less attractive men (Montoya, 2008). Men also show increased preference for female facial femininity if they consider themselves to be more attractive (Little, Jones, Feinberg, & Perrett, Unpublished data, personal communication). In addition, men who report engaging in more risky activities, which suggests good physical condition, have stronger preferences for attractive female faces than do their more risk-averse counterparts (Jones et al., 2007). It has also been shown that high-quality men (i.e., with fewer asymmetries) report that they invest less in their ongoing relationships, and are more likely to pursue a strategy of maximizing their number of mates than less attractive men (Gangestad & Simpson, 2000; Rhodes, Simmons, & Peters, 2005).

Mathematical models of mating games have been used to predict that males should adjust their resource offers according to their own mate value so that a higher mate value male would offer less (Hill & Reeve, 2004). Contrary to this prediction, however, costly signaling theory (Zahavi, 1974) posits that higher value males should signal their worth by paying more often. We should only expect this form of display where the performance costs of the signal are less for individuals in better condition. Given the structure of the current experiment we assume that there are no real differences in direct costs for low or

high mate value men to pay for the meal and therefore the relevant costs for men are not the direct costs of paying but the potential opportunity costs. Resources used to attract opposite sex interest could have been used elsewhere; perhaps on another date, or investing in a bank account. Higher value men will have more alternative opportunities of attracting mates and therefore the opportunity costs of paying for a meal are higher for higher quality men, and we would therefore expect high value men to prefer to pay less often (c.f. Barclay, 2010; Barclay & Reeve, under review; Hill & Reeve, 2004). The corollary of this with women is that higher mate value women are offering more in the mating game and should therefore be able to demand more provisioning.

#### *Current study and predictions*

The provisioning hypothesis predicts that men should more frequently be willing to provide resources, whereas women should prefer to be provisioned. We conducted a study to test if male participants would be more likely to prefer to pay for a meal for a hypothetical date than would female participants. We predicted that the conditional dependence on market effects would modulate provisioning and the acceptance of provisioning. Both men and women were predicted to be more willing to enter into exchange with more physically attractive partners, with men more frequently offering provisioning and women requesting it. Lastly, we predicted that the more attractive men would be less willing to invest in partners, and more attractive women would request greater provisioning from their partners.

### **Materials and Methods**

Preferences can be masked by constraints upon actual behavior. For instance, in decisions to pay for the meal on a date, an individual may have a clear preference but will not act on their preference because of some external constraint or a conflicting expectation of the situation. We were concerned with exploring preferences and sought to avoid the limitations and constraints associated with actual human behavior. We therefore did not evaluate actual courtship exchanges, but rather conducted an investigation that allowed us to obtain information on the unconstrained preferences of the studied participants.

#### *Participants*

A total of 2,280 participants took part in an online experiment, of which we included only participants who (a) completed all parts of the experiment and (b) reported that they had taken the time to answer questions honestly. Also, as we were interested in mating behavior, we only included participants who (c) reported they were heterosexual and (d) were clearly of reproductive age (i.e., 20 to 35 years old). This reduced the number to 245 male [mean age = 26.2 ( $SD = 4.5$ ) years] and 171 female [mean age = 25.2 ( $SD = 4.4$ ) years] participants.

#### *Procedure*

After giving consent, participants filled in a basic demographic questionnaire including age, sex and sexual orientation. They were asked to rate how attractive they

considered themselves on a Likert-type scale of 1 = very unattractive to 7 = very attractive. Participants were then given the following instructions:

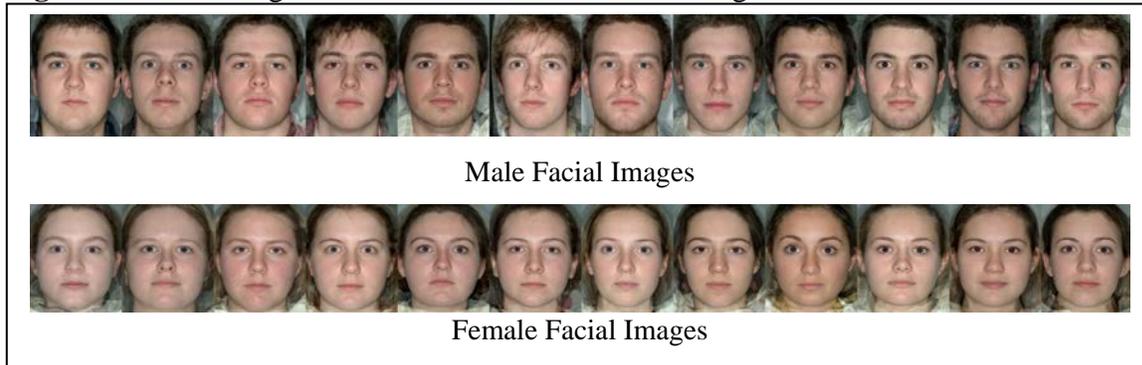
You will now be shown a series of facial images in two blocks. You should imagine that you have been out for a meal with the individual in the photograph. There are then three options for paying the bill at the end of the meal. You have to decide what you would prefer: to pay for both of you, to split the bill in half or for the other person to pay for the meal.

We presented participants with 12 opposite sex facial images and asked who they would prefer to pay the bill. Images were presented one by one in random order with image observation and participant decision time unconstrained.

### *Stimuli*

The 24 presented images were each made up of 3 randomly chosen same-sex facial photographs (See Tiddeman, Burt, & Perrett, 2001 for computer graphics techniques). These composite images were made from images selected from a set of neutrally posed images [50 male and 50 female; mean age = 20.4 ( $SD = 1.6$ ) years]. This image set was demographically similar to the participants but was collected some years previous to the present study.

**Figure 1.** Facial images used as stimuli, ordered left to right for attractiveness



To obtain attractiveness rankings for the 24 images the images were split by sex and each set of 12 images were presented as a group and ranked in order of attractiveness by 28 participants [mean age = 21.6 ( $SD = 4.4$ ) years; 10 male/18 female; female images Cronbach's alpha > .97; male images Cronbach's alpha > .94] who were not otherwise included in this study (see Figure 1 for composite images and final ranking).

Images were grouped for analysis (see below) into high, mid, and low attractiveness (Female mean rank: high = 9.3, mid = 6.7, low = 3.5; Male mean rank: high = 8.6, mid = 7.0, low = 3.8).

### *Analysis*

For each image, the participants had to answer how they would prefer the bill to be

paid. Answers were scored as -1 = other pays, 0 = split the bill and 1 = participant pays for the meal. Data on payment preferences was split by participant sex and analyzed by mixed ANOVAs with three levels of the within-subject variable (i.e., mean response to four least attractive images, four most attractive and the four middle images) and three levels of the between-subject variable (i.e., self-rated attractiveness). We also tested for linear relationships between levels of self-rated and image attractiveness. Fisher's LSD tests were used where significant  $F$ -values were found. All statistics used a decision criteria set at  $p < 0.05$ . (The three point response data raises a concern about statistical assumptions for treatment with ANOVA, but see (Hsu & Feldt, 1969) for evidence that limited response scales do not increase likelihood of error).

Participants were allocated to three attractiveness levels, low, mid, and high attractiveness, which divided the participants fairly evenly. Self-rated attractiveness values of 1-4 were allocated to the low-attractiveness group (male: 81; female: 59), a rating of 5 to the mid-attractiveness group (male: 92; female: 63) and a self rating of 6 or 7 to the high-attractiveness group (male: 71; female: 49).

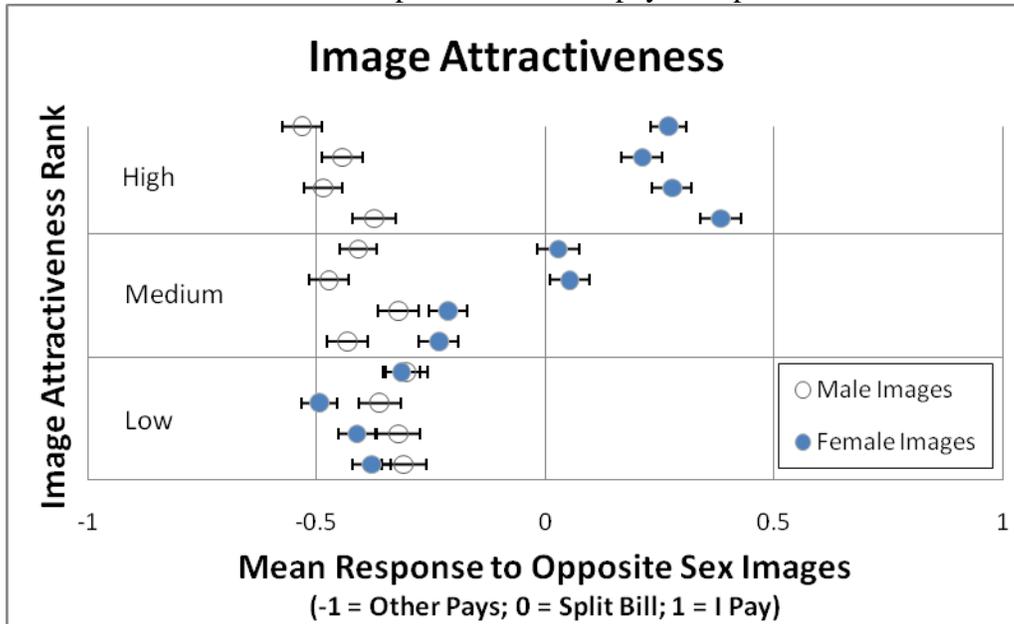
## **Results**

Most often participants preferred to split the bill (Male: 47%; Female: 50%) but both sexes more often reported a preference for their date to pay (Male: 30%; Female: 45%) than to pay for the meal themselves (Male: 23%; Female: 5%). Despite this overall trend to share or avoid payment, female participants preferred the opposite sex to pay for the meal more often than males, indicating a significant sex difference in choice (Mann-Whitney:  $U_{171, 245} = 12085$ ,  $p < .0005$ ). Our results showed that neither sex prefers to pay the bill, but that females have a higher tendency to prefer meals to be paid by their date.

### *Image attractiveness and payment*

Preliminary results showed that attractiveness did conditionally modulate payment preferences and that there was a distinct sex difference in how attractiveness affected them. Male image attractiveness negatively correlated with female preference (Spearman's rho:  $r_s = -.80$ ,  $N = 12$ ,  $p < .005$ ; see Figure 2), and thus female participants reported preferences for more attractive dates to pay. The opposite effect was seen with male participants. Female image attractiveness rank positively correlated with the reported male preferences (Spearman's rho:  $r_s = .90$ ,  $N = 12$ ,  $p < .0005$ ; see Figure 2), and thus males more frequently reported a preference to pay for more attractive females.

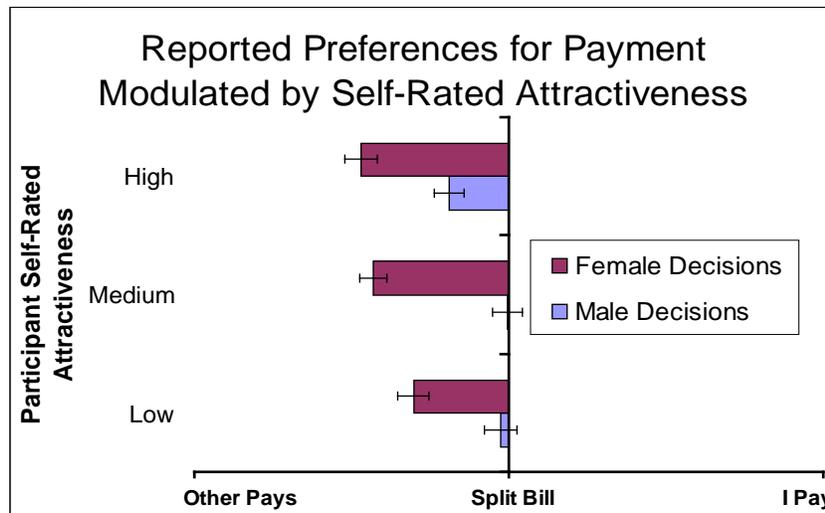
**Figure 2.** Effect of attractiveness of potential date on payment preferences



*Self-Rated attractiveness and payment*

Preliminary results also showed participant condition dependence such that their self-rated attractiveness related to their payment preferences. Payment preferences were negatively correlated with self-rated attractiveness in both sexes (Male:  $r_s = -.13$ ,  $N = 244$ ,  $p = .046$ ; Female:  $r_s = -.17$ ,  $N = 171$ ,  $p = .026$ ; see Figure 3). This shows that better condition participants (i.e., who reported higher self-rated attractiveness) showed stronger preferences for the opposite sex to pay for the meal.

**Figure 3.** Self-rated attractiveness predicts a shift in preference of both sexes toward the opposite sex paying for the meal



*Attractiveness interactions*

To test our hypotheses we analyzed the data with two mixed ANOVAs with three levels of image attractiveness and three levels of self-rated attractiveness. We found significant results in both men and women.

In male participants, the ANOVA showed a main effect of the images' attractiveness ( $F_{2, 482} = 284, p < .0005$ ), with no interaction between the attractiveness of the images and the self-rated attractiveness of participants ( $F_{4, 482} = 1.6, p = .17$ ). This analysis also showed a between subjects effect of self-rated attractiveness ( $F_{2, 241} = 3.9, p = .022$ ). Post-hoc comparisons using Fisher's LSD showed that preferences of individuals with high self-rated attractiveness differed from both medium (Mean dif = 0.19,  $p = .009$ ) and low groups (Mean dif = 0.16,  $p = .027$ ) but medium and low groups did not differ from each other (See Figure 3). No linear interaction between self-rated and image attractiveness was found ( $F_{2, 241} = 1.6, p = .2$ ).

In female participants, the ANOVA showed a main effect of the images' attractiveness ( $F_{2, 336} = 7.9, p < .0005$ ), with no interaction between the attractiveness of the images and the self-rated attractiveness of the participants ( $F_{4, 336} = 0.8, p = .53$ ). This analysis also showed a between-subject effect of self-rated attractiveness ( $F_{2, 168} = 3.3, p = .038$ ). Post-hoc comparisons using Fisher's LSD showed that preferences of individuals with high self-rated attractiveness differed from those with low self-rated attractiveness (Mean dif = 0.17,  $p = .017$ ) but no other comparisons were significantly different (See Figure 3). No linear interaction between self-rated and image attractiveness was found ( $F_{2, 168} = 1.1, p = .34$ ).

**Discussion**

The current study demonstrates that market effects can affect payment preferences related to food provisioning during romantic dating. While the mode response from both sexes was a preference to split the bill, suggesting a concern with reciprocity in courtship preferences, our results support predictions derived from a mating market framework based on the provisioning hypothesis (Buss, 1999). First, women more often reported a preference for the opposite sex to pay than men did. Second, participants' self-rated attractiveness predicted their payment preferences, indicating a market effect because each individual's own perceived mating value affected his or her willingness to demand resources. Third, the attractiveness of the potential date affected the payment preferences of men and women differently, showing a clear sex difference in how the conditional dependence on a mating market can affect resource allocation in romantic relationships. Male participants were more willing to pay for more attractive dates, showing that men preferred to invest resources in more potentially fecund mates. In contrast, female participants preferred that more attractive dates pay for them, indicating a preference to receive resources and enter into a potential courtship exchange with more attractive mates and a preference to avoid entering a possible reciprocation relationship with less attractive potential mates.

Costly signaling theory (Zahavi, 1974) would suggest that higher value men should signal their worth by paying more often. However, as discussed in the introduction, we

should only expect this where the performance costs of the signal are less for individuals in better condition. As this isn't the case in this experiment, we therefore expected high value men to prefer to pay less often. This is what the results showed.

We might also have expected women to demand more investment from less attractive men to compensate for their lower physical mate value. Indeed, this is also predicted from mathematical models of mating games (Hill & Reeve, 2004) but we did not ask participants to report the mating exchange they might expect, or what they would demand. We asked participants what they would prefer, and the female participants appeared to prefer the best possible mating exchange of high attractiveness combined with investment.

The hypothetical design of our experiment is both a strength and weakness in that we can demonstrate preferences that may be hidden in actual behavior at the same time as expecting that these preferences are likely to play out differently in actual behavior when modulated by expectations and demands. While women may prefer to be paid for by attractive men and men may prefer to only pay for the most attractive women, it is likely that both men and women will adapt their actual behavior to the local context rather than sticking absolutely with their preferences.

The reported preferences we found in this study, however, are generally consistent with actual behavior in social exchanges related to courtship and mating in humans. In dating advertisements, peoples' demands for better qualities in the type of romantic partner are related to their own value in the mating market (Pawlowski & Dunbar, 1999). In a sample in Uganda, polygynous marriages were affected by the local sex ratio and the amount of resources a male had. Males with more land and in areas with a higher female-to-male ratio were more likely to be in a polygynous than a monogamous marriage (Pollet & Nettle, 2009). Further, in a US sample from 1910 in areas where the ratio of females/males was smaller, socioeconomic status became a more important factor in marriage, showing increased competition between men and increased choosiness in women under such market conditions (Pollet & Nettle, 2008). Similar results related to male investment in mating has been found in non-human primates such as macaques (Gumert, 2007), sifakas (Norscia, Antonacci, & Palagi, 2009), and chimpanzees (Gomes & Boesch, 2009; Hemelrijk, Vanlaere, & Vanhooff, 1992; Stanford, Wallis, Mpongo, & Goodall, 1994). Collectively, the findings support the conception that males and females make exchanges during courtship and that market forces, such as supply and demand, relative partner value, and self-valuation can influence decision-making and social investment patterns in the mating relationships of humans and other primates.

In conclusion, we found that women preferred male dates to pay, especially when those dates were attractive men, and men showed a willingness to pay for female dates, especially when those dates were attractive women. Furthermore, both men and women modulated their preference in line with self-perceived mate value; self-rated attractiveness in both sexes predicted a shift in preference toward the opposite sex paying for the meal. The effects of attractiveness on dating preferences support the notion that payment and acceptance of payment on dates are part of a process of exchanges that occur during courtship that may potentially lead to the development of a sexual relationship.

**Acknowledgements:** This research was funded by an EPSRC grant received by the first author. The manuscript benefited hugely from the apposite comments of a number of anonymous reviewers.

**Received 29 November 2010; Revision submitted 4 February 2011; Accepted 6 February 2011**

## References

- Barclay, P. (2010). Altruism as a courtship display: Some effects of third-party generosity on audience perceptions. *British Journal of Psychology*, *101*, 123-135. doi:10.1348/000712609x435733
- Barclay, P., and Reeve, H. K. (under review). Extravagant and everyday generosity: The varying relationship between generosity and individual quality.
- Bliege Bird, R., Bird, D. A., Smith, E. A., and Kushnick, G. C. (2002). Risk and reciprocity in Meriam food sharing. *Evolution and Human Behavior*, *23*, 297-321.
- Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences*, *12*, 1-49.
- Buss, D. M. (1999). *Evolutionary psychology: The new science of the mind*. Boston: Allyn and Bacon.
- Carmody, R. N., Cone, E., Wrangham, R. W., and Secor, S. M. (2009). Cooking and the net energy value of meat: Implications for human evolution. *Integrative and Comparative Biology*, *49*, E27-E27.
- Carmody, R. N., and Wrangham, R. W. (2009). The energetic significance of cooking. *Journal of Human Evolution*, *57*, 379-391. doi:10.1016/j.jhevol.2009.02.011
- Coetzee, V., Chen, J., Perrett, D. I., and Stephen, I. D. (2010). Deciphering faces: Quantifiable visual cues to weight. *Perception*, *39*, 51-61.
- De Vries, J. M. A., Swenson, L., and Walsh, R. P. (2008). Hot picture or great self-description: Predicting mediated dating success with parental investment theory. *Marriage and Family Review*, *42*, 7-34.
- Gangestad, S. W., and Simpson, J. A. (2000). The evolution of human mating: Trade-offs and strategic pluralism. *Behavioral and Brain Sciences*, *23*, 573-644.
- Gomes, C. M., and Boesch, C. (2009). Wild Chimpanzees Exchange Meat for Sex on a Long-Term Basis. *PLoS ONE*, *4*, e5116. doi:10.1371/Journal.Pone.0005116
- Gumert, M. D. (2007). Payment for sex in a macaque mating market. *Animal Behaviour*, *74*, 1655-1667.
- Gurven, M. (2004). To give and to give not: The behavioral ecology of human food transfers. *Behavioral and Brain Sciences*, *27*, 543-583.
- Gurven, M., and von Rueden, C. (2006). Hunting, social status and biological fitness. *Social Biology*, *53*, 81-89.
- Hemelrijk, C. K., Vanlaere, G. J., and Vanhooft, J. A. R. A. M. (1992). Sexual exchange relationships in captive chimpanzees. *Behavioral Ecology and Sociobiology*, *30*, 269-275.
- Hill, S. E., and Reeve, H. K. (2004). Mating games: The evolution of human mating

- transactions. *Behavioral Ecology*, 15, 748-756. doi: 10.1093/beheco/arh073
- Hsu, T.-C., and Feldt, L. S. (1969). The effect of limitations on the number of criterion score values on the significance level of the F-Test. *American Educational Research Journal*, 6, 515-527.
- Jokela, M. (2009). Physical attractiveness and reproductive success in humans: Evidence from the late 20th century United States. *Evolution and Human Behavior*, 30, 342-350. doi:10.1016/j.evolhumbehav.2009.03.006
- Jones, B., Little, A., Penton-Voak, I., Tiddeman, B., Burt, D., and Perrett, D. (2001). Facial symmetry and judgements of apparent health: Support for a 'good genes' explanation of the attractiveness-symmetry relationship. *Evolution and Human Behavior*, 22, 417-429.
- Jones, B. C., DeBruine, L. M., Little, A. C., Conway, C. A., Welling, L. L. M., and Smith, F. (2007). Sensation seeking and men's face preferences. *Evolution and Human Behavior*, 28, 439-446. doi:10.1016/j.evolhumbehav.2007.07.006
- Jones, B. C., Little, A. C., Boothroyd, L., Feinberg, D. R., Cornwell, R. E., DeBruine, L. M., et al. (2005). Women's physical and psychological condition independently predict their preference for apparent health in faces. *Evolution and Human Behavior*, 26, 451-457.
- Kurzban, R., and Weeden, J. (2005). HurryDate: Mate preferences in action. *Evolution and Human Behavior*, 26, 227-244.
- Li, N. P., Bailey, J. M., Kenrick, D. T., and Linsenmeier, J. A. W. (2002). The necessities and luxuries of mate preferences: Testing the tradeoffs. *Journal of Personality and Social Psychology*, 82, 947-955.
- Little, A., Jones, B., Feinberg, D. R., and Perrett, D. (Unpublished data, personal communication). Strategic preferences in men for sexual dimorphism in female faces.
- Little, A. C., Burt, D. M., Penton-Voak, I. S., and Perrett, D. I. (2001). Self-perceived attractiveness influences human female preferences for sexual dimorphism and symmetry in male faces. *Proceedings of the Royal Society of London B*, 268, 39-44.
- Little, A. C., and Mannion, H. (2006). Viewing attractive or unattractive same-sex individuals changes self-rated attractiveness and face preferences in women. *Animal Behaviour*, 72, 981-987.
- Lovejoy, C. O. (1981). The Origin of Man. *Science*, 211, 341-350.
- Montoya, R. M. (2008). I'm hot, so I'd say you're not: The influence of objective physical attractiveness on mate selection. *Personality and Social Psychology Bulletin*, 34, 1315-1331. doi:10.1177/1046167208320387
- Moore, J. (1984). The evolution of reciprocal sharing. *Ethology and Sociobiology*, 5, 5-14.
- Noë, R., and Hammerstein, P. (1994). Biological markets: Supply and demand determine the effect of partner choice in cooperation, mutualism and mating. *Behavioural Ecology and Sociobiology*, 35, 1-11.
- Noë, R., and Hammerstein, P. (1995). Biological markets. *Trends in Ecology and Evolution*, 10, 336-339.
- Norscia, I., Antonacci, D., and Palagi, E. (2009). Mating first, mating more: Biological market fluctuation in a wild prosimian. *PLoS ONE*, 4, e4679.

doi:10.1371/journal.pone.0004679

- Palmer, A. R., and Strobeck, C. (2003). Fluctuating asymmetry analyses revisited. In M. Polak (Ed.), *Developmental instability (DI): Causes and consequences* (pp. 279-319). Oxford: Oxford University Press.
- Pawlowski, B., and Dunbar, R. I. M. (1999). Impact of market value on human mate choice decisions. *Proceedings of the Royal Society of London B*, 266, 281-285.
- Penton-Voak, I. S., Little, A. C., Jones, B. C., Burt, D. M., Tiddeman, B. P., and Perrett, D. I. (2003). Female condition influences preferences for sexual dimorphism in faces of male humans (*Homo sapiens*). *Journal of Comparative Psychology*, 117, 264-271.
- Pollet, T. V., and Nettle, D. (2008). Driving a hard bargain: Sex ratio and male marriage success in a historical US population. *Biological Letters*, 4, 31-33. doi:10.1098/rsbl.2007.0543
- Pollet, T. V., and Nettle, D. (2009). Market forces affect patterns of polygyny in Uganda. *Proceedings of the National Academy of Sciences*, 106, 2114-2117. doi:10.1073/pnas.0810016106
- Rhodes, G. (2006). The evolutionary psychology of facial beauty. *Annual Review of Psychology*, 57, 199-226.
- Rhodes, G., Simmons, L. W., and Peters, M. (2005). Attractiveness and sexual behavior: Does attractiveness enhance mating success? *Evolution and Human Behavior*, 26, 186-201.
- Rhodes, G., Yoshikawa, S., Palermo, R., Simmons, L. W., Peters, M., Lee, K., et al. (2007). Perceived health contributes to the attractiveness of facial symmetry, averageness, and sexual dimorphism. *Perception*, 36, 1244-1252.
- Siskind, J. (1973). *To hunt in the morning*. New York: Oxford University Press.
- Smith, E. (2004). Why do good hunters have higher reproductive success? *Human Nature*, 15, 343-364. doi: 10.1007/s12110-004-1013-9
- Stanford, C. B., Wallis, J., Mpongo, E., and Goodall, J. (1994). Hunting decisions in wild chimpanzees. *Behaviour*, 131, 1-18.
- Tiddeman, B. P., Burt, D. M., and Perrett, D. I. (2001). Prototyping and transforming facial textures for perception research. *IEEE Computer Graphics and Applications*, 21, 42-50.
- Vukovic, J., Jones, B. C., DeBruine, L., Feinberg, D. R., Smith, F. G., Little, A. C., et al. (2010). Women's own voice pitch predicts their preferences for masculinity in men's voices. *Behavioral Ecology*, 21, 767-772. doi:10.1093/beheco/arq051
- Walster, E., Aronson, V., Abrahams, D., and Rottman, L. (1966). Importance of physical attractiveness in dating behaviour. *Journal of Personality and Social Psychology*, 4, 508-516.
- Woll, S. B., and Young, P. (1989). Looking for Mr. or Ms. Right: Self-Presentation in videodating. *Journal of Marriage and the Family*, 51, 483-488.
- Wood, B., and Hill, K. (2000). A test of the "showing-off" hypothesis with Ache hunters. *Current Anthropology*, 41, 124-125.
- Wrangham, R. W., Jones, J. H., Laden, G., Pilbeam, D., and Conklin-Brittain, N. (1999). The raw and the stolen: Cooking and the ecology of human origins. *Current*

*Food sharing and sex*

*Anthropology*, 40, 567-594.

Zahavi, A. (1974). Value of handicap principle in evolution of communication systems between rivals. *Israel Journal of Zoology*, 23, 201-201.