

Distinguishing family from friends: Implicit cognitive differences regarding general dispositions, attitude similarity, and group membership

RICK O’GORMAN & RUTH ROBERTS

Department of Psychology, University of Essex, Colchester, CO4 3SQ, UK

Corresponding author: Rick O’Gorman eMail: rogorman@binghamton.edu, Tel: +44 1206 872128, Fax: ++44 1206 874901

Total word count: 9516

Abstract Kinship and friendship are key human relationships. Increasingly, data suggest that people are not less altruistic toward friends than close kin. Some accounts suggest that psychologically we do not distinguish between them while, countering this, there is evidence that kinship provides a unique explanatory factor. Using the Implicit Association Test, we examined how people implicitly think about close friends versus close kin in three contexts. In Experiment 1, we examined generic attitudinal dispositions toward friends and family. In Experiment 2, attitude similarity as a marker of family and friends was examined, and in Experiments 3 and 4, strength of in-group membership for family and friends was examined. Findings show that differences exist in implicit cognitive associations toward family and friends. There is some evidence that people hold more positive general dispositions toward friends, associate attitude similarity more with friends, consider family as more representative of the ingroup than friends, but friends are more ingroup than distant kin.

Keywords close relationships, cooperation, implicit association test, ingroup membership, attitude similarity

Distinguishing family from friends: Implicit cognitive differences regarding general dispositions, attitude similarity, and group membership

Introduction

The success of the human species is fundamentally driven by the ability to cooperate—broadly defined—with a large number of conspecifics, a feature that sets humans apart from most other organisms. This cooperation, in turn, is founded on our extensive social relationships. Cooperation, although possible amongst strangers, is typically built on repeated interactions with the same individuals, building relationships. The study of human social relationships from an evolutionary perspective has historically partitioned them into kinships and friendships (Buss 2011; Curry et al. 2013; Hruschka 2010; Workman and Reader 2014), based on the two pillars of social evolution, inclusive fitness theory (Hamilton 1964) and reciprocal altruism theory (Trivers 1971). These frameworks, in turn, have shaped how we study those relationships. Essentially, whereas kinship has been seen as a reliable way for altruism to flourish, with a high probability of a shared trait that thus ensures benefits flow to the same genes (Dawkins 1976), friendship (usually contrasted to kinship, rather than as an orthogonal category; see Hruschka 2010 for further discussion) has been seen as needing more immediate exchanges to be viable. As such, friendships are thought to be more vulnerable to cheating, need more mechanisms to protect cooperative behavior, and thus should typically yield lower cooperation. In addition, recent approaches to friendship focus on direct-fitness benefit pathways, where friendships reflect underlying mutually beneficial arrangements, such as alliances (DeScioli and Kurzban 2011; Tooby and Cosmides 1996). As a result, kinship and friendship are not always examined alongside each other (e.g., DeScioli and Kurzban 2009; Korchmaros and Kenny 2001, 2006; Park and Schaller 2005), or a

relatively anaemic version of a non-kin relationship is used ('acquaintances'; Burnstein et al. 1994; Lieberman and Linke 2007), which fails to robustly test friendship as a contrast to kinship.

However, recent theoretical and empirical developments have overtaken this longstanding dichotomy. It is now widely recognized that inclusive fitness is driven by genetic similarity rather than the more narrow genealogical (consanguineous) relatedness (Lehmann et al. 2007) and empirical work shows that humans are capable of assorting into groups of non-related yet like-minded individuals (Hafen et al. 2011; O'Gorman et al. 2008; Rushton and Bons 2005; Sheldon et al. 2000). This places emphasis on assortative interactions between cooperators, prompting a focus on mechanisms for individuals to aggregate with cooperatively like-minded others. Kinship, however discerned, offers one mechanism to achieve this, but we can expect more nuanced mechanisms also. Not all relatives are equal in cooperative traits.

A range of studies have simultaneously examined both relationship types, though results offer an unclear picture. While some studies show an overlap between close friends and close kin, particularly when focused on altruism measures (Ackerman et al. 2007; Essock-Vitale and McGuire 1985; Kruger 2003; Madsen et al. 2007; Stewart-Williams 2007), other studies suggest that kin are more privileged (Curry et al. 2013; Hackman et al. 2015; Kruger 2003; Rachlin and Jones 2008; Roberts and Dunbar 2011). A key distinction that emerges from these two sets of studies is that kinship, however measured, is predictive above and beyond other examined factors—most frequently emotional closeness—with altruism as the final outcome measure.

The uniqueness of kinship, beyond other relationships, must be captured by other proximate psychological mechanisms that remain to be uncovered. In addition, recognition that consanguineous kinship need not be the only mode by which we would predict that non-

random associations of cooperating individuals occur (Hamilton 1975; Lehmann et al. 2007; Price 1972; Wilson and Wilson 2007) raises a need to focus on how different types of relationships may require different circumstances to allow cooperation to be viable. This, in turn, suggests that there is likely to be a benefit in examining broadly the proximate psychological mechanisms of how we develop and use relationships. In particular, it may be useful to examine how people cognitively parse these relationships. Much of the work on altruism within kinship and friendship has focused on behavioral outcome measures, either hypothetical (responding to a vignette) or retrospective self-report (based on past behavior during a window of time). While this approach has revealed patterns of helping that follow theoretical predictions for relatedness and relationship strength (friendships versus acquaintances), they have not typically examined how we cognitively process kinship and friendship. In particular, given the consistent findings that friendships are strong targets for altruism, often matching close relatives or even siblings, this raises the question of how do we think about friends versus family? We are all familiar with the expressions ‘she is like a sister’ directed toward a close friend and ‘she is my best friend’ in reference to a sibling. These expressions not only suggest that we distinguish between these two categories, but that each has meaningful characteristics. The question is, in what ways might we distinguish between these two categories that relate to evolutionary considerations?

The present research

Four experiments were conducted to examine how people may distinguish, or not, between friends and family. Throughout the four studies, we focused on participants’ implicit biases toward family and friends in relation to traits likely to be relevant to cooperation. Implicit biases reflect underlying dispositions that may be shaped by evolved preferences

(Park and Schaller 2005), although they may also be influenced by experience and culture. Usefully, implicit measures reduce the role of executive cognitive control in responses, providing us with knowledge of the motivational orientations and basic attitudes held toward targets that shape behavior (Strack and Deutsch 2004). Comparisons of attitudes and behaviors show that these implicit attitudes can be important predictors (Conner et al. 2007; Greenwald et al. 2009; Nosek 2007; Nosek et al. 2007; Perugini et al. 2007, 2011).

As an initial baseline of dispositions toward family and friends, we focused in the first experiment on measuring participants' general attitudinal disposition toward kin and friends, with strangers forming a reference category. Although we might consider this measure to be a crude measure for an evolutionary approach, it offers both a parallel to typical domain-general approaches from social psychology and a point of departure for the following three experiments.

In the second experiment, we look at the relevance of attitude similarity as a kinship cue. Park and Schaller (2005) found that people associate someone who is attitudinally similar to themselves with close kin rather than strangers, and Park and Schaller argue that attitude similarity is a likely kinship cue, mirroring physical similarity. However, they did not examine attitude similarity and friendship, important because attitude similarity could just as easily be predicted to be a relevant friendship cue. Attitude similarity may be a valuable foundation for successful friendships, and similarity (homophily) is an established bias for friendships and other relationships (Hafen et al. 2011; McPherson et al. 2001; Rushton and Bons 2005). In addition, attitude similarity may be an important cue for the formation of alliances (DeScioli and Kurzban 2011), and one possible basis for mutually beneficial, direct-fitness, cooperation (Tooby and Cosmides 1996; West et al. 2007). Thus, Experiment 2 examines whether kinship, friendship, or both are associated with attitude similarity, relative to strangers, as a reference category.

The third and fourth experiments examine whether kinship or friendship is more associated with ingroup membership. Like similarity, the ingroup bias is well established as a key facilitator of cooperative behavior (Yamagishi and Mifune 2008). In addition, group membership is conceptually relevant to the debate around inclusive fitness and multilevel selection, with group membership theorized as a key cue for facilitating altruistic behavior, independent of kinship (O’Gorman et al. 2008; Wilson et al. 2008). It is pertinent to how friendships, in particular, may operate, with alliances and communal sharing being premised on a common group membership. If group membership is related to assortative processes, then friendship might be expected to more strongly associate with ‘ingroup’ descriptors than kinship. Conversely, if group membership evolutionarily has been shaped by kinship associations then kinship should trump friendship in association strength with the ingroup category. Experiment 3 again uses strangers as a reference category, while Experiment 4 uses ‘distant kin’, designed to expand on the findings of Experiment 3 and to place friendship within a broader kinship continuum.

We used the Implicit Association Test (IAT; Greenwald et al. 1998) to measure implicit attitudes. The IAT is an established measure of implicit cognition that is widely used in social psychology. Adopting the IAT both allowed us to replicate a previous methodology closely, and examine the implicit dispositions of participants which relate to less deliberative (planned) behavior. The IAT is a computerized task that requires participants to rapidly categorize target concepts (family, strangers, friends) and attribute concepts (pleasant, unpleasant¹) using only two response keys. The IAT relies on the assumption that, if a target concept and an attribute concept are highly associated (e.g., pleasant and family), the task will be easier, and therefore quicker, when they share the same response key than when they

¹ In the standard use of IATs, to measure people’s general attitudes toward a target category or object, the attribute pairing (capturing the valence of the attitude toward the target) is typically either pleasant/unpleasant or positive/negative. With either attribute pairing, the measures are seen as capturing basic implicit attitudes toward the targets.

require a different response key. Based on response times, a relative measure of attitudes toward the targets can be determined.

Experiment 1

The purpose of this experiment was to determine a basic orientation for people's attitudinal preferences, in line with standard social cognitive methodology, regarding family and close friends, with strangers as a reference category. This seems a useful grounding to begin from to better understand cognitive dispositions toward family and close friends. In contrast to most studies that examine dispositions of some kind toward kin and friends, we required participants to identify specific target individuals within each category to heighten the accessibility of actual specific attitudes. In addition, we focused on close family and close friends. In past studies where kinship is included as a category, the term is often narrowly operationalized along these lines (close family). For example, Lieberman et al. (2008) examine 'category confusion' (confusing members of different categories) for siblings. In contrast, friendship can often lack appropriately narrow operationalization. By having participants identify specific close friends and family, ambiguity around categories can be avoided.

Methods

Participants

Eighty participants (64 females, 15 males; Age: $M = 20.4$; $SD = 5.1$; one participant did not provide sex or age) based at a northern UK university were recruited to the study in

exchange for course credit. The experiment (and all following experiments) received institutional ethical approval. Informed consent was obtained from all individual participants included in the study, and participants were debriefed upon completion of the experiment.

Materials

Implicit Association Test (IAT): There were three different IATs. The first IAT examined relative general attitudes toward *family* and *friends*, the second examined *family* versus *strangers* and the third examined *friends* versus *strangers*; the latter two IATs were counterbalanced for order across participants. Because the focus of the experiment was on family versus friends, and because the second and third IATs have greater equivalency (always having strangers as a comparison), the family/friends IAT was presented first across all participants. The exemplar words were obtained by having participants enter the names of five close family members, five close friends and five strangers (selected from the *names list*, see hereinafter) at the start of the computerized portion. We directed participants to choose family members “who are actually related to you” while selected friends “should not include relatives”. They were told that names for the strangers category “should be names for which you do not know anyone by that name as a friend, colleague or neighbor”.

The *pleasant* attribute category words were *peace*, *laughter*, *kind*, *fun*, and *sunny* while the *unpleasant* category words were *war*, *sadness*, *pain*, *filth*, and *death*. Each IAT was presented using E-Prime experimental software (*E-Prime 2.0 [Computer software]* 2012) running on a Microsoft Windows compatible PC with a standard CRT display monitor with a refresh frequency of 75Hz. The IAT was set up as per the standard format (Greenwald et al. 1998), with seven blocks of trials. The practice blocks had 20 trials per block, except for the reversed target-pairing practice block, which had 30 trials to mitigate the effects of the

reversal (Nosek et al. 2005), while the critical test blocks had 60 trials per block. The IATs used a “built-in penalty” (Greenwald et al. 2003) for incorrect responses—participants would see a red X for 500ms and had to correct their response before they could continue to the next trial. The IAT was counterbalanced for the order of the target category-attribute pairings, such that half of the participants first had pleasant paired with one target category while the other half started with pleasant paired with the opposing category. Participants categorized target words using the S and K keys.

Names list: The top 50 names for boys and girls in England and Wales for 2007 were provided to participants for selecting five stranger names. The list was obtained from the UK Office of National Statistics website (<http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-243640>). Participants were instructed to choose five names of their own sex that were not found amongst their family or friends.

Procedure

Upon arrival, participants were led to the testing booth, and seated in front of a computer. They were provided with an overview of the study’s purpose (measuring attitudes toward family and friends) and procedure. After obtaining participation consent, participants were then provided with the names list and a pen to choose names. Once completed, the IAT testing script was initialized, the experimenter entered the assigned participant number, and then the participants entered their age, sex, and the names of family, friends and strangers, prompted by the program. On completion of the three IATs, the participants were debriefed and provided with their course credits.

Results and Discussion

IAT D-scores were calculated using the D1 algorithm (Greenwald et al. 2003), weighted for number of trials per block. Scores reflect the difference in response latency between possible pairings in each IAT, with positive scores indicating a positive association between pleasantness and the initial attribute category listed for each IAT. For the family/friends IAT, the D-scores ranged from .58 (indicating a positive bias to family) to -.60 (indicating a positive bias to friends). For the family/strangers IAT, D-scores ranged from .80 to -.45, while for the friends/strangers IAT, D-scores ranged from .81 to -.30. IAT reliability (as captured by internal consistency) was good (Nosek et al. 2007); calculated as per (Perugini et al. 2007): Family/friends IAT, $\alpha = .78$, family/strangers IAT, $\alpha = .65$, and friends/stranger IAT, $\alpha = .65$.

Participants showed a slightly stronger positive association between pleasantness and friends than pleasantness and family ($M \pm SD = -.02 \pm .30$) but this was not significant (one-way t-test, $t(79) = -.50, p = .618, r = .06$). There was a significant, positive association for family over strangers ($M \pm SD = .20 \pm .24; t(79) = 7.45, p < .001, r = .64$), and a significant, positive association for friends over strangers ($M \pm SD = .28 \pm .24; t(79) = 10.48, p < .001, r = .76$). People do not seem to have more positive generic implicit attitudes toward family than toward close friends. However, D-scores were significantly larger for participants' preference for friends over strangers than for family over strangers, $t(79) = -2.73, p = .008, r = .29$ (see Fig. 1). Thus, although the direct pairing of family and friends did not yield a significant difference in positive implicit attitudes, the IAT scores for the pairings of these categories with strangers suggest that people may have a slight but real bias in positive implicit attitudes toward friends than family, at least when contrasted to strangers.

Experiment 2

The finding that people do not distinguish between friends and family in general positivity reflects the considerable and extensive roles that both play in our social lives. However, such a broad-scale measure may mask differences that are more specific to distinguishing the two categories of relationship. One such specific factor is similarity. Physical similarity (‘phenotype matching’) has been shown to be a cue to kinship in humans and nonhumans (DeBruine et al. 2007), unsurprisingly as many physical features are heritable. Related to such findings, Park and Schaller (2005) have shown previously that an individual who is more attitudinally similar to the participant is more strongly associated with the category of family (versus stranger) than an individual who differs. However, there is a large literature that shows that similarity in characteristics such as race, sex, and age shape human social networks, and this effect extends to psychological traits such as attitudes and beliefs (Curry and Dunbar 2013; McPherson et al. 2001). Even more intriguing, perhaps, is the finding by Rushton and Bons (2005) that there appears to be a genetic bias toward homophily, and particularly for heritable characteristics, which suggests that psychological similarity could reflect not just family membership but shape humans’ broader social networks. Because Park and Schaller did not examine friendship, when it would seem a relevant additional category for attitude similarity, we modified Park and Schaller’s method to incorporate friends as a target category, alongside family and strangers.

Although we sought to replicate Park and Schaller’s study, we did not do so fully. Principally, Park and Schaller had a second IAT to examine generic positivity toward family and strangers. They did so to show that their findings—that people associate those who are attitudinally similar with family—are not simply due to family being subsumed into the attribute *positive*, relative to strangers. Thus, instead of having a second IAT task as Park and Schaller did, we have relied on Experiment 1 as a basis for capturing generic implicit

cognitive attitudes to family and friends, reducing the duration of the experiment for participants (the three-way comparison already requires three IATs). Comparison of results for the present experiment with those from Experiment 1 may indicate whether attitudes toward family and friends are falling under a broader, generic pleasantness category.

Methods

Participants

133 participants, based at two UK universities, completed the study in exchange for payment. Of these, four were dropped due to incorrect pairing of stimulus materials (target-individual details) and IAT condition, one was dropped due to a lack of living family members, one due to being very slow at the tasks and one due to failure to complete the IATs. Data for 22 participants were discarded due to a programming error over-assigning participants to one counterbalanced condition while omitting two other conditions (these participants were replaced during the study such that numbers across conditions was balanced). This resulted in 104 participants being retained for analysis (71 females, 33 males; Age: $M = 23.9$; $SD = 6.2$).

Materials

Names list: This was the same as in Experiment 1.

Implicit Association Test (IAT): As in Experiment 1, there were three different IATs. The first IAT examined the perceived association between attitudinally similar and dissimilar individuals with *family* and *friends*, while the second and third IATs examined the association

with *family* and *strangers* and with *friends* and *strangers*, counterbalanced for order across participants. Stimuli consisted of the names for individuals in each of the target relationship categories, as per Experiment 1, and the images of two attitudes-related individuals. The two individuals were assigned names (*Carol* and *Elaine*, as per Park and Schaller). The pairing of names to images was counterbalanced across participants, as was the pairing of Carol and Elaine to being attitudinally similar or dissimilar. To reduce the otherwise extensive permutations due to counterbalancing, IAT pairings between family/strangers and the attitudes-related individuals were matched for friends/strangers, such that those participants for whom family was initially paired with the attitudinally-similar individual also had friends paired initially with the same individual, and vice versa. All other details were as in Experiment 1.

Faith in Intuition instrument (FI): This is a subscale of the Rational-Experiential Inventory (Epstein et al. 1996), and consists of 12 items. It is a widely used measure of an intuitive or instinctive disposition to behavior, contrasted with a more deliberative approach. It has a high internal consistency ($\alpha = .79$ for the present experiment). Items include statements such as “I believe in trusting my hunches” and “I am quick to form impressions about people.” Although not a focus of the present research, this scale was included in the experiment to maintain methodological correspondence with Park and Schaller.

Attitudes Scale: As for FI, this scale was not used in analysis but was included to maintain methodological correspondence with Park and Schaller (2005). It consists of five items, replicating that used by Park and Schaller (2005). The items cover such topics as birth control, bingo and the death penalty. In addition, three attitude items were presented to participants, for which participants were asked to predict how they thought the attitude-related individuals (Carol and Elaine) would respond. The items covered the death penalty, reading and roller-coasters.

Procedure

Upon arrival, participants were led to the testing booth, and seated in front of the computer. They were provided with an overview of the study purpose and procedure. After obtaining participation consent, participants were provided with the names list and a pen to choose names, as well as the Faith in Intuition instrument, and the Attitudes Scale. On completion of those, participants were presented with a laminated sheet with images of, and fake details about, the two attitude-related individuals, Elaine and Carol, and the Attitudes-prediction Scale. Participants were asked, for one of the individuals, to “imagine that she agrees with your attitudes toward separate roles for men and women, loud music, playing bingo, easy access to birth control, and being assertive” while participants were asked to imagine that the other target disagrees with the participants on the those attitude topics. These instructed pairings were counterbalanced for names and images. Once completed, the IAT testing script was initialized and the procedure followed that of Experiment 1, except that participants received a payment (UK£5) rather than course credit.

Results and Discussion

IAT D-scores were calculated as per Experiment 1. Positive D-scores indicate a positive association between the initial attribute category in each IAT and the attitudinally similar individual. The D-scores ranged for the family/friends IAT from .87 to -.47, for the family/strangers IAT from .50 to -.54, and for the friends/strangers IAT from .76 to -.49. Reliability (as captured by internal consistency) was not as good for the family/friends IAT as in Experiment 1, but the other two IATs were comparable: Family/friends IAT, $\alpha = .55$,

family/strangers IAT, $\alpha = .64$, and friends/strangers IAT, $\alpha = .64$. That the family/friends IAT had lower internal consistency may suggest that participants had difficulties disentangling friends and family on the task.

Examining the IAT D-scores in one-way t-tests, participants showed a slightly stronger positive association for the attitudinally-similar individual with family than with friends ($M \pm SD = .03 \pm .25$) but this was not significant ($t(103) = 1.13, p = .262, r = .11$), and a similarly non-significant positive association with family over strangers ($M \pm SD = .03 \pm .21; t(103) = 1.37, p = .173, r = .13$). However, participants showed a significantly more positive association (Bonferroni-adjusted α) for the attitudinally-similar individual with friends than with strangers ($M \pm SD = .07 \pm .25; t(103) = 2.63, p = .010, r = .25$). People do not seem to associate an attitudinally similar individual with family over friends, or over strangers, but do associate such an individual with friends over strangers. That said, the D-scores were not significantly different between the family/strangers IAT and the friends/strangers IAT ($p = .203$; see Fig. 2).

The present findings expand upon (Park and Schaller 2005) findings, which were restricted to examining family versus strangers. Although the present study replicates the qualitative finding by Park and Schaller, of family more associated with attitude similarity than strangers, the effect was not actually significant. In addition, The narrow inclusive fitness approach by Park and Schaller would appear to have led to the omission of a key ecological component (friendship) that, in the present experiment, has a meaningful bearing on interpretation of findings for associations between an attitudinally similar individual to kin and strangers.

Relating Experiment 2's findings on implicit attitudinal differences to Experiment 1's, whereas in Experiment 1 we found significant general positive biases toward both family over strangers and friends over strangers, in Experiment 2 we find that the lack of a domain-

general distinction does not carry over into a more specific cognitive appraisal. The failure to find a distinction when friends were pitted directly against family, yet finding a distinction between friends versus strangers and not between family versus strangers is somewhat surprising, but the IAT is a contrast task. It may be that participants do not conceptually distinguish between family and friends for attitude similarity when directly contrasted, suggesting that cognitive rankings of relationships are not transitive.

Experiment 3

We sought to examine whether the implicit biases found in Experiments 1 and 2 are due to the participant-generated friends set representing a better alignment for individuals' interests (and thus aligned attitudes) than does kinship by examining association with ingroup membership. Group membership is a powerful and prevalent psychological categorization process (Buttelmann and Böhm 2014; Fu et al. 2012; Gaertner et al. 2006). People readily group others as ingroup or outgroup, and such categorization has impact on cooperation and discrimination, sufficiently powerful to scale to ethnic groups and contribute to the worst extremes of human behavior. This tendency to readily define group boundaries may have an evolved benefit, given that humans are a group-living species and cooperation is fundamental to our success, with a concomitant need to set boundaries for interaction partners (Brewer 1999). The ingroup bias that typically emerges in this research is thus built on a different psychological foundation than homophily, though there is likely inevitable overlap in mechanisms.

With regard to the present work, various clichés abound regarding choice of family and friends, and particularly that we can select friends, implying that the latter grouping can be in some way better (e.g., 'You can choose your friends but you can't choose your family').

This in turn would be predicted to set up more positive general attitudes toward friends (Experiment 1, albeit not a strong effect) and to provide an underlying reason for the stronger alignment of friends with an attitudinally similar individual than for family (Experiment 2, again, not a strong effect). This reasoning, along with the work showing that friendship may relate to alliance formation (DeScioli and Kurzban 2011), would predict that the categorization of friends as ingroup should be as strong as, or stronger than of kinship. In contrast, kinship consists of both a more familiar set of individuals, with a longer relationship duration, and one that has an evolutionarily definable and salient boundary (or set of expanding boundaries, with family and then layers of relatedness). Evolutionarily, kinship may have provided a firm means of creating a group boundary that aligned with genetic interests.

Methods

Participants

80 participants (46 females, 34 males; Age: $M = 24.7$; $SD = 7.3$) based at an eastern UK university were recruited to the experiment in exchange for course credit.

Materials

Names list: This was the same as in Experiment 1.

Implicit Association Test (IAT): As in Experiment 1, there were three different IATs. The first IAT examined the perceived association between ingroup membership with *family* and *friends*; the second and third examined the association with *family* and *strangers* and with

friends and *strangers*, counterbalanced across participants for order. The ingroup category (*Us*) words were *we*, *us*, and *our* while the outgroup category (*Them*) words were *they*, *them*, and *their*. All other details were as in Experiment 1.

Procedure

The procedure was identical to that of Experiment 1.

Results and Discussion

IAT D-scores were calculated as per Experiment 1. Positive D-scores indicate a positive association between the initial attribute category listed for each IAT and the ingroup attribute category. The D-scores ranged for the family/friends IAT from .88 to -.61, for the family/strangers IAT from .97 to -.39, and for the friends/strangers IAT from .82 to -.38. Reliabilities (as captured by internal consistency) for the IATs in this experiment were better than the first two experiments: Family/friends IAT, $\alpha = .84$, family/strangers IAT, $\alpha = .79$, and friends/strangers IAT, $\alpha = .73$.

Examining the IAT D-scores in one-way t-tests, participants showed a significantly stronger positive association for ingroup membership with family than with friends ($M \pm SD = .23 \pm .34$, $t(79) = 6.26$, $p < .001$, $r = .58$), a significantly stronger positive association with family over strangers ($M \pm SD = .31 \pm .29$; $t(79) = 9.55$, $p < .001$, $r = .73$), and a significantly stronger positive association with friends than with strangers ($M \pm SD = .24 \pm .28$; $t(79) = 7.87$, $p < .001$, $r = .66$). Participants associate ingroup with family more than they do friends or strangers, and with friends more than strangers. Moreover, D-scores differed in size for family/strangers versus friends/strangers (see Fig. 3), $t(79) = 2.03$, $p = .046$, $r = .22$.

Family is clearly the primary ingroup over friends, and of course over strangers, contrasting with the findings for the previous experiments, where, if any category emerged as favoured, it was friends. The prediction that emerged from the first two experiments that friendship could be more strongly associated with ingroup is clearly countered by the data in Experiment 3. Instead, the results suggest that assortative grouping to form friendships does not supplant the value of family as an ingroup, at least at the cognitive appraisal level. This contrasts with the hint of friendship being slightly favoured for general positivity and attitude similarity.

Experiment 4

In light of the findings in Experiment 3, the question emerges as to whether the bias toward family over friends is restricted to the narrow kin group, family, or whether kinship more broadly trumps friendship. The former prediction results from a view that shared life history together and cultural factors (the role of family in society) contribute to ingroup membership. In contrast, an expectation for broader kinship, beyond family, to be more associated with ingroup membership than friendship is an expectation implicitly conveyed in some of the evolutionary psychology literature that has adopted a narrow inclusive fitness approach (based on sanguineous affiliation) and thus implies a cognitively less flexible mechanism. However, such a conclusion is less obviously so for the modern broader approach based on genetic similarity (and thus, selective assortative interactions, Rushton and Bons 2005). To examine these contrasts, Experiment 4 retained the methodology of Experiment 3, but replaced ‘strangers’ with ‘known but distant relatives’.

Methods

Participants

57 participants (40 females, 17 males; Age: $M = 26.6$; $SD = 12.7$) based at an eastern UK university were recruited to the experiment, and none received any form of compensation.

Materials

Implicit Association Test (IAT): Each IAT was presented using Millisecond Inquisit 4 experimental software (*Inquisit 4.0.6 [Computer software]* 2014), which runs on both Microsoft Windows and Apple OS X. As in Experiment 1, there were three different IATs. The first IAT examined the perceived association between ingroup membership with *family* and *friends*, the second and third examined the association with *family* and *relatives* and with *friends* and *relatives*. All three IATs were counterbalanced across participants for order using an incomplete counterbalancing approach (this does not include every permutation but ensured that each IAT preceded each of the others and followed each of the others an equal number of times). The ingroup category (*Us*) exemplar words were *we*, *us*, and *our* while the outgroup category (*Them*) exemplar words were *they*, *them*, and *their*. For relatives exemplar stimuli, participants were asked to supply the names of five “known but distant relatives”. The purpose was to obtain kin from outside family, where possible, but still familiar. All other details were as in Experiment 1.

Procedure

Participants were tested in three differing methods: 35 participants completed the experiment with the experimenter in person (some in the lab, some at the participant's home, hereafter 'in person'), while the remainder (22) completed it in a setting of their choosing via online initiation of the experiment (Inquisit can run remotely via a download; hereafter, 'online'). For those completing the experiment in person, they were led to the testing booth, and seated in front of the testing computer. In all cases, instructions provided participants with an overview of the experiment's purpose and procedure. After obtaining participation consent (via the software), participants were then instructed by the program to provide their age, sex, and names of family, friends and distant kin ("Please provide the names of five known but distant relatives"). Participants completed the three IATs. On completion of the IATs, the participants were provided with a debrief.

Results and Discussion

IAT D-scores were calculated as per Experiment 1. Positive D-scores indicate a positive association between the initial attribute category listed for each IAT and the ingroup attribute category. The D-scores ranged for the family/friends IAT from .87 to -.87, for the family/relatives IAT from .89 to -.39, and for the friends/relatives IAT from .60 to -.65. Reliabilities (as captured by internal consistency) for the IATs in this experiment were strong: Family/friends IAT, $\alpha = .80$, family/relatives IAT, $\alpha = .83$, and friends/relatives IAT, $\alpha = .85$.

Examining the IAT D-scores in one-way t-tests, all comparisons returned significant effects (one marginal using a Bonferroni-adjusted α). Participants showed a stronger positive association for ingroup membership with family than with friends ($M \pm SD = .11 \pm .31$, $t(56) = 2.68$, $p = .010$, $r = .34$), a stronger positive association with family over relatives ($M \pm SD =$

.33 ± .29; $t(56) = 8.66$, $p < .001$, $r = .76$), and a stronger positive association with friends than with relatives ($M \pm SD = .11 \pm .28$; $t(56) = 2.45$, $p = .018$, $r = .32$). Participants significantly associate ingroup with family more than they do friends or relatives, and with friends more than relatives. Moreover, D-scores differed in size for family/relatives versus friends/relatives (see Fig. 4), $t(56) = 4.40$, $p < .001$, $r = .51$.

Family is again clearly the primary ingroup over friends, in line with the findings for the previous experiment, and over relatives, novel if unsurprising. However, the question as to whether the bias toward kinship in Experiment 3 was restricted to a narrow kin group (i.e., family), or whether kinship more broadly trumps friendship, has been answered, with the results favoring the former option. This suggests that kinship per se is not a category that always trumps other relationships, in this case friendship, but has limits.

General Discussion

The main contribution sought with this study is to further develop our understanding of how we think about kin and friends, particularly in contrast to each other, as two key, but not usually strongly overlapping, social categories (at least, as we tend to define and use the terms). Existing research on kinship and friendship has tended to suffer from a dichotomized approach, driven by a historically divergent theoretical framework, as though in real life we interact with kin and friends in distinctly segregated ways. In reality, kin and friends make up a substantial component of our social network, competing for our attention and resources, and, with some individuals, falling into both camps. Moreover, over evolutionary timeframes, this overlap is likely to have been greater with reduced mobility (Walker 2014). At the same time, friendship and kinship may be orthogonal to each other, with membership of both categories possible (Hruschka 2010). The present study was an attempt to further our

understanding of how we think about the two categories in relation to each other within specific, evolutionarily salient, cognitive domains that are known to impact on behavior: attitude similarity and ingroup membership.

Experiment One adopted a standard social psychological approach, measuring participants' generalized attitudes toward kin and friends (with strangers as a reference group). The results found that we do not strongly distinguish between close kin and friends, while both are distinguished from strangers, although friends more so. For evolutionarily minded readers, these results may seem uninteresting. However, aside from establishing that kinship is not, in general, cognitively privileged over friendship, it shows, in light of Experiments Two to Four, that apparent null effects for a domain-general approach (such as general positivity) may simply fail to capture more nuanced effects that exist and are uncovered when a phenomenon is studied with greater specificity (for example, if those effects are in opposition, yielding an overall null outcome).

Experiment Two replicated and expanded upon Park and Schaller (2005). Park and Schaller found that people associate kin with an attitudinally similar person more strongly than a dissimilar person, and suggested that attitudes may serve as a kinship cue. However, inclusion of a close-friends category in the present study found a stronger effect for the contrast of friends with strangers than for family with strangers, failing to replicate the latter effect at a significant level. Friends and family were equally strongly associated with an attitudinally similar person, suggesting that both may typically share attitudes with participants, though the previously mentioned stronger similarity association with friends versus strangers suggests that attitude similarity may be a marker of friendship more readily than kinship. Unlike other possible cues of relatedness, attitude similarity does not appear to be a kin detection cue. The results here, contrasting with Park and Schaller, show the importance of not allowing a narrow theoretical framework to overly determine the approach

to empirical research. While kin selection theory has long been considered the primary explanation for the structure of social relationships, there is always a need to challenge the robustness and applicability of any theory.

Experiment Three represented a test of a second psychological process, ingroup bias, that is pertinent to how we are likely to think about family and friends. Ingroup bias is well studied in social psychology, but is generally studied with little attention to the impact of different relationships on the process. The third experiment found that the family category is clearly more strongly associated with our ingroup than is the friends category, though friends as a category is recognized as an ingroup relative to strangers. These results fit somewhat with results from Lieberman et al. (2008), insofar as kinship trumps friendship, but contrasts with findings by Lickel et al. (2000) who found that family and friends cluster as a single entitative category, relative to forty group-types (although family ranked slightly higher before clustering). Park et al. (2008) anticipated the results of Experiment Three, noting the likely relevance of group bias in their discussion of kinship recognition cues. They pointed out that as kin often lived in a single unit historically, outgroup membership would have been a strong predictor of non-kin. However, as kinship in our study so far has reflected immediate family, Experiment Three did not completely test this hypothesis. An alternative explanation for the results of Experiment Three may be that, while kin is perceived as a fundamental social group, friendships do not automatically constitute a unitary group, resulting in a failure to be evaluated as an ingroup vis-à-vis family.

Experiment Four thus elaborated on the preceding one by substituting less immediate kin for strangers. Now, although family remained the category most strongly associated with ingroup membership, the friends category was more strongly associated with ingroup membership than relatives. This undermines any notion that kinship will trump non-kinship in a simplistic manner in our cognitive biases. It relates well with the findings from Stewart-

Williams (2007) and Essock-Vitale and McGuire (1985) that friends are more similar to close family (siblings) than are cousins for directed help. The results of Experiment Four suggest that shared life history, which typically results from close kinship, and cultural factors such as the role of family in society may weigh on determining ingroup membership, rather than a simple and broad notion of kinship detection. Such a conclusion is in keeping with an evolutionary approach to incest avoidance (Lieberman 2009; Lieberman et al. 2003), in which cues from the immediate environment (shared maternal care, co-residence) appear to be adaptively used to determine who to exclude as a sexual partner.

As the study is relatively novel in approach, there remain a considerable number of unaddressed questions. In the present study we examined two possible cognitions that pertain to relationships (attitude similarity and ingroup membership). These two features both have relevance to our social networks, and cooperation, while, at the same time, they represent distinct processes (homophily and intergroup bias) may serve distinct evolutionary roles, as suggested by the different results. The results suggest that while similarity may be a marker of both friends and family, ingroup membership is more clearly delineated. Similarity does not generate group membership, at least in simplistic terms. It is worth noting, too, that the methodologies subtly differed in that for attitude similarity the question asked was whether someone who is similar to me is more associated with friends or family (rather than are family or friends more similar to me), whereas for group membership, it was a simpler question of whether family or friends or more associated with ingroup verbal markers. The finding for attitude similarity may not differ for the alternative question, but it is worth noting.

There are other ways in which family and friends may be distinguished that are meaningful and impact on how those relationships function and translate to behavior, such as relationship durability, parental demands, and societal expectations. Another factor worthy of

being examined is the impact of age of participants on category associations and related cognitions (our participants were primarily, though not exclusively, of typical college student age; would older participants have a similar pattern of results?). Inclusion of additional types of relationships, such as romantic relationships, may also broaden understanding of the place of each in our social networks.

More focused examination of the specific levels of relatedness and closeness would also tighten up the findings, although it would be unlikely to radically modify them. In the present study, we did not obtain data for relatedness for chosen family and relatives, primarily to avoid lengthening the experiments, as establishing relatedness accurately requires detailed questioning, including distinctions between full, half, step and adopted siblings. Such data was not required for the methodology used in the present study, as the IAT operates at the category level. Thus, as long as participants were choosing those who they perceived as ‘close family’ then the IAT will capture associations between family and target cognitions, such as ingroup membership. Similarly, we left the ‘close’ in ‘close friends’ open to subjective definition. As the term is commonly used to describe emotional closeness in the context of friends, and rarely geographic, we consider it unlikely that errors occurred in this regard. Moreover, even if individuals vary in rated closeness for friends, it should not alter their entries for the friends category and the conclusions of the present study.

Alternative methodologies are of course worth considering, given that any single approach risks idiosyncrasies. While the IAT is a well-established social cognitive tool, it is limited to examining associations between categories, and attempts to bypass deliberative cognition. It is not well understood exactly what shapes the associations that the IAT examines, and as such, other methodologies will help us to better tease apart the cognition that lies behind our social relationships. Another drawback of the IAT methodology is that because the IAT operates at the category level, it is not useful to examine individual

exemplars. Alternatives exist—for example, the Extrinsic Affective Simon Task (De Houwer 2003)—that may help to examine the effects of specific relationships (e.g., siblings, parents, etc.) on individuals preferences and biases. In addition, it would be useful to examine whether the specifics of each individual’s relationships impact the results (e.g., a good versus bad relationship with a parent). While these issues become noise in our data, a more fine-toothed approach may reveal a more precise understanding of the dynamics of human social relationships. Such an approach could revert to a self-report, explicit measures approach, thus also confirming the implicit measurement used in the present manuscript. Combining these measures with measures of cooperation would expand on extant findings in the literature that have focused on the mediating role of emotional closeness on cooperation.

Conclusion

Research into our social relationships has often focused on non-relatives in social psychology, while typically focusing on either kin or non-kin in evolutionary psychology. In the present study, we contrasted how kin and friends are evaluated in three implicit cognitive domains, general positivity, attitude similarity and group membership, expanding beyond emotional closeness and self-reported altruism. We find that although participants do not distinguish between the two for general positivity, friends are slightly more strongly associated with attitude similarity, but group membership is more strongly associated with family, though with friends more than distant kin. The results overall suggest a nuanced cognition regarding kinship and friendship, although the present study represents only a beginning in this theoretically more integrated approach.

Acknowledgments We would like to acknowledge the British Academy for part-funding this research, grant SG 48011. We would like to thank Brian Meier for supplying an E-Prime IAT template and Justin Park for sharing stimulus materials, Catherine Day, Kirsten Bartlett, Mary-Jane Budd, and Steve Southworth for data collection, and Mitch Callan and Gillian Sandstrom for comments on the manuscript.

References

- Ackerman, J. M., Kenrick, D. T., & Schaller, M. (2007). Is friendship akin to kinship? *Evolution and Human Behavior*, *28*(5), 365–374. doi:10.1016/j.evolhumbehav.2007.04.004
- Brewer, M. B. (1999). The Psychology of Prejudice: Ingroup Love and Outgroup Hate? *Journal of Social Issues*, *55*(3), 429–444. doi:10.1111/0022-4537.00126
- Burnstein, E., Crandall, C., & Kitayama, S. (1994). Some neo-Darwinian decision rules for altruism: Weighing cues for inclusive fitness as a function of the biological importance of the decision. *Journal of Personality and Social Psychology*, *67*(5), 773–789. doi:10.1037/0022-3514.67.5.773
- Buss, D. (2011). *Evolutionary Psychology: The New Science of the Mind* (4th ed.). Boston: Pearson.
- Buttelmann, D., & Böhm, R. (2014). The Ontogeny of the Motivation That Underlies In-Group Bias. *Psychological Science*, *25*(4), 921–927. doi:10.1177/0956797613516802
- Conner, M. T., Perugini, M., O’Gorman, R., Ayres, K., & Prestwich, A. (2007). Relations Between Implicit and Explicit Measures of Attitudes and Measures of Behavior: Evidence of Moderation by Individual Difference Variables. *Personality and Social Psychology Bulletin*, *33*(12), 1727–1740. doi:10.1177/0146167207309194
- Curry, O., & Dunbar, R. I. M. (2013). Do Birds of a Feather Flock Together?: The Relationship between Similarity and Altruism in Social Networks. *Human Nature*, *24*(3), 336–347. doi:10.1007/s12110-013-9174-z

- Curry, O., Roberts, S. G. B., & Dunbar, R. I. M. (2013). Altruism in social networks: Evidence for a “kinship premium.” *British Journal of Psychology*, *104*(2), 283–295. doi:10.1111/j.2044-8295.2012.02119.x
- Dawkins, R. (1976). *The selfish gene*. Oxford: Oxford University Press.
- DeBruine, L. M., Jones, B. C., Little, A. C., & Perrett, D. I. (2007). Social Perception of Facial Resemblance in Humans. *Archives of Sexual Behavior*, *37*(1), 64–77. doi:10.1007/s10508-007-9266-0
- De Houwer, J. (2003). The extrinsic affective Simon task. *Experimental Psychology*, *50*(2), 77–85. doi:10.1026//1618-3169.50.2.77
- DeScioli, P., & Kurzban, R. (2009). The Alliance Hypothesis for Human Friendship. *PLoS ONE*, *4*(6), e5802. doi:10.1371/journal.pone.0005802
- DeScioli, P., & Kurzban, R. (2011). The company you keep: Friendship decisions from a functional perspective. In J. I. Krueger (Ed.), *Social Judgment and Decision Making* (pp. 209–225). New York: Psychology Press.
- E-Prime 2.0 [Computer software]*. (2012). Sharpsburg, PA, USA: Psychology Software Tools.
- Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive–experiential and analytical–rational thinking styles. *Journal of Personality and Social Psychology*, *71*(2), 390.
- Essock-Vitale, S. M., & McGuire, M. T. (1985). Women’s lives viewed from an evolutionary perspective. II. Patterns of helping. *Ethology and Sociobiology*, *6*(3), 155–173.
- Fu, F., Tarnita, C. E., Christakis, N. A., Wang, L., Rand, D. G., & Nowak, M. A. (2012). Evolution of in-group favoritism. *Scientific Reports*, *2*. doi:10.1038/srep00460
- Gaertner, L., Iuzzini, J., Witt, M. G., & Oriña, M. M. (2006). Us without them: Evidence for an intragroup origin of positive in-group regard. *Journal of Personality and Social Psychology*, *90*(3), 426–439. doi:10.1037/0022-3514.90.3.426
- Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: the implicit association test. *Journal of Personality and Social Psychology*, *74*(6), 1464–1480. doi:10.1037/0022-3514.74.6.1464

- Greenwald, A. G., Nosek, B. A., & Banaji, M. R. (2003). Understanding and using the Implicit Association Test: I. An improved scoring algorithm. *Journal of Personality and Social Psychology*, *85*(2), 197–216. doi:10.1037/0022-3514.85.2.197
- Greenwald, A. G., Poehlman, T. A., Uhlmann, E. L., & Banaji, M. R. (2009). Understanding and using the Implicit Association Test: III. Meta-analysis of predictive validity. *Journal of Personality and Social Psychology*, *97*(1), 17–41. doi:10.1037/a0015575
- Hackman, J., Danvers, A., & Hruschka, D. J. (2015). Closeness is enough for friends, but not mates or kin: mate and kinship premiums in India and U.S. *Evolution and Human Behavior*, *36*(2), 137–145. doi:10.1016/j.evolhumbehav.2014.10.002
- Hafen, C. A., Laursen, B., Burk, W. J., Kerr, M., & Stattin, H. (2011). Homophily in stable and unstable adolescent friendships: Similarity breeds constancy. *Personality and Individual Differences*, *51*(5), 607–612. doi:10.1016/j.paid.2011.05.027
- Hamilton, W. D. (1964). The genetical evolution of social behaviour. I. *Journal of Theoretical Biology*, *7*(1), 1–16. doi:10.1016/0022-5193(64)90038-4
- Hamilton, W. D. (1975). Innate social aptitudes of man: an approach from evolutionary genetics. In R. Fox (Ed.), *Biosocial Anthropology* (pp. 133–155). New York: Wiley.
- Hruschka, D. J. (2010). *Friendship: Development, Ecology, and Evolution of a Relationship*. Berkeley, CA: University of California Press.
- Inquisit 4.0.6 [Computer software]*. (2014). Seattle, WA: Millisecond Software.
- Korchmaros, J. D., & Kenny, D. A. (2001). Emotional closeness as a mediator of the effect of genetic relatedness on altruism. *Psychological Science*, *12*(3), 262–265.
- Korchmaros, J. D., & Kenny, D. A. (2006). An evolutionary and close-relationship model of helping. *Journal of Social and Personal Relationships*, *23*(1), 21–43. doi:10.1177/0265407506060176
- Kruger, D. J. (2003). Evolution and altruism: Combining psychological mediators with naturally selected tendencies. *Evolution and Human Behavior*, *24*(2), 118–125.
- Lehmann, L., Keller, L., West, S. A., & Roze, D. (2007). Group selection and kin selection: two concepts but one process. *Proceedings of the National Academy of Sciences*, *104*(16), 6736. doi:10.1073/pnas.0700662104

- Lickel, B., Hamilton, D. L., Wieczorkowska, G., Lewis, A., Sherman, S. J., & Uhles, A. N. (2000). Varieties of groups and the perception of group entitativity. *Journal of Personality and Social Psychology, 78*(2), 223–246. doi:10.1037//0022-3514.78.2.223
- Lieberman, D. (2009). Rethinking the Taiwanese minor marriage data: evidence the mind uses multiple kinship cues to regulate inbreeding avoidance. *Evolution and Human Behavior, 30*(3), 153–160. doi:10.1016/j.evolhumbehav.2008.11.003
- Lieberman, D., & Linke, L. (2007). The Effect of Social Category on Third Party Punishment. *Evolutionary Psychology, 5*(2), 289–305.
- Lieberman, D., Oum, R., & Kurzban, R. (2008). The family of fundamental social categories includes kinship: evidence from the memory confusion paradigm. *European Journal of Social Psychology, 38*(6), 998–1012. doi:10.1002/ejsp.528
- Lieberman, D., Tooby, J., & Cosmides, L. (2003). Does morality have a biological basis? An empirical test of the factors governing moral sentiments relating to incest. *Proceedings of the Royal Society B: Biological Sciences, 270*(1517), 819–826. doi:10.1098/rspb.2002.2290
- Madsen, E. A., Tunney, R. J., Fieldman, G., Plotkin, H. C., Dunbar, R. I. M., Richardson, J.-M., & McFarland, D. (2007). Kinship and altruism: A cross-cultural experimental study. *British Journal of Psychology, 98*(2), 339–359. doi:10.1348/000712606X129213
- McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a Feather: Homophily in Social Networks. *Annual Review of Sociology, 27*, 415–444.
- Nosek, B. A. (2007). Implicit–explicit relations. *Current Directions in Psychological Science, 16*(2), 65–69.
- Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2005). Understanding and Using the Implicit Association Test: II. Method Variables and Construct Validity. *Personality and Social Psychology Bulletin, 31*(2), 166–180. doi:10.1177/0146167204271418
- Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2007). The Implicit Association Test at age 7: A methodological and conceptual review. In J. A. Bargh (Ed.), *Social psychology and the unconscious: The automaticity of higher mental processes* (pp. 265–292). New York: Psychology Press.

- O’Gorman, R., Sheldon, K. M., & Wilson, D. S. (2008). For the good of the group? Exploring group-level evolutionary adaptations using multilevel selection theory. *Group Dynamics: Theory, Research, and Practice*, *12*(1), 17–26. doi:10.1037/1089-2699.12.1.17
- Park, J. H., & Schaller, M. (2005). Does attitude similarity serve as a heuristic cue for kinship? Evidence of an implicit cognitive association. *Evolution and Human Behavior*, *26*(2), 158–170. doi:10.1016/j.evolhumbehav.2004.08.013
- Park, J. H., Schaller, M., & Van Vugt, M. (2008). Psychology of human kin recognition: Heuristic cues, erroneous inferences, and their implications. *Review of General Psychology*, *12*(3), 215–235. doi:10.1037/1089-2680.12.3.215
- Perugini, M., Conner, M., & O’Gorman, R. (2011). Automatic activation of individual differences: A test of the gatekeeper model in the domain of spontaneous helping. *European Journal of Personality*, *25*(6), 465–476. doi:10.1002/per.826
- Perugini, M., O’Gorman, R., & Prestwich, A. (2007). An ontological test of the IAT: Self-activation can increase predictive validity. *Experimental Psychology*, *54*(2), 134–147. doi:10.1027/1618-3169.54.2.134
- Price, G. R. (1972). Extension of covariance selection mathematics. *Annals of Human Genetics*, *35*(4), 485–490. doi:10.1111/j.1469-1809.1957.tb01874.x
- Rachlin, H., & Jones, B. A. (2008). Social discounting and delay discounting. *Journal of Behavioral Decision Making*, *21*(1), 29–43. doi:10.1002/bdm.567
- Roberts, S. G. B., & Dunbar, R. I. M. (2011). The costs of family and friends: an 18-month longitudinal study of relationship maintenance and decay. *Evolution and Human Behavior*, *32*(3), 186–197. doi:10.1016/j.evolhumbehav.2010.08.005
- Rushton, J. P., & Bons, T. A. (2005). Mate choice and friendship in twins: Evidence for genetic similarity. *Psychological Science*, *16*(7), 555–559.
- Sheldon, K. M., Sheldon, M. S., & Osbaldiston, R. (2000). Prosocial values and group assortment. *Human Nature*, *11*(4), 387–404. doi:10.1007/s12110-000-1009-z

- Stewart-Williams, S. (2007). Altruism among kin vs. nonkin: effects of cost of help and reciprocal exchange. *Evolution and Human Behavior*, 28(3), 193–198.
doi:10.1016/j.evolhumbehav.2007.01.002
- Strack, F., & Deutsch, R. (2004). Reflective and Impulsive Determinants of Social Behavior. *Personality and Social Psychology Review*, 8(3), 220–247.
doi:10.1207/s15327957pspr0803_1
- Tooby, J., & Cosmides, L. (1996). Friendship and the banker's paradox: Other pathways to the evolution of adaptations for altruism. In W. G. Runciman, J. M. Smith, & R. I. M. Dunbar (Eds.), *Evolution of social behaviour patterns in primates and man* (Vol. 88, pp. 119–143). New York, NY, US: Oxford University Press.
- Trivers, R. L. (1971). The Evolution of Reciprocal Altruism. *The Quarterly Review of Biology*, 46(1), 35–57.
- Walker, R. S. (2014). Amazonian horticulturalists live in larger, more related groups than hunter-gatherers. *Evolution and Human Behavior*, 35(5), 384–288.
doi:10.1016/j.evolhumbehav.2014.05.003
- West, S. A., Griffin, A. S., & Gardner, A. (2007). Social semantics: altruism, cooperation, mutualism, strong reciprocity and group selection. *Journal of Evolutionary Biology*, 20(2), 415–432.
doi:10.1111/j.1420-9101.2006.01258.x
- Wilson, D. S., van Vugt, M., & O'Gorman, R. (2008). Multilevel selection theory and major evolutionary transitions implications for psychological science. *Current Directions in Psychological Science*, 17(1), 6–9.
- Wilson, D. S., & Wilson, E. O. (2007). Rethinking the theoretical foundation of sociobiology. *The Quarterly Review of Biology*, 82(4), 327–348.
- Workman, L., & Reader, W. (2014). *Evolutionary Psychology: An Introduction* (3rd ed.). Cambridge, England: Cambridge University Press.
- Yamagishi, T., & Mifune, N. (2008). Does Shared Group Membership Promote Altruism? Fear, Greed, and Reputation. *Rationality and Society*, 20(1), 5–30. doi:10.1177/1043463107085442

BIOGRAPHICAL SKETCHES

Rick O’Gorman is a lecturer in psychology at the University of Essex. He works on altruism, cooperation, leadership, and the physiological correlates of evolved processes.

Ruth Roberts has completed a Research Methods in Psychology MSc at the University of Essex and plans to complete her PhD at the University of Portsmouth.

FIGURE LEGENDS

Fig. 1 Mean pleasantness IAT D-scores comparing family, friends, and strangers, with 95% confidence intervals.

Fig. 2 Mean attitude-similarity IAT D-scores comparing family, friends, and strangers, with 95% confidence intervals.

Fig. 3 Mean ingroup IAT D-scores comparing family, friends, and strangers, with 95% confidence intervals.

Fig. 4 Mean ingroup IAT D-scores comparing family, friends, and distant relatives, with 95% confidence intervals.







