“Friendship Jealousy”: An (Overlooked) Emotion for Friendship Maintenance?

by

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ABSTRACT

Friendships make us happy, keep us healthy, and can even facilitate our reproductive fitness. But most friendships are not forever—even when we want them to be. How do people maintain valued friendships? I propose that "friendship jealousy" arises when people perceive others as posing threats to valued friendships, and that this response can function to prevent friendship loss and friend defection. In preliminary experiments, I tested predictions derived from this functional view. As predicted, I found, first, that friendship jealousy is calibrated to friend value. Second, friendship jealousy predicts intentions to "friend guard" (i.e., engage in behavior to protect the friendship). Third, friendship jealousy has sex-differentiated features, which are consistent with sex differences in friendship structures and ancestral friendship functions. The present work pits against one another intuitive and functional predictions as to what drives friendship jealousy. Although intuition might lead one to expect greater jealousy when a friend spends more time with a new person, a functional view suggests greater jealousy when that new person threatens to fulfill the same function for one's friend that one is currently fulfilling (i.e., to "replace" him/her). Preliminary studies revealed that greater friendship jealousy is evoked when friends form new same-sex friendships (which presumably pose greater replacement threat, but lesser time threat) versus new romantic relationships (which presumably pose lesser replacement threat, but greater time threat). The focal experiment explicitly and experimentally manipulates a version of "replacement threat" (whether the best friend "chooses" the new friend over you) and "time threat" (how much time the best friend spends with the new friend). In line with functional predictions, the amount of time the best friend spends with a new friend drives friendship jealousy—but

only when direct information about replacement threat is unavailable. Regardless of the time threat posed, participants report high friendship jealousy when replacement threat is high, and low friendship jealousy when replacement threat is low. Results imply that friendship jealousy is calibrated to replacement threat (over time threat). Overall, findings suggest that friendship jealousy might be a functional response aimed at facilitating friendship maintenance.

For my mom and dad.

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CHAPTER 1

INTRODUCTION

Adele Schopenhauer was overcome with sadness, beset by anger, and filled with anxiety. After years of an intensely close bond with her best friend Sibylle, Adele began to doubt that she was Sibylle's most cherished friend; Sibylle had formed a new friendship with another woman, and Adele was bitterly jealous (Yalom & Brown, 2015). Whereas this scene could easily be taken from a modern-day high school, it actually describes shifting friendships among adult intellectuals in nineteenth-century Germany.

Jealousy is a complex system composed of several different emotions. Most descriptions liken "being jealous" to feeling some mixture of sadness, anger, and/or anxiety (Bringle, 1991; Hupka, 1991; Parrott & Smith, 1993; Sharpsteen, 1991; Sharpsteen & Kirkpatrick, 1997). For decades, social scientists have sought to understand this complex, negative feeling—but such research has focused near-exclusively on jealousy in romantic/sexual relationships (e.g., Bhugra, 1993; Buss, 2000, 2013; Buunk, 1991; DeSteno, Valdesolo, & Bartlett, 2006; Freud, 1910; Hupka, 1991). Historical, anthropological, and some empirical evidence suggest, however, that jealousy is not unique to mating relationships (e.g., Hruschka, 2010; Parker, Low, Walker, & Gamm, 2005; Yalom & Brown, 2015). Here, I explore jealousy in a distinct social domain—friendship—building on work taking an evolutionary approach to emotion.

From an evolutionary or functional perspective, feelings such as jealousy serve ultimate, adaptive ends. On this view, romantic/sexual jealousy motivates behavior that facilitates mate retention; successfully preventing the defection of one's romantic partner to another person may bolster one's fitness (Buss, 2013; Buss, Larsen, Westen, & Semmelroth, 1992). Applying

this functional approach to jealousy in the friendship domain implies that "friendship jealousy" might motivate behavior that facilitates friend retention, particularly insofar as successfully preventing the defection of valued friends to other people may bolster one's fitness. Whereas jealousy might serve similar ends in both relationship contexts (i.e., in both romantic relationships and in friendships), because people's friends serve some distinct adaptive functions (as compared to people's romantic partners), friendship jealousy may also possess some distinct features.

In terms of similarities, like romantic relationships, friendships are core components of daily life, facilitate health and happiness, and can even promote one's reproductive fitness (e.g., Ackerman & Kenrick, 2009; DeScioli & Kurzban, 2009, 2012; Perlman, Stevens, & Carcedo, 2015; Tooby & Cosmides, 1996). Moreover, people may engage in social competition both to make and keep valued friends (e.g., DeScioli & Kurzban, 2012; Rose, 1984). Yet whereas substantial research has addressed the adaptive challenge of retaining romantic partners (e.g., Buss & Shackelford, 1997; Kenrick, Griskevicius, Neuberg & Schaller, 2010; Kenrick, Neuberg, Griskevicius, Becker & Schaller, 2010; Pillsworth & Haselton, 2006), far less work has explored strategies of friendship maintenance and retention.

The functional approach I use here proposes that, although negative to experience, friendship jealousy might further positive ends—specifically in helping people mitigate threats to valued friendships posed by potential interlopers. I use this functional framing to derive and test a series of preliminary hypotheses about friendship jealousy, investigating how threats to different friendships might evoke different levels of friendship jealousy, whether feelings of friendship jealousy predict intentions to engage in threat-countering behavior (i.e., "friend guarding), what sex differences are evident in

friendship jealousy, and—in the focal experiment presented here—what drives friendship jealousy. Specifically, the present work pits functional predictions against intuitive ones to investigate which threats evoke friendship jealousy. Although intuition might lead one to expect greater jealousy when a best friend spends more time with a new friend, a functional view suggests greater jealousy when that new friend threatens to fulfill the same function for the best friend that one is currently fulfilling (i.e., to "replace" him/her). The focal study explicitly and experimentally manipulates "time threat" and "replacement threat" to test which drives friendship jealousy.

Jealousy Functions to Protect Valued Social Relationships

Jealousy is typically defined as a complex, negative feeling triggered by real or perceived threats to a valued social relationship—specifically by threats posed by a third party who may be interested in one's partner or in whom one's partner may be interested (Burkett, 2009; Daly, Wilson, & Weghorst, 1982; Hupka, 1991; Parker et al., 2005; Salovey & Rodin, 1984; Sharpsteen & Kirkpatrick, 1997).[1] To illustrate the prototypical example, an individual becomes jealous upon perceiving that his or her spouse is interested in another person (i.e., an "interloper" or "poacher"). The experience of jealousy is considered aversive and has been described as a blend of sadness, anger, and anxiety (e.g., DeSteno et al., 2006; Hupka, 1991;

[1] "Jealousy" and "envy" are often used interchangeably in everyday conversation, and both may be considered complex, negative feelings. However, the former is evoked by the threatened loss of an existing, valued bond, whereas the latter is evoked when one covets something someone else has (and that the envious person lacks; e.g., Buss, 2013; DelPriore, Hill, & Buss, 2012).

Parrott & Smith, 1993). Most researchers agree that jealousy motivates a range of responses aimed at protecting those threatened relationships (e.g., Buss, 2013; DeSteno et al., 2006).

A Functional View of Romantic/Sexual Jealousy

There is a large body of evolutionary research on jealousy in romantic/sexual relationships (e.g., Buss, 2013; Buss & Haselton, 2005; Buss et al., 1992; Buunk, Angletiner, Oubaid, & Buss, 1996; Daly et al., 1982). From this perspective, jealousy is considered a tool for maintaining valued romantic/sexual relationships. Successfully retaining these bonds—as when one fends of a potential mate poacher—implies increased fitness via the continued access to any benefits provided by the relationships (e.g., a partner's reproductive potential, partner-mediated resources). Thus, this view presumes that, on average, people who experienced sexual/romantic jealousy had greater success in preventing partner loss/defection—and therefore enjoyed greater reproductive success—than did people who failed to experience sexual/romantic jealousy under those circumstances (e.g., Buss, 2013).[2]

Evolutionary empirical work on romantic/sexual jealousy has used task analysis to assess whether it exhibits features implying special design for solving the particular adaptive

[2] A functional argument supposes that, even if people occasionally harm their fitness via harming their mates (e.g., in fits of jealousy-induced rage), on average, people who experienced sexual/romantic jealousy were likely to have been more successful at maintaining their valued sexual/romantic relationship, and thus enjoyed greater reproductive success, than those who did not. Jealousy can evoke a range of mate-guarding behavior—from murdering one's rival to harming one's own partner—that would be considered neither morally "good" nor necessarily adaptive.

problem of maintaining valued romantic/sexual relationships in the face of prospective third-party threats (e.g., Buss, 2000; Buss, 2013; Buss & Haselton, 2005; Buss et al., 1992; Buunk et al., 1996; Daly et al., 1982; Miller & Maner, 2008, 2009). In line with functional predictions, romantic/sexual jealousy (a) is evoked when people perceive that another person poses a threat to a valued romantic/sexual relationship, (b) motivates behavior aimed at countering that threat (i.e., mate guarding), and (c) possesses evolutionarily-cogent sex-differentiated design features (Buss, 2013; Buss, et al., 1992; Desteno, Valdesolo, & Barrett, 2006; Harris, 2003; Salovey, 1991). Because a male stands to face especially high costs from a female partner's sexual infidelity (e.g., investing in offspring who do not share his genes), males tend to experience comparatively greater jealousy over a female partner's prospective sexual (versus emotional) infidelity. Because a female stands to face especially high costs at a male partner's emotional infidelity (e.g., loss of partner-mediated resources), females tend to experience greater jealousy over a male partner's prospective emotional (versus sexual) infidelity (e.g., Brase, Caprar, & Voracek, 2004; Buss et al., 1992; Buss, Larsen, & Westen, 1996; Buunk et al., 1996; Easton, Schipper, & Shackelford, 2007; Kennair, Nordeide, Andreassen, Stronen, Pallesen, 2011; Kuhle, Smedley, & Schmitt, 2009; Miller & Maner, 2008; Shackelford, Buss, & Bennett, 2002; but see Harris, 2003).

From a functional view, then, romantic/sexual jealousy evolved, shaped by natural selection, to solve a recurrent adaptive problem tributary to reproductive success—preventing the loss of one's valued, likely fitness-benefitting romantic relationship. Might similar feelings of jealousy exist and function in other, distinct social domains—specifically in same-sex friendship?

Friendship: A Functional Social Relationship

Friendships—defined as medium- to long-term cooperative bonds between genetically unrelated conspecifics—are considered central to health, happiness, and well-being (e.g., Hruschka, 2010; Perlman, et al., 2015). Friends are often important sources of social, emotional, and material support (e.g., Davis & Todd, 1982, 1985; Trivers, 1971; Uchino, Cacciopo, & Kiecolt-Glaser, 1996). Friends can promote one's own survival and the survival of one's offspring (e.g., Hrdy, 2011; Hruschka, 2010; Silk et al., 2009; Sugiyama, 2004). For example, Sugiyama's (2004) examination of health and mortality risks among the Shiwiar, forager-horticulturalists in Ecuadorian Amazonia, suggests that provisioning from friends can prevent recurrently-faced illnesses and injuries from becoming fatal. Relatedly, Tooby and Cosmides (1996) theorized that forming such friendships can solve the adaptive problem of ensuring help in times of dire need. Further, lacking and/or failing to maintain friends can be associated with a number of negative psychosocial and health outcomes (e.g., Benenson, 2014; Cacciopo et al., 2000). In sum, the formation and, importantly, the continued maintenance of valued friendships may be fitness-benefitting.

The Challenge of Friendship Maintenance

Despite the felt and objective value of having friends, even valued friendships can and do end (Ayers, Krems, & Aktipis, 2017; Casper & Card, 2010; Rose, 1984; Rose & Serafica, 1986; Wellmen, Wong, Tindall, & Nazer, 1997). There are numerous reasons why friendships end (e.g., one or both parties no longer have interest in the friendship, one friend moves away, an intractable fight). One reason that people frequently cite for losing friends *whom they would have wished to retain*, however, is interference from third parties (e.g., Parker, Kruse, & Aikens, 2010; Rose, 1984; Tannen, 2017).

Multiple studies have found that both children and adults believe that a friend's forming a new friendship was a major cause of the dissolution or diminution of their existing friendships (Bigelow, Tesson, & Lewko, 1996; McEwan, Babin Gallagher, & Farinelli, 2008; Parker et al., 2010; Rose, 1984; Silverman, Greca, & Wasserstein, 1995; Tannen, 2017). This perceived threat is nicely illustrated by one woman's statement to *The New York Times*: "'Most girls won't admit this, but they'd rather you hit on their significant other than their best friend'" (Alford, 2014).

Given that valued friends can be "lost"[3] to other people, how do people maintain valued

[3] At first glance, some might intuitively resist the notion that people can lose *friends* to other people (e.g., via friend poaching)—even as it might be commonly accepted that people can lose *romantic partners* to other people (e.g., via mate poaching). After all, the notion that one's love is infinite is inherently appealing. Yet independent lines of research instead converge on the notion that people can maintain only so many relationships at once (Dunbar, 1998; Tooby & Cosmides, 1996; Zhou, Sornette, Hill, & Dunbar, 2005). For example, one has only a finite amount of time, attention, and energy (e.g., Miritello et al., 2013), and social relationships require such time, attention, and energy to maintain (Oswald, Clark, & Kelly, 2004; Vigil, 2007). Indeed, Tooby and Cosmides (1996) proposed that people have only so many friendship slots, or niches, with each friend perhaps serving a niche-specific function. This implies that forming a new friendship or other close relationship might cause the loss or diminished closeness of an existing friendship (Dunbar, 2012). Somewhat similarly, DeScioli and Kurzban's (2009) "Alliance Hypothesis of Friendship" would also suggest that a friend forming a new friendship could be perceived as a threat, not necessarily by completely displacing a person from a friendship niche, but rather by "out-ranking" that person in the mutual friend's

friendships? Existing social psychological research has largely focused on the question of how people maintain existing romantic relationships. However, some work has explicitly examined friendship maintenance. Such work is largely descriptive, having taken a data-driven approach to cataloging the tactics people report using to maintain friendships (e.g., Canary, Hause, Stafford, & Wallace, 1993; Fehr, 1996; Hays, 1985; Oswald & Clark, 2006; Oswald et al., 2004; Rose & Serafica, 1984; Rusboldt, Olsen, Davis, & Hannon, 2004). For example, Oswald and colleagues (2004) developed a typology of friendship maintenance strategies, including being positive around one's friend, being supportive, and spending time together. Others have cited the importance of avoiding sensitive issues and making one another laugh (Burleson & Samter, 1994; Canary et al., 1993).

Friendship maintenance is likely to involve two central challenges: retaining a friend's continued investment in the existing friendship and—more germane to the current work—preventing the defection or loss of a friend to another person. Notably, these aforementioned tactics might keep a friend invested in the ongoing relationship, but these tactics do not seem well-designed for preventing a friend's defection to someone else.

Friendship Jealousy?

If preventing friend defection has been a recurrent adaptive challenge, people might possess tools to resolve it. Specifically, a functional approach would expect that people should detect and adaptively respond when a valued friend might be poached by or otherwise lost to another person. Friendship jealousy may be one such functional response. Before outlining a series of predictions about the features friendship jealousy should possess, were it a functional

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alliance hierarchy.

response, I briefly review some of the existing literature on friendship jealousy from a non-functional perspective.

Existing research. In developmental psychology, there is some empirical work on jealousy in the context of friendship. This work builds on foundations developed by Selman and colleagues (e.g., Selman, 1980; Selman & Schultz, 1990). As Parker et al. (2005) noted, Selman expected that jealousy over friends abates after adolescence, when "social-cognitive advances help older children take a more balanced view in which they recognize that no single relationship, no matter its quality, can meet all the interpersonal needs of an individual" (p. 236). This notion that friendship jealousy is the result of immaturity and/or abnormal development is consistent with early theorizing on general jealousy (see Buss, 2013 for a review).

Guided by such theorizing, empirical work has near-exclusively examined friendship jealousy in children and adolescents, and has primarily focused on measuring the negative antecedents and outcomes of friendship jealousy (Kraft & Mayeux, 2016; Lavallee & Parker, 2009; Parker, Campbell, Kollat, & Lucas, 2008; Parker, Ebrahimi, & Libber, 2005; Parker et al. 2010; Parker et al., 2005; Parker, Ramich, & Roth, 2009; Roth & Parker, 2009). For example, some evidence suggests that children with low self-esteem have a high "vulnerability to jealousy" over friendships (Ebrahimi, Parker, Lavallee, & Seiffke-Krenke, 2005), that children who experience friendship jealousy also experience lower satisfaction with their friendships (e.g., Giltenboth, 2001; Lavallee & Parker, 2009; Parker et al., 2005; Parker & Wargo Aikens, 2009), and that children with a reputation for being jealous are less accepted by their peers and are also more often victimized by their peers (e.g., Parker et al., 2010; Parker & Gamm, 2003).

Taking a functional perspective raises some questions about these findings. For example, if friendship jealousy consistently causes such negative outcomes, why does it remain so

prevalent among children—if not also among adults? Indeed, jealousy over friends forming new friendships is evidenced across modern cultures (Hruschka, 2010). Observations of adults reacting with jealousy to the perception that their friends prefer the company of another person exist across the historical record as well (e.g., Alford, 2014; Rose, 1984; Tannen, 2017; Yalom & Brown, 2015). Moreover, friendship jealousy is even a common theme in the arts, from literary fiction (e.g., work by Elena Ferrante, John Knowles) to critically-acclaimed comedies (e.g., "Bridesmaids") and so-called "reality TV" (e.g., "The Real Housewives of Beverly Hills").

Similarly, one might question whether friendship jealousy would consistently cause negative outcomes. One possible reason that friendship jealousy has been associated with negative outcomes in existing literature is that the theoretical perspective motivating this literature specifically posits that friendship jealousy arises from personal deficits (e.g., immaturity, inappropriate conceptualizations of friendship), and has thus directed researchers to explore primarily negative outcomes. However, a full discussion of whether, when, and why friendship jealousy might elicit negative outcomes is beyond the scope of the current work.

Overview: A Functional Perspective on Friendship Jealousy

A functional perspective on friendship jealousy generates multiple predictions. Using this perspective, I have derived and tested several preliminary hypotheses about friendship jealousy in adults. First, and most basically, friendship jealousy should be aroused by threats to valued friendships—with threats to closer friendships evoking greater jealousy than threats to more peripheral ones—and friendship jealousy should also positively predict behavioral intentions aimed at countering those threats (i.e., "friend-guarding").

Second, a functional view would expect that friendship jealousy should be sensitive to the threat that one might be "replaced" by the interloper. That is, greater

friendship jealousy should be evoked when the interloper stands to fulfill the same function for one's friend that one is currently fulfilling. I predict that friendship jealousy is closely calibrated to "replacement threat"—even in comparison to other possible and more intuitive threats that might be expected to drive friendship jealousy (e.g., the amount of time one's friend spends with a new person). This prediction is the central component of the present work.

Third, friendship jealousy might also be expected to show some sex differences. Specifically, because men's and women's same-sex friendships may have different structures and/or ancestral functions, different situations might be expected to influence men's and women's friendship jealousy. In a series of five experiments—four preliminary studies and the focal dissertation experiment—I provide initial support for these functional predictions.

CHAPTER 2

OVERVIEW OF PRELIMINARY RESEARCH

Support for Basic Predictions: Friend Value and "Friend Guarding"

Most basically, friendship jealousy should be aroused by threats to valued friendships, should be evoked more strongly when closer versus more peripheral relationships are potentially threatened, and this feeling should predict increased behavioral intentions aimed at countering those threats (i.e., "friend guarding"). Preliminary findings support these predictions.

In two studies—one with an adult community sample gleaned from an online participant platform (Study 1), and one using a large undergraduate student sample (Study 2)—I first asked participants to write down the names of several same-sex friends (e.g., a best friend, a close friend, an acquaintance), and then to imagine that these friends were forming new, potentially closer friendships with a same-sex stranger. I asked participants to report the amount of jealousy—along with theoretically-relevant emotions (e.g., anger, sadness) and also distractor emotions (e.g., pride)—that they felt in response to imagined scenarios (For information about the methods, analyses, and results of Studies 1 – 4, see Appendices A – E, respectively.)

Friendship Value

I first tested the prediction that the prospective loss of closer, more valued friends (versus more peripheral, less valued friends) would evoke greater reported friendship jealousy. Participants in both samples reported greater friendship jealousy at the prospect of *best* friends forming new, potentially closer friendships with a same-sex stranger than at the prospect of *close* friends doing the same. People also reported greater friendship jealousy at the prospect of *close* friends forming new, potentially closer friendships with a same-sex stranger than at the prospect of *acquaintances* doing the same (see Figure 1). Taken together, the data suggest that

friendship jealousy is sensitive to friend value.

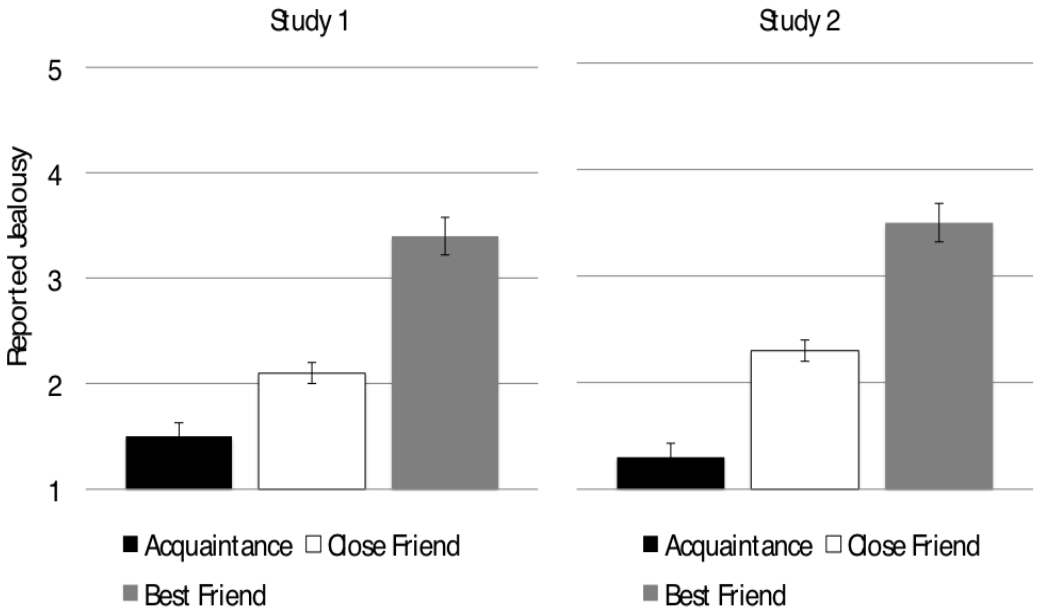


Figure 1. Reported jealousy in reaction to various same-sex friends (i.e., acquaintances, close friends, best friends) forming new, potentially closer friendships with a same-sex stranger from Studies 1 and 2. Error bars represent standard errors.

"Friend Guarding"

I also tested the prediction that friendship jealousy positively predicts behavioral intentions to "friend guard." In Study 2, participants were prompted, later in the study, to recall scenarios in which best friends formed new, potentially closer relationships with various other people (a same-sex stranger, the participant's own close friend, a new romantic partner). Participants were then asked to report the likelihood of engaging in a range of "friend-guarding" actions (e.g., "Monopolize my best friend's time"). Supporting predictions, friendship jealousy strongly and positively predicted behavioral intentions to friend guard.

Support for Functional Predictions: "Replacement Threat"

In addition to these more basic predictions about friendship jealousy, a functional perspective generates several sets of nuanced predictions. One set deals with the threats that evoke friendship jealousy. From a functional view, jealousy may be aroused when friends form new relationships because those new relationships can threaten to displace one from the "friendship niche" that he/she is currently occupying—as by fulfilling the same function for one's friend that one is currently fulfilling. Such replacement implies the diminishment and redirection of friend-mediated benefits (e.g., material resources, social support). This prediction that "replacement threat" evokes friendship jealousy can be contrasted with intuitive predictions that, for example, jealousy should be evoked when a friend spends comparatively more time with someone else (regardless of the function that new person serves for the friend).

Consider two situations wherein a man might be expected to react with jealousy: In one situation his best friend forms a new romantic relationship. In a parallel situation, his best friend forms a new same-sex friendship. The new romantic relationship might make very steep demands on the best friend's time. Presumably, time that a man's best friend spends with that new romantic partner cannot be spent with him. Indeed, a 17th century Welsh poet opined that "We may generally conclude the Marriage of a Friend to be the Funeral of a Friendship" (as quoted in Yalom & Brown, 2015, p. 83). Thus, one might reasonably expect that someone would feel deep jealousy at a best friend's forming a new romantic relationship. More specifically, someone would feel deep jealousy at a best friend's forming a new romantic relationship if such jealousy were driven by the prospective loss of time spent with the best friend (i.e., "time threat").

However, a man is likely to fulfill some functions for his best friend that are distinct

from those functions fulfilled by the new romantic partner. In other words, whereas the best friend's new romantic partner might take up a lot of the best friend's time, the new romantic partner does not stand to replace that man (i.e., to fulfill the same function that he does for the best friend and thus occupy his friendship niche). By contrast, the best friend's new same-sex friend might place comparatively lesser time demands on that best friend than would a new romantic partner. More importantly, however, it is likely that both the man and his best friend's new same-sex friend could fulfill similar functions for the best friend. Thus, the best friend's new same-sex friend poses a greater threat of replacing the man in his best friend's social circle than does the best friend's new romantic partner.

In sum, if time threat drives friendship jealousy, people should report greater jealousy at the best friend forming a new romantic relationship (as this presumably poses a greater time threat but a lesser replacement threat). If replacement threat drives friendship jealousy, people should report greater jealousy at the best friend forming a new same-sex friendship (as this presumably poses a lesser time threat but a greater replacement threat).

In Studies 1 and 2, participants were additionally asked to imagine best friends forming new, potentially closer relationships with various interlopers: a same-sex stranger (as discussed above), one of the participant's own same-sex close friends, and a romantic partner.[4] In both samples, participants reported greater friendship jealousy when best friends formed new, potentially closer friendships (with either a same-sex stranger or a same-sex friend) than when

[4] Most people typically form same-sex friendships and opposite-sex mateships. The paradigm I used presumed heterosexuality. Of note, however, is that these predicted effects replicate among the sample of non-heterosexual participants from Study 2 (N~60).

their best friends formed new, potentially closer romantic relationships. See Figure 2.

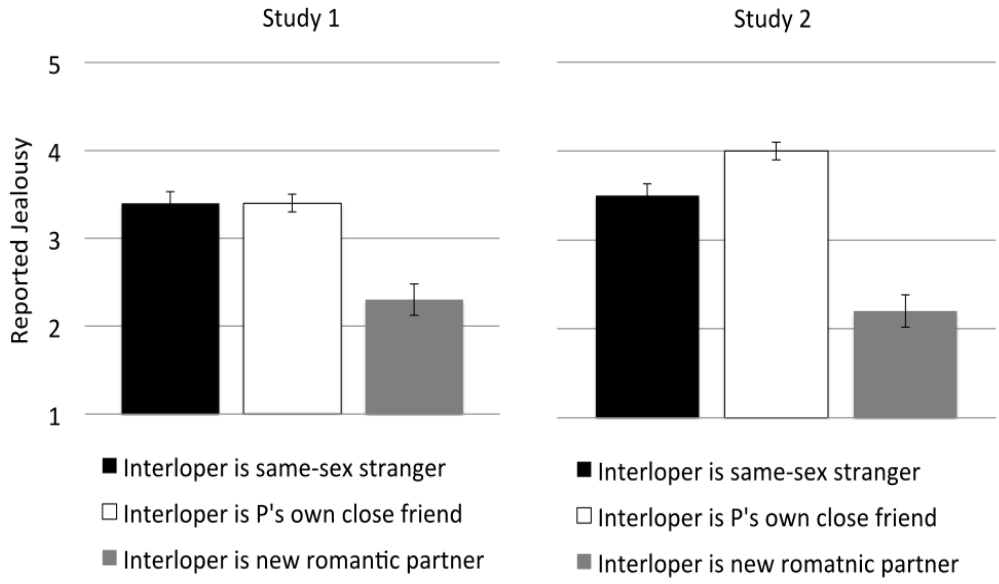


Figure 2. Reported jealousy in reaction to a same-sex best friend forming new, potentially closer relationships with various potential interlopers (i.e., a same-sex stranger, the participant's own same-sex close friend, a new romantic partner) from Studies 1 and 2. Error bars represent standard errors.

Using similar logic, I also explored friendship jealousy when same-sex best friends form new, potentially closer friendships with same- versus opposite-sex strangers (Study 3). A person's same- and opposite-sex friends might serve some distinct functions (e.g., Buss & Schmitt, 1993; Campbell, 2002). Therefore, same-sex strangers might pose greater replacement threats than opposite-sex strangers. A functional view thus predicts people would feel greater friendship jealousy at a best friend's new, potentially closer friendship with a same-sex stranger versus an opposite-sex stranger. In a third study, using undergraduate participants and a similar

design to Studies 1 and 2, I found that people reported greater friendship jealousy at the prospect of best friends forming new, potentially closer friendships with same- versus opposite-sex strangers.[5] See Figure 3.

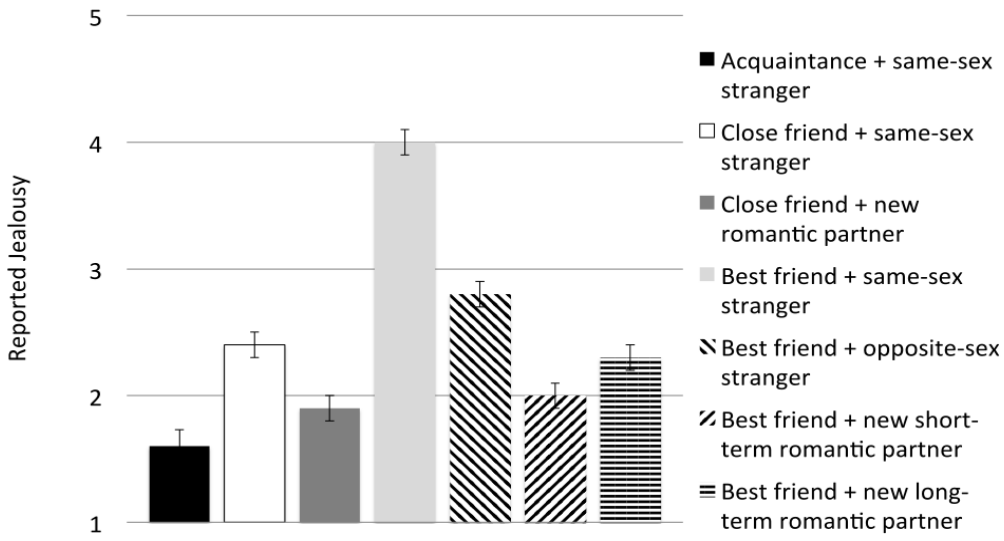


Figure 3. Reported jealousy in reaction to multiple scenarios in which various same-sex friends (i.e., acquaintances, close friends, best friends) form new, potentially close relationships with various interlopers from Study 3. Error bars represent standard errors.

This study also extended functional predictions about jealousy when friends form new friendships versus romantic relationships. Studies 1 and 2 varied the interloper type only for

[5] These opposite-sex strangers were explicitly noted as being purely platonic friends, therefore it is unlikely that this finding is a mere replication of the above finding that people are less jealous at the best friend's new (presumably opposite-sex) romantic relationship versus new same-sex friendship.

scenarios featuring best friends (but not close friends or acquaintances). Study 3 varied the interloper type for close friends. Results replicated the pattern of findings for best friends; that is, people reported greater jealousy when close friends formed a new, potentially closer relationship with a same-sex stranger than with a romantic partner.

Study 3 also assessed reactions to a best friend forming new, potentially closer short- and long-term romantic relationships. Studies 1 and 2 assessed jealousy in reaction to best friends forming new romantic relationships, but did not specify the type of romantic relationship (i.e., short- or long-term). Thus, one might have wondered, for example, whether participants assumed that the best friend's *new* romantic relationship was also short-term (and, e.g., would not take up much of the best friend's time and energy); this assumption may have caused reported jealousy to be attenuated in reaction to this scenario. When a best friend forms a new explicitly long-term romantic relationship, however, no such attenuation would be expected. Results revealed that—regardless of the type of romantic relationship specified—people report greater jealousy at best friends forming new same-sex friendships than new romantic relationships.[6] This further supports the functional prediction that friendship jealousy is calibrated to replacement threat.

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[6] Results also showed that participants reported greater jealousy over best friends forming a new long- versus short-term romantic relationship. Compared to short-term romantic partners, long-term partners might be more likely both to take up a best friend's time and energy and also to begin to fulfill some overlapping functions with best friends. Thus, this particular comparison is not helpful in testing between intuitive and functional predictions.

Support for Functional Predictions: Sex Differences

The second set of functional predictions deals with expected sex differences in friendship jealousy. To a great extent, males' and females' same-sex friendships are quite similar and can serve many of the same functions (e.g., Hruschka, 2010; Perlman et al., 2015). For example, men and women tend to have similar numbers of friends and social network sizes, place similar value on their friendships, and spend about the same overall amount of time with friends (e.g., Caldwell & Peplau, 1982; Dunbar, 2012).

However, psychological literature also recognizes some robust sex differences in men's and women's same-sex friendships (Benenson, 2014; Campbell, 2002; Geary, 1998). To the extent that men's and women's friendships have different structures and/or have historically served some sex-specific functions, men's and women's friendship jealousy might also take on somewhat different forms.

Women (Vs. Men) Report Greater Friendship Jealousy at the Prospective Loss of Best Friends

Cross-cultural evidence suggests that, whereas females tend to form one or two very close dyadic friendships, males tend to form looser multi-male friendship groups. Evidence for these robust structural differences come from contexts as disparate as children's play groups and adults' Facebook profile pictures (e.g., Benenson, 2014; Campbell, 2002; David Barrett et al., 2015; Kon & Losenkov, 1978; Vigil, 2007). To use the terminology of friendship niches (Tooby & Cosmides, 1996), this suggests that women might have one or two very deep niches for same-sex friends, whereas men might have more numerous, shallower niches.

One implication of these structural differences for men's and women's friendship jealousy is that women might invest more heavily in any one best (or close) friend than men do.

Thus, compared to a man, when a woman's best friend (or close friend) forms a new, potentially closer friendship with a same-sex stranger, she would be expected to experience greater levels of friendship jealousy. This prediction is consistent with findings from existing friendship jealousy work in children, which has shown that girls reported greater friendship jealousy than boys did (Parker et al., 2005).

Re-analyzing reported friendship jealousy data from Studies 1 and 2, I found that women report greater friendship jealousy than men do at the prospect of best friends forming new, potentially closer friendships with same-sex others (see Figure 4). In Study 2 (but not Study 1), women also reported greater friendship jealousy than men did at the prospect of close friends forming new, potentially closer friendships with a same-sex stranger. There were no significant sex differences at the prospect of best friends forming new, potentially closer romantic relationships.

Men (Vs. Women) Report Greater Friendship Jealousy at the Prospective Loss of Acquaintances

An evolutionary analysis of male and female friendships might also suggest that males' and females' same-sex friendships have also historically served some sex-specific functions (e.g., Benenson, 2014; Campbell, 2002; Geary, 1998; Hrdy, 2011). In particular, evidence from evolutionary anthropology and primatology suggest that ancestral males protected their groups in times of intergroup conflict, and that males' same-sex friends provided ready-made coalitions to engage in intergroup warfare (Geary, 1998; Geary & Flinn, 2002; Geary, Winegard, & Winegard, 2014; Wrangham, 1999).

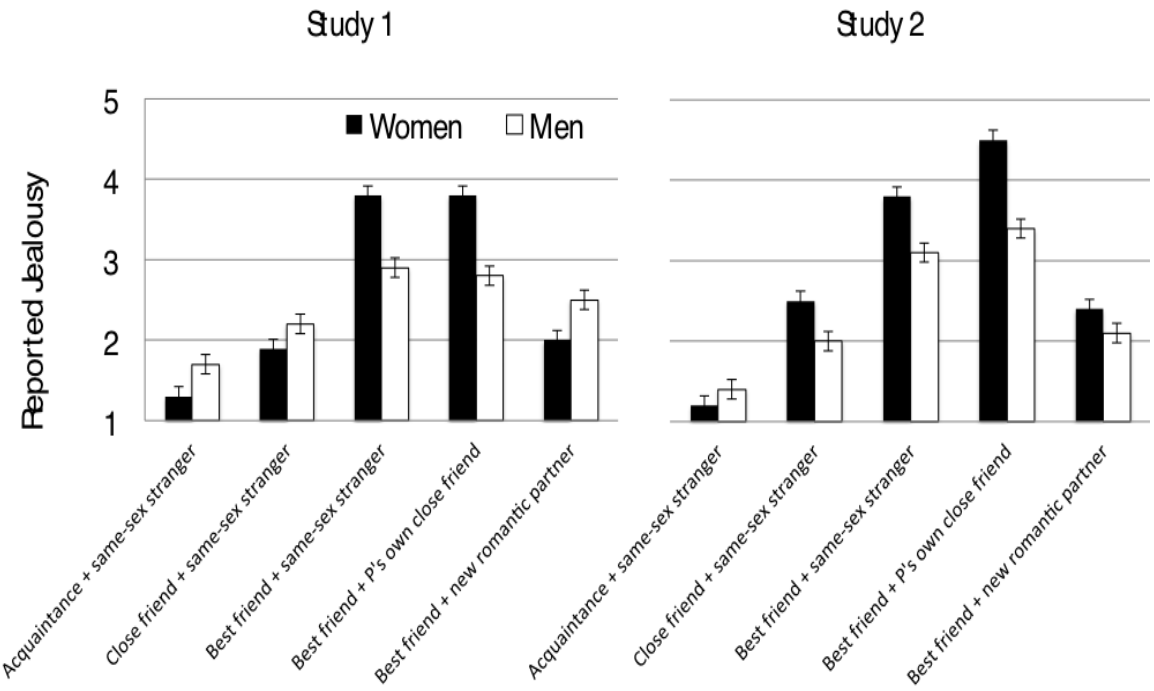


Figure 4. Women's and men's reported jealousy in reaction to various scenarios from Studies 1 and 2. Error bars represent standard errors.

In such conflicts, the size of one's group plays a powerful role (Johnson & MacKay, 2015; Kahlenberg, Thompson, Muller, & Wrangham, 2008; Wrangham, 1999). If the size of one's friend group has typically implied greater benefits for men than for women (Benenson et al., 2013; Johnson & MacKay, 2015; Wrangham, 1999), then men might experience greater jealousy at the prospective loss of those more peripheral friends than women might. Re-analyzing reported friendship jealousy data from Studies 1 and 2, I found that, compared to women, men tend to report greater friendship jealousy when acquaintances form new, potentially closer friendships with same-sex strangers. However, the size of this effect is quite small, and the level of jealousy over acquaintances was, as expected, quite low for both sexes.

Men (but not Women) Report Greater Friendship Jealousy at the Prospective Loss of Friends to a Rival Team (Vs. a Rival Person).

Given that particularly men's same-sex friends might have historically served coalitional purposes, another implication for friendship jealousy is that men might report greater jealousy when the coalitional nature of their friendships is made more salient. For example, if men's friends were cast as "teammates" who were to become potentially closer to a rival "team," this might lead men (but not women) to report greater friendship jealousy. For women, the possible defection of a friend to a rival team might still be jealousy-evoking, but likely not more so than the possible—and likely more recurrently-faced—defection of a best friend to a rival person.

In Study 4, I tested the prediction that men (but not women) would report greater friendship jealousy when friends-*cum*-teammates form new, potentially closer bonds with *rival teams* than when those same exact friends form new, potentially closer bonds with *rival people*. This study used an online adult participant sample. All participants completed two conditions, counterbalanced. In one condition, participants were asked to imagine being on a team with their same-sex friends and that those various friends were forming new, potentially closer relationships with a rival team. In the other condition, similar to previous studies, participants were asked to imagine the same friends forming new, potentially closer relationships with another same-sex person (here, a same-sex rival). After each instance, participants reported levels of jealousy, as well as theoretically-relevant and distractor emotions.

In line with predictions, men reported greater levels of friendship jealousy when imagining friends-*cum*-teammates possibly defecting to a rival team than when they imagined these same friends possibly defecting to a rival person (see Figure 5). By contrast, women showed the reverse pattern, reporting greater friendship jealousy when imagining friends

defecting to a rival person rather than to a rival team. Again, however, compared to men, women tended to report greater friendship jealousy overall. Specifically, women reported significantly greater friendship jealousy in the rival person condition, and also greater friendship jealousy in the rival team condition (but not significantly so).

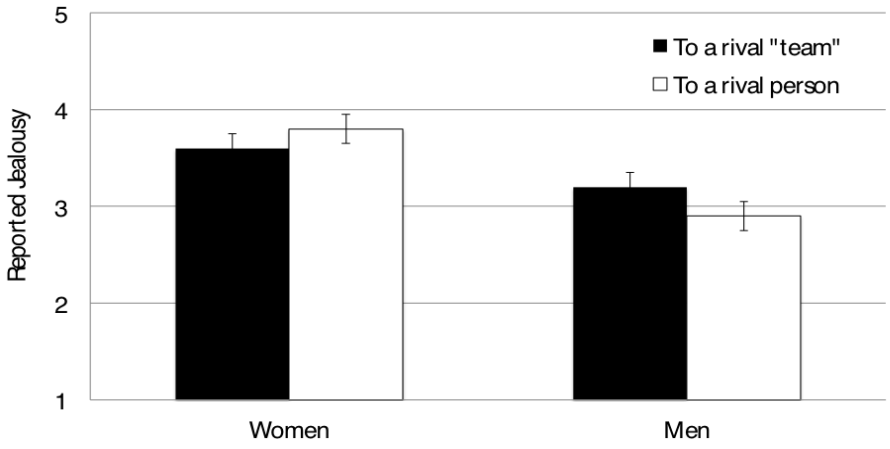


Figure 5. Women's and men's reported jealousy in reaction to friends defecting to rival "teams" and rival persons from Study 4. Error bars represent standard errors.

CHAPTER 3

METHODS

Introduction to the Focal Experiment

One of the most intriguing findings from Studies 1 – 3 is that people reported greater jealousy when friends formed new, potentially closer same-sex friendships (which presumably pose higher "replacement threat," but lesser "time threat") than when friends formed new, potentially closer romantic relationships (which presumably pose higher time threat, but lesser replacement threat). This finding supports the functional prediction that friendship jealousy is calibrated to replacement threat, perhaps more than it is calibrated to other threats that one might have intuitively expected—specifically the amount of time that one's friend might divert from the existing to the new relationship. Study 5 provides an explicit and experimental test of whether friendship jealousy is calibrated to time threat (as an intuitive view might predict) versus replacement threat (as a functional view would predict).

Study 5 thus orthogonally manipulates time threat and a particular version of replacement threat—one linking replacement threat to the Alliance Hypothesis of Friendship (DeScioli & Kurzban, 2009). This theory holds that one can have only so many friends, and also that a person's friends are ranked hierarchically in descending order of those one would support in a conflict between those friends. For example, all things equal, if one's best friend (first-ranked friend) had a conflict with one's fourth-ranked friend, one would likely support the best friend over the fourth-ranked friend. Relative to lower-ranked friends, then, higher-ranked friends receive support in possible

inter-friend conflict, and also, presumably, preferential access to other friend-mediated benefits (e.g., material resources, information).

Moreover, differently-ranked friends might be attuned to their relative rankings (and also the implications of those rankings; DeScioli & Kurzban, 2009; DeScioli, Kurzban, Koch, & Liben-Nowell, 2011). One cue to where a person falls in a friend's hierarchy is whether that friend supports him/her over another person in inter-friend conflict (DeScioli et al., 2011). For a concrete example, if Steve failed to support his new close friend Tony in Tony's conflict against Steve's long-time close friend Bucky, Bucky would likely infer that he still outranks Tony in Steve's friendship hierarchy. But if Steve *did* support his new friend Tony in Tony's conflict against Bucky, Bucky might instead infer that Tony had now "taken his place," replacing him in his previously-higher rank in Steve's friendship hierarchy. Replacement threat may thus be cued by a friend supporting someone else over oneself.

As in preliminary studies, manipulations regarding time and replacement threat were delivered via hypothetical scenarios. Complementing Studies 1 – 3, which varied the interloper as a proxy for implying levels of replacement and time threat, the focal study kept the interloper constant (a new, close same-sex friend). Thus, in all scenarios, the participant begins by imagining that the best friend has formed a new, close same-sex friendship. To vary time threat, participants imagine that the best friend is spending either much or little time with this new friend. To vary replacement threat, the participant is instructed to imagine that the best friend is attending a desirable social event at which space is limited, and that the best friend may take one friend as his/her guest. Both the participant and the new friend have voiced their desires to attend. In the low replacement

threat condition, the best friend decides to take the participant instead of the new same-sex friend. In the high replacement threat condition, the best friend decides to take the new same-sex friend instead of the participant. In the no-information control condition, the participant is informed only that the best friend can take one person to the social event.

This design allowed me to test the functional prediction that friendship jealousy is calibrated to replacement threat (over time threat). This is not to say that time threat is expected to have no effect. Indeed, insofar as the amount of time a best friend spends with a new friend cues the extent to which the new person might pose a current or eventual replacement threat, I would expect time threat to influence friendship jealousy. Thus, I predicted that (1) when there is no information about replacement threat (i.e., in the no-information control condition for replacement threat), time threat should drive the results. The more time that the best friend spends with the new friend, the more friendship jealousy should be evoked. However, (2) time threat will have less effect on friendship jealousy than will replacement threat. When available, replacement threat should largely override the effects of time threat, such that, when participants have direct and explicit information cueing replacement threat, their reported friendship jealousy should track replacement threat: High replacement threat should evoke high levels of friendship jealousy, and low replacement threat should evoke low levels of friendship jealousy.

Participants and Design

Based on a power analysis, I determined a sample size of approximately 400 participants was necessary. U.S. Participants were recruited from Amazon's Mechanical

Turk for a 15-minute study titled "Emotions and Social Networks." (See Appendix F for materials.) Given expected attrition, I attempted to recruit 450 participants. All of those participants—a maximum of 428 (218 females; M_{age} = 37.97; SD_{age} = 12.11)—who filled out focal dependent variables are included in analyses.

As in previous studies, participants first answered questions about their same-sex friends before imagining and responding to a social scenario. Here, however, participants read only one scenario. The scenario dealt with same-sex best friends forming a new, close friendship with a same-sex person. Participants were randomly assigned to a scenario reflecting one of six cells, given the 2 (time threat: high, low) x 3 (replacement threat: low, high, no-information control) between-subjects component of the experimental design.

After reading the scenario, participants then reported their reactions, including generalized jealousy, and both theoretically-relevant and distractor emotions (e.g., anger, sadness, happiness, relief) on a 7-point Likert-scale (1 = *Not at all*, 7 = *Very much*). Thus, in all, this study had a 2 (time threat: high, low) x 3 (replacement threat: no low, high, no-information control) x 10 [reactions] mixed-factors design.

Potential Moderators

In light of previous work on jealousy, participants also completed assessments of potential moderators. For example, some have theorized that a propensity for friendship jealousy is linked to low self-esteem (e.g., Ebrahimi et al., 2005; Parker et al., 2008). I measured *self-esteem* via the Rosenberg (1965) self-esteem scale, which contains items such as, "On the whole, I am satisfied with myself," scored on a 4-point Likert-type scale (1 = *Strongly disagree*, 4 = *Strongly agree*).

Theorizing from a similar camp might also expect that friendship jealousy would exist primarily among younger participants, asserting that normally-developing adults take a more "balanced" view of relationships that presumably precludes or attenuates feeling jealousy over friends forming new friendships (e.g., Parker et al., 2005; Selman, 1980). Included in the demographic measurements was a question on *participant age*.

One might also wonder whether the number of friends that one has—or, more specifically, the number of same-sex friends one has—might affect friendship jealousy. For example, perhaps those who have larger numbers of friends might experience lessened friendship jealousy (e.g., because they do not need any one friend as much, because they can easily become closer with other, existing friends). To assess this, I asked participants to report their *number of friends*, their *number of Facebook/online friends*, and their *number of same-sex friends*.

CHAPTER 4

RESULTS

Test of Focal Hypothesis

Focusing on reported friendship jealousy,[7] I found the predicted interaction between time threat and replacement threat, $F(2, 422) = 5.13$, $p = .006$, $\eta_p^2 = .024$, in addition to a marginally significant main effect of time threat, $F(1, 422) = 3.29$, $p = .071$, $\eta_p^2 = .008$, and a significant main effect of replacement threat, $F(2, 422) = 112.93$, $p < .001$, $\eta_p^2 = .349$.

Examining the main effect of time threat revealed that scenarios presenting high time threat evoked marginally greater friendship jealousy ($M = 2.91$, $SE = .11$) than did scenarios presenting low time threat ($M = 2.62$, $SE = .11$; $p = .071$). Examining the main

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[7] I conducted a 2 (time threat: high, low) x 3 (replacement threat: no-information control, high, low) x 10 [reactions] mixed-factors Analysis of Variance (ANOVA), which revealed significant main effects of replacement threat, $F(2, 422) = 19.55$, $p < .001$, $\eta_p^2 = .085$, and reactions, $F(9, 3798) = 84.18$, $p < .001$, $\eta_p^2 = .166$, as well as significant interactions between reactions and time threat, $F(9, 3798) = 3.21$, $p = .001$, $\eta_p^2 = .008$, reactions and replacement threat, $F(18, 3798) = 118.51$, $p < .001$, $\eta_p^2 = .360$, and time threat and replacement threat, $F(2, 422) = 3.58$, $p = .029$, $\eta_p^2 = .017$. These effects were qualified by a significant three-way interaction, $F(18, 3798) = 3.71$, $p < .001$, $\eta_p^2 = .017$. In keeping with the focus of this paper, I conducted planned follow-up comparisons to assess specific, *a priori* predictions regarding reported friendship jealousy. (See Appendix G for means [SDs] of all reactions.)

effect of replacement threat revealed that scenarios presenting high replacement threat evoked much greater friendship jealousy ($M = 4.38$, $SE = .14$) than did scenarios presenting no replacement threat information ($M = 2.40$, $SE = .14$; $p < .001$), and that scenarios presenting no replacement threat information evoked significantly greater friendship jealousy than did scenarios presenting low replacement threat information ($M = 1.52$, $SE = .14$; $p < .001$).

I explored the predicted interaction of time threat and replacement threat. In line with predictions, *only* in the no-information control condition for replacement threat did time threat drive results; as expected, more time spent with the best friend evoked greater reported friendship jealousy ($M = 2.90$, $SE = .19$) than did less time spent with the best friend ($M = 1.90$, $SE = .19$), $F(1, 422) = 13.38$, $p < .001$, $\eta_p^2 = .031$). See Figure 6.

Time threat did not affect reported friendship jealousy in the low replacement threat condition (when the best friend chose you over the new friend), which evoked relatively low levels of friendship jealousy overall ($M_{high\text{-}time} = 1.45$, $SE_{high\text{-}time} = .19$; $M_{low\text{-}time} = 1.58$, $SE_{low\text{-}time} = .19$; $p = .630$). Time threat also did not affect reported friendship jealousy in the high replacement threat condition (when the best friend chose the new friend over you), which evoked relatively high levels of friendship jealousy overall ($M_{high\text{-}time} = 4.38$, $SE_{high\text{-}time} = .19$; $M_{low\text{-}time} = 4.39$, $SE_{low\text{-}time} = .20$; $p = .984$). That time threat did not affect reported jealousy when replacement threat information was available—and particularly when replacement threat was specified as being low—suggests that people may use time threat as a cue to replacement threat. When more direct information about replacement threat is available, such information more strongly drives

friendship jealousy. Thus, this overall pattern of results suggests that friendship jealousy is calibrated more closely to replacement threat than to time threat.

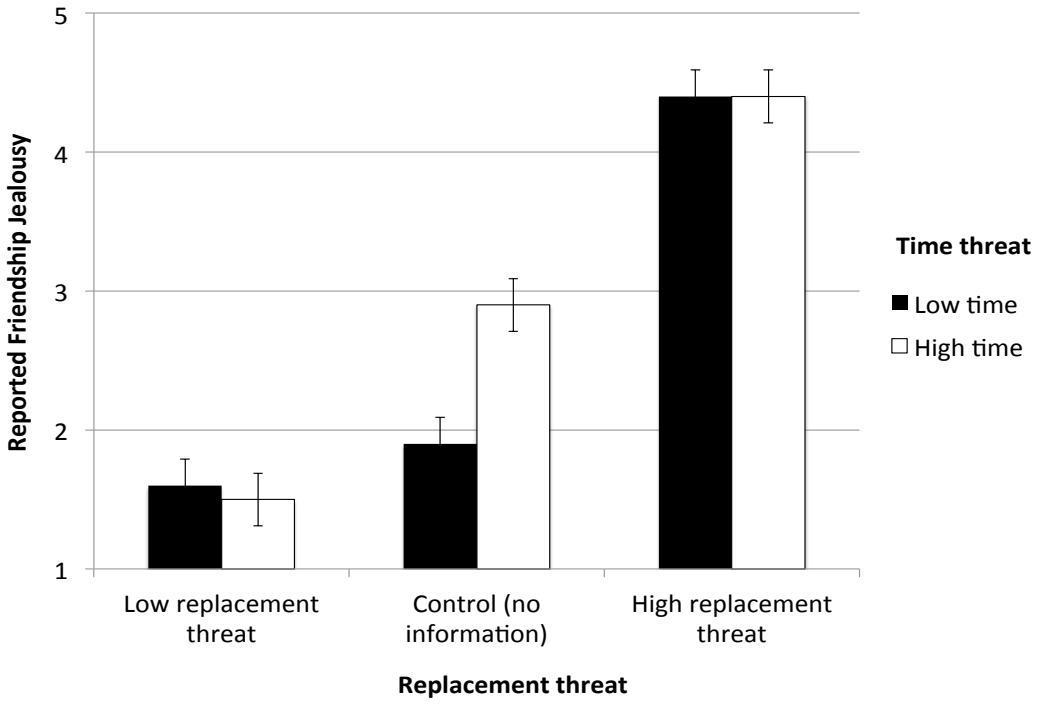


Figure 6. Reported levels of friendship jealousy as a function of time threat and replacement threat. Error bars represent standard errors.

Robustness of Results

I also explored whether self-esteem, participant age, number of friends, number of Facebook/online friends, or number of same-sex friends significantly affected the pattern of results. These variables did not moderate the predicted pattern of responding. Additionally, including these variables as covariates, each in a separate ANOVA, revealed that the predicted interaction of time and replacement threat—as well as the overall pattern of results gleaned from simple comparisons—were highly robust. The

inclusion of these variables failed to render the predicted omnibus interaction or the predicted comparisons non-significant.[8]

Sex Differences

Even as I did not predict that participant sex would critically moderate the pattern of results here, I additionally examined sex differences. The same pattern of findings holds for both male and female participants.

Including participant sex as a factor in a 2 (Participant sex) x 2 (time threat: high, low) x 3 (replacement threat: low, high, no-information control) between-subjects ANOVA again yields a marginally significant main effect of time threat, $F(1, 416) = 3.36$, $p = .068$, $\eta_p^2 = .008$, a significant main effect of replacement threat, $F(2, 416) = 113.67$, $p < .001$, $\eta_p^2 = .353$, and the predicted significant interaction between time threat and replacement threat, $F(2, 416) = 5.19$, $p = .006$, $\eta_p^2 = .024$. There was not a main effect of participant sex ($p = .153$). However, there was a significant interaction between participant sex and replacement threat, $F(2, 416) = 4.79$, $p = .009$, $\eta_p^2 = .023$.

Exploring this participant sex and replacement threat interaction revealed that, whereas participant sex did not influence reported friendship jealousy in the low or no-information control replacement threat conditions (ps < .250), participant sex did influence reported friendship jealousy in the high replacement threat condition, $F(1, 416) = 10.49$, $p = .001$, $\eta_p^2 = .025$. In this condition, women reported greater friendship

[8] Because self-esteem and the various "number of friends" measures were completed after the manipulations, I first examined whether they were influenced by those manipulations. They were not.

jealousy (M = 4.82, SE = .19) than men did (M = 3.93, SE = .20). This is consistent with preliminary findings, showing that, compared to men, women report greater jealousy when their dyadic best friendships are threatened (see Figure 7).

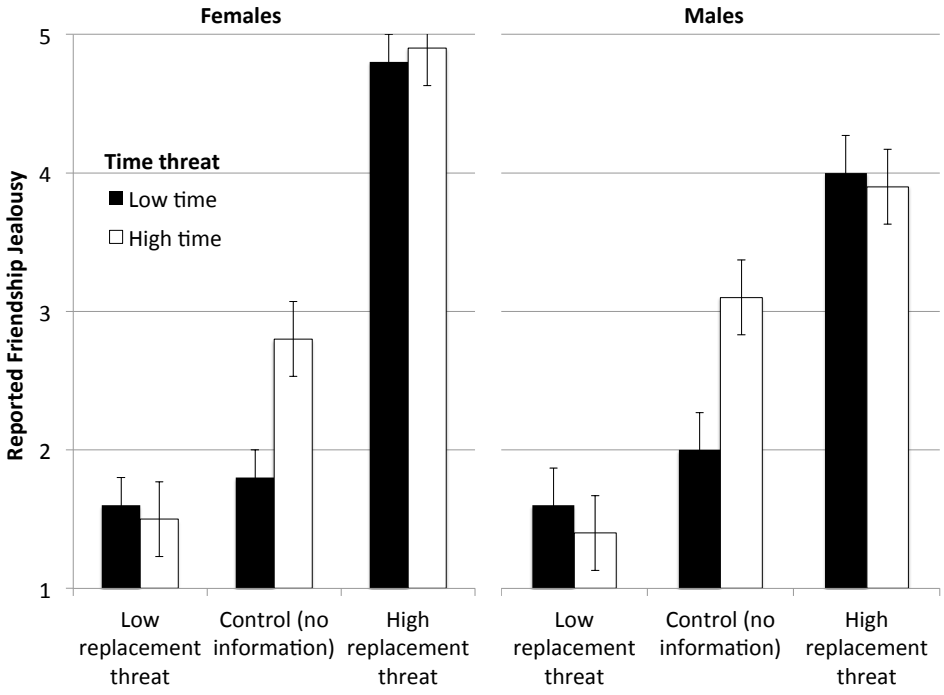


Figure 7. Women's and men's reported levels of friendship jealousy as a function of time threat and replacement threat. Error bars represent standard errors.

CHAPTER 5

DISCUSSION

A functional view supposes that, if friendship jealousy were an adapted response, ultimately facilitating friendship maintenance and friend retention when valued friendships are potentially threatened by other people, then friendship jealousy would be expected to possess a number of design features. Taking a functional view, I derived and tested—in a series of preliminary studies as well as a focal experiment—several sets of predictions regarding these design features of friendship jealousy.

One set of basic predictions—that threats to closer versus more peripheral friendships would evoke greater friendship jealousy, and that friendship jealousy levels would positively predict intentions to friend guard—was not distinctly functional. That is, both functional and other perspectives might expect friendship jealousy to (a) be stronger when closer friendships are threated and (b) motivate behavior aimed at friend retention (i.e., "friend guarding;" Buss, 2013; DeSteno et al., 2006). The results of preliminary experiments supported these basic predictions.

More importantly, two sets of distinctly functional predictions about friendship jealousy also received empirical support. One set of functional predictions regarded sex differences in friendship jealousy. Given structural differences in men's and women's friendships—females often form one or two extremely close, dyadic bonds, whereas males often from looser multi-male friendship groups—I predicted and found that women report greater friendship jealousy at the prospective loss of best friends than men do. Given that, ancestrally, males' same-sex friendships might have served some sex-specific functions—particularly in providing ready-made coalitions for intergroup conflict—I also

predicted and found that men (but not women) report greater jealousy at the prospect of losing friends-*cum*-teammates to rival social groups.

The other set of functional predictions regarded drivers of friendship jealousy. Although intuition might lead one to expect greater jealousy when a friend spends more time with a new person, a functional view expects greater jealousy when that new person threatens to fulfill the same function for one's friend that one is currently fulfilling (i.e., to "replace" him/her). Preliminary findings revealed that people report greater jealousy when friends form new same-sex friendships (which presumably pose greater "replacement threat" but lesser "time threat") versus new romantic relationships (which presumably pose lesser replacement threat but greater time threat). Findings provided initial support for the functional prediction that friendship jealousy is calibrated to replacement threat over time threat. The focal experiment (Study 5) critically extended this line of investigation.

Focal Findings and Implications

The purpose of the focal work was to orthogonally manipulate the effects of replacement threat and time threat on reported friendship jealousy, again pitting intuitive and functional predictions against one another. Complementing preliminary studies, which varied the interloper as a proxy for implying levels of replacement or time threat, the focal study kept the interloper constant (a new, close same-sex friend), and also explicitly manipulated both replacement threat and time threat. In line with functional predictions, results suggest that friendship jealousy is calibrated to replacement threat (over time threat). When people lack direct information about whether they are being replaced (i.e., in the no-information control condition for replacement threat), time threat

drives levels of reported friendship jealousy. When people have explicit information about replacement threat, however, the amount of time that a best friend spends with the new, close friend becomes largely irrelevant. Friendship jealousy is low when replacement threat is low, and friendship jealousy is high when replacement threat is high. This further suggests that people may use time threat as a cue to replacement threat when more direct information about replacement is unavailable, but that friendship jealousy is more strongly calibrated to replacement threat than it is to time threat.

This pattern of results was robust against several potential moderators—self-esteem, participant age, and number of reported friends—some of which existing theorizing and/or intuition might have expected to influence reported friendship jealousy (Ebrahimi et al., 2005; Parker et al., 2008; Selman, 1980). This pattern of results was also the same for both men and women, suggesting that friendship jealousy is more strongly calibrated to replacement threat (over time threat) for both sexes.[9]

Implications

The present work provides some of the first data on friendship jealousy in adults. This notion that friendship jealousy might serve functional ends challenges existing developmental research on friendship jealousy (e.g., Parker et al., 2005; Selman, 1980),

[9] Consistent with sex differences predicted and found in preliminary studies, such that women reported greater friendship jealousy when their dyadic best friendships were potentially threatened by interlopers, women also reported greater friendship jealousy in the high replacement threat condition (i.e., when their dyadic best friendships were potentially threatened by interlopers) than men did.

as well as some non-functional work on jealousy more generally (see Buss, 2013 for a review). Existing accounts of friendship jealousy have assumed that such "immature" feelings abate after adolescence in normally-developing individuals, and are thus not present or would be extremely low in the majority of adults (Parker et al., 2005; Selman, 1980). This view might thus have expected that adults' reported feelings of friendship jealousy, if at all present, would be strongest among younger participants. In contrast to these assumptions, however, the focal study revealed high levels of friendship jealousy among adults. Participant age did not influence reported feelings of friendship jealousy.

Similarly, existing work has also suggested that friendship jealousy may be driven by low self-esteem (e.g., Ebrahimi et al., 2005; Parker et al., 2008). Participant self-esteem was not correlated with friendship jealousy, nor did self-esteem affect the pattern of friendship jealousy predicted and found here. Overall, my findings are largely inconsistent with these existing theories of friendship jealousy.

Instead, these findings begin to make a functional case for friendship jealousy. The data presented here represent one part of a possible nomological network supporting the assumption that friendship jealousy may be adapted (e.g., Schmitt & Pilcher, 2004). Other evidence might include findings of friendship jealousy among non-Western peoples, which would counter notions that feelings of jealousy are a purely Western social construction and/or the result of capitalist society (e.g., Bhurga, 1993). Observational evidence of friendship jealousy is already present in the ethnographic record (see Hruschka, 2010). Employing the scenarios used here in cross-cultural samples could investigate the possible universality of friendship jealousy's psychological features.

An additional feature of this network might come from non-human animal behavior. Although not evidence for *feelings* of friendship jealousy per se, behavior consistent with the expected and functional outcomes of friendship jealousy has been observed among non-human animals. For one example, genetically-unrelated chimpanzees have been described as "jealously prevent[ing] the formation of rival relationships" (DeScioli & Kurzban, 2012, p. 211). For another example, Vavra (1979) observed that female free-ranging horses in southern France and Spain—which are known to form close dyadic bonds with one another—can bite, kick, and otherwise attack same-sex interlopers who approach their dyadic partners (as cited in Innis Dagg, 2004, p. 54). Additional observational and/or experimental work in non-human animals could reveal further behavioral reactions that may be consistent with friendship jealousy (e.g., friend-guarding behavior).

Methodological Considerations and Future Directions

Here, I used hypothetical scenarios to explore reported jealousy, and I asked participants for their responses to these scenarios, as is common in related research (e.g., see Buss, 2013; Daly et al., 1982; Parker et al., 2005). Some have raised questions about using self-reported jealousy, particularly among adult participants—because, for example, friendship jealousy is a negative feeling, and friendship jealousy might be considered shameful to experience and thus report (Harris, 2003; Parker et al., 2010). On this view, one might expect a response bias toward consistently low levels of reported friendship jealousy. However, participants reported levels of friendship jealousy that not only systematically varied in line with predictions, but also went above the midpoint of

the scale (in Study 5's high replacement threat condition), suggesting that this particular response bias is unlikely to be problematic for the results presented here.

Friendship jealousy was measured as a single self-report item. Although this single-item assessment of reported friendship jealousy was the outcome of interest, I also measured a number of other responses to imagined scenarios. Participants showed a similar pattern of responding on items assessing anger, sadness, and reverse-coded happiness as they did to jealousy. (See Appendix G for means [SDs] of all reported emotions in Study 5.) Anger and sadness are discrete, basic emotions that existing literature deems theoretically and phenomenologically linked to jealousy; indeed, jealousy is considered a mix of these emotions (Bringle, 1991; Hupka, 1991; Parrott & Smith, 1993; Sharpsteen, 1991; Sharpsteen & Kirkpatrick, 1997). This pattern of responding might increase confidence that the measure of jealousy used here is assessing the construct of interest.

Converging evidence

Nevertheless, complementary methods would be useful in further investigating friendship jealousy and also attenuating concerns about other potential issues (e.g., related to the use of hypothetical scenarios, reporting biases, single-item measures). Experience sampling and/or daily diary studies might be especially helpful in exploring whether and in what instances friendship jealousy is evoked in real-time. Similarly, one might also ask participants to *recall* real-world experiences of friends having formed various new relationships, again complementing friendship jealousy findings from these experiments. Such methods would allow for the exploration of friendship jealousy in a less controlled but potentially more ecologically valid way.

Additionally, converging evidence could come from physiological studies measuring, for example, heart rate, electrodermal activity, electromyographic activity, and skin temperature in reaction to hypothetical jealousy-inducing scenarios and/or recalled real-world events. If, for example, people showed the same patterns of physiological arousal to replacement and time threat as participants self-reported here, this would provide further corroboration for the functional prediction that friendship jealousy is more strongly calibrated to replacement threat (over time threat).

Likewise, some cognitive methods have also been used, particularly to explore sex differences in romantic/sexual jealousy (e.g., Buss, 2013; Schutzwohl & Koch, 2004). For example, Schutzwohl and Koch (2004) embedded previously-validated cues to either emotional or sexual infidelity in scenarios. One week after presenting those scenarios, they gave participants a surprise memory-recall test. In line with functional predictions, men remembered more cues to sexual infidelity and women remembered more cues to emotional infidelity. Such methods might be useful for further investigating sex differences in friendship jealousy. For example, that same procedure could be used for exploring men's and women's responses to friends defecting to rival social groups versus rival persons (e.g., Do men better remember cues to group defection than women, and do women better remember cues to rival person defection than men?).

In all, taking a multi-method approach to investigating various features of friendship jealousy could build a body of research as formidable and robust as the existing work on romantic/sexual jealousy.

The Present Scenarios: Time threat, replacement threat, and other cues

Another consideration would be the particular scenarios used in the present experiment (Study 5). No single manipulation is perfect; here, it is possible that time threat was less "threatening" than replacement threat. That is, participants imagined that their best friends had become close to a same-sex stranger and were spending either a great deal of time with this person (high time threat) or not a lot of time with this person (low time threat). This time threat operationalization was not explicitly zero-sum; although it is implied, it was not made explicit that time the best friend spent with the new person was time not spent with the participant. However, it was inherent in the replacement threat wording that the choice of whom to bring to the party was zero-sum. (See Appendix F.). In future studies, one might strengthen the wording of the time threat manipulation, amplifying its zero-sum nature.

This experiment additionally made salient a specific version of replacement threat, one in line with the Alliance Hypothesis of Friendship (DeScioli & Kurzban, 2009). Although this instantiation of replacement threat overrode time threat, one might wonder whether replacement threat is necessarily the most salient cue to friendship jealousy. Indeed, research, observation, and intuition point out other possible cues as potential drivers of friendship jealousy (e.g., closeness of the best friend and new person, the best friend exchanging goods or favors with the new person, the best friend sharing privileged personal information with the new person, the best friend depending on the new person; e.g., Balliet, Tybur, & van Lange, 2016; Benenson, 2014; Tannen, 2017; Yalom & Brown, 2015).

Taking a broadly computational view, I would expect that a friendship jealousy "system" should be sensitive to any number of cues—all in service of making an

inference about whether the focal friendship and its associated benefits are about to be lost and diverted to another person.[10] To the extent that any cue reliably covaries with the loss or diminution and redirection of such friendship benefits—whether those benefits take the form of support in conflict (DeScioli & Kurzban, 2009, 2012), reciprocal exchange (Trivers, 1971), material support in times of dire need (Sugiyama, 2004; Tooby & Cosmides, 1996), or so on—that cue should spur feelings of friendship jealousy. More direct and/or reliable cues would be expected to override potentially more distal and/or weaker ones. Given the pattern of findings in the present work, this would imply that replacement threat is a more direct and/or reliable cue than time threat is.

Other Avenues for Future Exploration

The present work laid some foundations for further exploration of friendship jealousy. For example, I began to test some potential moderators of participants' friendship jealousy. Future work might continue to explore this, as participants' dispositional concerns or other individual differences could moderate their reactions to jealousy-inducing scenarios (e.g., zero-sum thinking, rejection sensitivity; cf. Miller &

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[10] This consideration points out an important boundary condition. To the extent that friendship jealousy is specifically about the loss of a friend/friend-related benefits *and also the redirection of that friend/friend-related benefits to another person*, scenarios describing loss alone (e.g., one's best friend seems to have withdrawn from him/her) should evoke negative emotions, but would not be expected to evoke friendship jealousy. Scenarios describing loss *and* cues to possible redirection to another person would be expected to evoke friendship jealousy.

Maner, 2009; Zengel, Edlund, & Sagarin, 2013). Below, I focus on two particular areas for future work that might prove especially fruitful: participants' reactions to interloper features and friend guarding.

Interloper Features

Functional research on romantic/sexual jealousy has found that certain evolutionarily-relevant interloper features evoke greater romantic/sexual jealousy (e.g., Schmitt & Buss, 2001). For example, given male mate preferences, a physically attractive female interloper seems to be especially threatening to other women, thus evoking higher levels of reported romantic/sexual jealousy among women.

What interloper features might be especially threatening in friendship contexts, thus evoking high levels of friendship jealousy? To answer this, one might first look to existing research on friend preferences. People are thought to prefer friends who are frequently encountered (i.e., physically proximate to them), similar to them, and familiar to them (e.g., Verbrugge, 1983). People also highly value trustworthiness in friends (e.g., Cottrell, Neuberg, & Li, 2007). Further, friends are often same-sex and similar in age (e.g., Benenson, 2014). Perhaps, then, scenarios describing interlopers as having those features linked to friendship preferences would evoke the greatest friendship jealousy.

In line with the functional view presented here, however, one might predict that whichever features render an interloper a particularly strong replacement threat should evoke the greatest friendship jealousy. Consider a friendship that serves the primary function of helping one another study for physics tests. On this view, a same-sex interloper who was frequently encountered (e.g., whom the best friend sat next to during the rest of the school day) but was bad at physics might be less threatening than an

interloper who was rarely encountered but great at physics. Future work may explicitly manipulate interloper features, exploring how these features affect friendship jealousy and subsequent friend guarding.

Friend Guarding

On a functional view, friendship jealousy should motivate behavior that protects the valued friendship (i.e., "friend guarding"). Friend guarding itself could be the topic of an entire line of research. Indeed, friend guarding is likely composed of multiple tactics (e.g., vigilance, direct or indirect aggression toward friends, direct or indirect aggression toward interlopers). Further, each of these tactics might be preferentially deployed depending on a number of factors (e.g., the sex of the actor, the type of interloper, features of the interloper, features of the actor).

The present framework would make some predictions about what future friend guarding research might find.[11] For example, one might expect sex differences in friend

[11] In preliminary work, I developed and tested a friend-guarding scale by adapting a mate-guarding scale, finding very low reported intentions to friend guard. This might imply that, although people strongly mate guard, they do not strongly friend guard. If correct, perhaps the presumed greater exclusivity of typical mating relationships, as compared to typical friendships, causes greater jealousy and guarding. However, there may be qualitative differences between romantic relationships (and mate guarding) and friendships (and friend guarding), such that the current friend-guarding scale either lacked relevant items assessing frequent, intense friend guarding behavior and/or included items that are relevant for mate guarding but not friend guarding. Future work

guarding. In particular, given that women reported greater friendship jealousy at the prospective loss of best friends than men did, women would be expected to engage in greater friend guarding over best friends than men would. Preliminary findings provide some initial support for this prediction. Second, women and men might also prefer differing tactics of friend guarding. Compared to men, women might avoid deploying more overt and/or directly aggressive tactics toward same-sex friends or interlopers, as women are generally less likely to engage in such behavior (e.g., Benenson, 2014; Campbell, 2002; Miller & Maner, 2008).

Additionally, friend guarding might quantitatively and qualitatively differ depending on the type of interloper. For example, a best friend forming a new, potentially closer romantic relationship (versus a new same-sex friendship) might spur low overall levels of friend guarding. A best friend forming a new, potentially closer friendship with one's own same-sex close friend (versus a same-sex stranger) might spur high levels of friend guarding via some tactics (e.g., those involving keeping friends apart or keeping both friends interested in oneself), but very low levels of friend guarding via tactics that might be damaging to one's existing relationship with the interloper. Moreover, interloper features might figure prominently in the deployment of various tactics. For example, one would not be expected to enact physical aggression toward a same-sex interloper who was much more physically formidable than oneself.

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might explore alternative procedures for measuring friend guarding (see, e.g., Fisher & Cox, 2011).

Finally, the emotionally-mixed nature of friendship jealousy might also have consequences for friend guarding. Recall that jealousy can feel like a mix of anger, sadness, and anxiety (e.g., Parrott & Smith, 1993; Sharpsteen, 1991; Sharpsteen & Kirkpatrick, 1997). A functional approach might expect that anger- and sadness-tinged jealousy would not only be evoked by somewhat different situations, but also that these flavors of jealousy might motivate different tactics of friend guarding (e.g., Al-Shawaf, 2015; Miller & Maner, 2008; Sell, Tooby, & Cosmides, 2009). Anger-tinged jealousy, for example, might be engaged when the interloper is less formidable than oneself, and might motivate one to engage in friend-guarding tactics involving overt aggression toward the interloper. Sadness-tinged jealousy might be engaged when one has lesser ability to inhibit the defection of a friend, and might instead motivate one to withdraw from the target friend (cf. Miller & Maner, 2008). When successful, both types of friend guarding should facilitate similar outcomes—causing the friend to maintain and/or increase investment in the existing friendship. One might also imagine, however, that each mode of friend guarding could also backfire (e.g., a best friend gets upset at the actor for jealously harming the interloper, the best friend fails to react to the actor's withdrawal). Whether, how, and in which situations people friend guard remains largely unexplored.

Conclusion

I proposed that "friendship jealousy" arises when people perceive others as posing threats to valued friendships, and that this response may ultimately function to prevent friendship loss and friend defection. In preliminary experiments, I tested predictions derived from this functional view. Preliminary findings suggested that (1) greater friendship jealousy is evoked at prospective threats to closer (versus more peripheral) friendships, and (2) friendship

jealousy positively predicts behavioral intentions to friend guard. (3) Friendship jealousy has sex-differentiated design features, which are consistent with sex differences in friendship structures and historical friendship functions. Building on preliminary findings assessing drivers of friendship jealousy, the focal experiment further supports a functional view: Friendship jealousy is more strongly calibrated to the extent that the interloper stands to replace a person in his/her best friendship than it is to the amount of time that the best friend and interloper spend together. In all, findings suggest that, although negative to experience, friendship jealousy might ultimately function to serve prosocial ends.

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APPENDIX A

JEALOUSY RESULTS FOR STUDY 1

In Study 1, I first addressed predictions regarding what evokes friendship jealousy. Specifically, I tested the basic hypothesis that friendship jealousy is calibrated to friend value, such that people report greater friendship jealousy for closer, more valued friends (versus more peripheral, less valued friends). I also tested a more nuanced functional hypothesis—that friendship jealousy is calibrated to "replacement threat" versus "time threat," such that people report greater friendship jealousy when friends form new same-sex friendships versus new romantic relationships (as same-sex friendships ostensibly pose higher replacement threat and lower time threat than do romantic relationships).[12]

Method

Adult participants ($N = 122$; 69 female; $M_{age} = 35.77$, $SD_{age} = 11.31$) were recruited from Amazon's Mechanical Turk (MTurk) online participant platform and participated in return for small monetary compensation. Participants completed a two-part task.

In the first part of the task, participants reported their sex and then a range of information about their existing same-sex friends and friendships. Specifically, participants were first asked to give the names (first name, last initial) of a series of same-sex others whom they saw in their day-to-day lives: a best friend (defined as the "one same-sex friend to whom the participant felt most close"), a close friend who was not already friends with the best friend (close friend #1), a second close friend who was not

[12] The conduct of the research reported here was approved by the Arizona State University IRB.

already friends with the best friend (close friend #2), and an acquaintance. Participants were then asked to fill out a series of questions about several of these friends and these friendships, which are not discussed here (e.g., self-reported closeness; Aron, Aron, & Smollan 1992).

In the second and experimental section of the task, participants were asked to imagine five different scenarios regarding friends forming a new, potentially closer relationship with another person; these were presented in randomized order. Each scenario used the names of the friends reported in the first part of the task. Specifically, participants were instructed: "Imagine that [Acquaintance] and another same-sex person met up and started to really enjoy one another's company. You haven't previously met this other person, but [Acquaintance] is spending a lot of time with them. They're becoming fast and close friends---maybe even closer with one another than you are with [Acquaintance]."

In all, participants were asked to imagine three scenarios in which friends of varying closeness and value (acquaintance, close friend #1, best friend) formed a new friendship with a same-sex stranger and that this new relationship was potentially closer than the one the participant had with the target friend (i.e., acquaintance, close friend #1, best friend). An additional two other scenarios asked participants to imagine the best friend becoming potentially closer to the participant's own close friend (close friend #2), and to a new romantic partner. Scenarios were presented in randomized order.

After each scenario, participants filled out a series of self-reported items assessing responses. Responses assessed included jealousy, emotions commonly associated with

jealousy (e.g., anger, sadness), and other distractor emotions. Reactions were assessed on a 7-point Likert-scale (1 = *Not at all*, 7 = *Very much*).[13]

Results and Discussion

Does jealousy vary as a function of "friend value"? I predicted that people would report greater friendship jealousy at the prospective loss of closer and more valued friends versus more peripheral and less valued friends. Exploring reported friendship jealousy across the five scenarios revealed a significant effect of scenario, $F(4, 484) = 46.10$, $p < .001$, $\eta_p^2 = .275$.

As expected, the prospective loss of the best friend to a same-sex stranger evoked greater reported friendship jealousy (M=3.41, SE=.18) than did the prospective loss of a close friend to a same-sex stranger ($p < .001$, 95%CI =[.979, 1.693]). The prospective loss of a close friend to a same-sex stranger evoked greater reported friendship jealousy (M=2.07, SE=.13) than did the prospective loss of an acquaintance to a same-sex stranger (M=1.50, SE=.10, $p < .001$, 95%CI =[.331, .816]). This suggests that the prospective loss of increasingly close, valued friends evokes increasing friendship jealousy, supporting the prediction that friendship jealousy is sensitive to "friend value."

Does jealousy vary as a function of "replacement threat"? I also predicted that friendship jealousy would vary as a function of whether the interloper stands to replace the participant (i.e., "replacement threat"). To test this, I explored reported friendship jealousy in reaction to the best friend forming new same-sex friendships (with a same-sex

[13] Given the focus of the current work, and in keeping with the results discussed in the main manuscript, I discuss only findings for the jealousy item in Appendices.

stranger, with close friend #2) or a new romantic relationship. Because friends and romantic partners fulfill different functions, or friendship niches, I expected that the best friend's forming a new opposite-sex romantic relationship would evoke lesser reported friendship jealousy than would either scenario in which the best friend forms a new same-sex friendship.

Exploring these simple comparisons in light of the above-reported significant omnibus test supports those specific predictions: People reported significantly lesser levels of reported friendship jealousy at the best friend forming a new romantic relationship (M=2.28, SE=.15), as compared to the best friend forming a new friendship with either a same-sex stranger (M=3.41, SE=.18, $p < .001$, 95%CI =[.-1.549, -.713]), or with the participant's own close friend (M=3.40, SE=.17, $p < .001$, 95%CI =[-1.506, -.740]).

APPENDIX B

JEALOUSY RESULTS FOR STUDY 2

Study 1 supported the predictions that friendship jealousy is calibrated to friend value and that friendship jealousy is calibrated to replacement threat (over time threat). In this second study, I replicate findings from Study 1 in a larger undergraduate sample. Additionally, I test the prediction that friendship jealousy might motivate threat-relevant behavior—that is, that reported friendship jealousy strongly and positively predicts behavioral intentions to engage in "friend guarding."

Method

Adult participants ($N = 466$; 253 female; $M_{age} = 20.06$, $SD_{age} = 2.04$) were recruited from an undergraduate subject pool and participated in a three-part task in return for course credit. The first and second parts of this task were identical to those in Study 1.

New to Study 2, I assessed participants' behavioral intentions to engage in "friend guarding." At the end of Study 2, participants were asked to recall three scenarios (the best friend becoming potentially closer with a same-sex stranger, the best friend becoming potentially closer with close friend #2, and the best friend becoming potentially closer with a new romantic partner), in randomized order. After recalling and re-immersing themselves in each scenario, participants filled out a 44-item friend guarding scale (e.g. "How likely would you be to…monopolize your best friend's time?"; $\alpha = .97$) that I created by adapting the existing Mate Retention Inventory, which assesses people's mate-guarding intentions (Buss, Shakelford, & McKibben, 2008; Shackelford, Goetz, & Buss, 2005). Friend-guarding intentions were assessed on a 7-point Likert-scale (1 = *Not at all likely*, 7 = *Very likely*).

Results and Discussion

Does jealousy vary as a function of friend value? I examined specific predictions in light of a significant omnibus test assessing reported jealousy across the five scenarios, $F(4, 1860) = 288.93$, $p < .001$, $\eta_p^2 = .383$.

As expected, the prospective loss of the best friend to a same-sex stranger evoked greater reported friendship jealousy (M=3.47, SE=.09) than did the prospective loss of a close friend to a same-sex stranger ($p < .001$, 95%CI =[1.024, 1.382]), and the prospective loss of a close friend to a same-sex stranger evoked greater reported friendship jealousy (M=2.27, SE=.08) than did the prospective loss of an acquaintance to a same-sex stranger (M=1.33, SE=.04, $p < .001$, 95%CI =[.798, 1.095]). This replicates findings from Study 1 and further suggests friendship jealosuy is calibrated to friend value.

Does jealousy vary as a function of "replacement threat"? To test whether friendship jealousy is calibrated to replacement threat (versus time threat), I again explored reported friendship jealousy in reaction to the best friend forming either same-sex friendships (with a same-sex stranger, with close friend #2) or a romantic relationship. Exploring simple comparisons in light of the above-mentioned significant omnibus test supports functional predictions: People reported significantly lesser levels of friendship jealousy at the best friend forming a new romantic relationship (M=2.24, SE=.08) as compared to the best friend forming a new friendship with either a same-sex stranger (M=3.47, SE=.09, $p < .001$, 95%CI =[.-1.406, -1.066]), or with the participant's own close friend (M=4.00, SE=.09, $p < .001$, 95%CI =[-1.943, -1.581]). This replicates findings from Study 1 and further suggests that friendship jealousy is calibrated to replacement threat over time threat.

Does jealousy predict levels of "friend guarding"? To determine whether levels of reported jealousy might motivate reported behavioral intentions to engage in friend guarding, I first created two composites: a "best friend jealousy" composite consisting of participants' reported jealousy in reaction to each scenario in which best friends formed new relationships ($\alpha = .77$), and a composite of "best friend-guarding intentions," consisting of reported behavioral intentions to friend guard in reaction to each scenario wherein best friends formed new relationships ($\alpha = .91$). Consistent with predictions, best friend jealousy was significantly, positively, and strongly correlated with best friend-guarding intentions, $r(468) = .511$, $p < .001$.

I also examined whether intentions to guard one's best friend varied in the same ways that people's reported jealousy varied; that is, I examined whether people reported stronger behavioral intentions to guard their best friends from same-sex others (stranger, close friend #2) as opposed to new romantic partners. I explored the simple effects of the significant omnibus test exploring differences in behavioral intentions to friend guard across the three scenarios, $F(2, 924) = 94.05$, $p < .001$, $\eta_p^2 = .169$. Consistent with predictions, people reported greater behavioral intentions to friend guard in response to a best friend forming a new friendship with a same-sex stranger (M=1.87, SE=.09) than in response to a best friend forming a new romantic relationship (M=1.49, SE=.03, $p < .001$, 95%CI =[.318, .443]). Similarly, people reported greater behavioral intentions to friend guard in response to a best friend forming a new friendship with their own close friends

(M=1.73, SE=.04) than in response to a best friend forming a new romantic relationship ($p < .001$, 95%CI =[.182, .287]).[14]

[14] Although participants reported greater levels of jealousy in response to a best friend becoming potentially closer with participants' own close friends than with a stranger, participants reported stronger behavioral intentions to friend guard in response to a best friend becoming potentially closer with strangers than with participants' own close friends ($p < .001$, 95%CI =[.097, .196]). Whereas this renders the overall pattern of friend guarding intentions not entirely consistent with the pattern of reported jealousy, this finding is nevertheless consistent with the notion that at least some tactics of friend guarding (e.g., those requiring physical action against the interloper) would be far less likely when that interloper is an existing friend.

APPENDIX C

JEALOUSY RESULTS FOR STUDIES 1 & 2: EVIDENCE FOR SEX DIFFERENCES

Studies 1 and 2 both gathered demographic data, including participant sex. Using those data, I was able to test the predictions that, compared to men, (1) women would report greater levels of friendship jealousy overall (Studies 1 & 2), (2) women would report greater behavioral intentions to engage in (best) friend guarding (Study 2), and (3) sex differences in reported friendship jealousy would statistically mediate the relationship between participant sex and behavioral intentions to (best) friend guard.

I also tested the predictions that, whereas (4) females would report greater levels of friendship jealousy at the prospective loss of their few, close friends (i.e., best and perhaps also friends) to possible interlopers than males would, (5) males might report greater levels of friendship jealousy at the prospective loss of their acquaintances than females would. If these predictions were supported, it would further imply that there may be evolutionarily-cogent sex differences in the features of friendship jealousy.

Are there Sex Differences in Reported Friendship Jealousy?

Study 1. A 2 (Participant sex) x 5 [Scenario] mixed-factors ANOVA revealed significant main effects of participant sex, $F(1, 120) = 4.99$, $p = .027$, $\eta_p^2 = .040$, such that, as expected, women reported greater overall levels of friendship jealousy (M=2.72, SE=.13) than men did (M=2.29, SE=.15), and of scenario, $F(4, 480) = 43.08$, $p < .001$, $\eta_p^2 = .264$. These effects were qualified by a significant participant sex x scenario interaction, $F(4, 480) = 5.49$, $p = .001$, $\eta_p^2 = .044$.

As expected, compared to male participants (M=2.94, SE=.27), female participants reported greater friendship jealousy in reaction to a best friend's becoming potentially closer with a same-sex stranger (M=3.77, SE=.24), $F(1, 120) = 5.15$, $p = .025$, $\eta_p^2 = .041$. Similarly, compared to male participants (M=2.83, SE=.25), female

participants reported greater friendship jealousy in reaction to best friends becoming potentially closer with participants' own close friends (M=3.84, SE=.22), $F(1, 120) = 9.54$, $p = .002$, $\eta_p^2 = .074$. There was not a significant sex difference in reported jealousy at the prospect of a close friend becoming potentially closer with a same-sex stranger (M_{men}=1.89, SE_{men}=.20; M_{women}=2.22, SE_{women}=.18; $p = .215$). There was also not a significant sex difference in reported friendship jealousy at a best friend becoming potentially closer with a new, opposite-sex romantic partner, as expected (M_{men}=2.00, SE_{men}=.22; M_{women}=2.49; SE_{women}=.20; $p = .101$).

I also found that, compared to women (M=1.29, SE=.13), men reported significantly greater friendship jealousy in reaction to an acquaintance becoming potentially closer with a same-sex stranger (M=1.77, SE=.14), $F(1, 120) = 6.50$, $p = .012$, $\eta_p^2 = .051$. Note that this effect is quite small.

Study 2. Findings from Study 2's large undergraduate sample replicate the pattern of results from Study 1. A 2 (Participant sex) x 5 [Scenario] mixed-factors ANOVA revealed significant main effects of participant sex, $F(1, 464) = 23.14$, $p < .001$, $\eta_p^2 = .048$, such that, as expected, women reported greater overall levels of friendship jealousy (M=2.90, SE=.07) than men did (M=2.38, SE=.08), and of scenario, $F(4, 1856) = 284.95$, $p < .001$, $\eta_p^2 = .380$. These effects were qualified by a significant interaction, $F(4, 1856) = 16.60$, $p < .001$, $\eta_p^2 = .035$.

As in Study 1, compared to men (M=3.11, SE=.14), women reported greater friendship jealousy in reaction to best friends becoming potentially closer with a same-sex stranger (M=3.78, SE=.13), $F(1, 464) = 17.62$, $p < .001$, $\eta_p^2 = .037$. Compared to males (M=3.39, SE=.13), female participants also reported greater friendship jealousy in

reaction to best friends becoming potentially closer with participants' own close friends (M=4.45, SE=.12), $F(1, 464) = 42.12$, $p < .001$, $\eta_p^2 = .083$. Unlike in Study 1, compared to men (M=2.10, SE=.13), women did report greater friendship jealousy in reaction to close friends becoming potentially closer with a same-sex stranger (M=2.49, SE=.13), $F(1, 464) = 13.59$, $p < .001$, $\eta_p^2 = .028$. Replicating findings from Study 1, there was not a significant sex difference in reported friendship jealousy at a best friend becoming potentially closer with a new, opposite-sex romantic partner, as expected ($p = .085$).

Also replicating findings from Study 1, compared to women (M=1.44, SE=.14), men reported significantly greater friendship jealousy in reaction to an acquaintance becoming potentially closer with a same-sex stranger (M=1.17, SE=.15), $F(1, 464) = 4.01$, $p = .046$, $\eta_p^2 = .009$, although, again, the size of this effect is quite small.

Are there Sex Differences in Behavioral Intentions to Friend Guard?

Friend-guarding intentions were measured in Study 2. A 2 (Participant sex) x 3 [Scenario] mixed-factors ANOVA revealed significant main effects of participant sex, $F(1, 461) = 5.79$, $p = .017$, $\eta_p^2 = .012$, such that, as expected, women reported greater overall intentions to friend guard (M=1.79, SE=.05) than men did (M=1.60, SE=.06), and of scenario, $F(2, 1856) = 284.95$, $p < .001$, $\eta_p^2 = .380$. These effects were qualified by a significant interaction, $F(4, 922) = 92.18$, $p < .001$, $\eta_p^2 = .167$.

Although, compared to men (M=1.78, SE=.07), women trended in the direction of reporting greater behavioral intentions to friend guard in reaction to the best friend becoming potentially closer with a same-sex stranger (M=1.95, SE=.06), this difference was only marginally significant, $F(1, 461) = 3.28$, $p = .071$, $\eta_p^2 = .007$. However, compared to male participants (M=1.58, SE=.06), female participants did report

significantly greater behavioral intentions to friend guard in reaction to the best friend becoming potentially closer with their own close friends (M=1.85, SE=.06), $F(1, 461) = 10.25$, $p = .001$, $\eta_p^2 = .027$. And, as expected, there was no significant sex difference in behavioral intentions to friend guard in reaction to the best friend becoming potentially closer with a new romantic partner (M_{men}=1.43, SE_{men}=.05; M_{women}=1.54, SE_{women}=.04; $p = .114$).

Is the Relationship between Participant Sex and Friend-guarding Intentions Statistically Mediated by Reported Friendship Jealousy?

Friendship jealousy is expected to motivate behavioral intentions to friend guard; if men and women report different levels of friendship jealousy, these different levels would be expected to evoke different levels of friend-guarding intentions. Following Preacher and Hayes (2008), I tested whether levels of best friend jealousy statistically mediated the relationship between participant sex and behavioral intentions to best friend guard for 5,000 bootstrapped samples.

The indirect of effect of participant sex on best friend guarding was estimated to lie between .118 and .284 with 95% confidence interval (CI; $\beta = .196$, $SE = .04$). The direct effect of participant sex on best friend guarding was not significant ($p = .672$; 95%CI=[-.160, .103]). Because zero was not included in the confidence interval for the indirect effect, but was included in the confidence interval for the direct effect, this suggests that reported best friend jealousy fully statistically mediates the relationship between participant sex and behavioral intentions to friend-guard. This is in line with the theoretical chronology of friendship jealousy, which supposes that sex differences in

friendship structures and/or functions lead to sex differences in friendship jealousy, which, in turns, might motivate threat-mitigating behavior (i.e., friend guarding).

APPENDIX D

JEALOUSY RESULTS FOR STUDY 3

Study 3 replicated the design of Studies 1 and 2 with several minor modifications to extend predictions about the sensitivity of friendship jealousy to "replacement threat." First, in addition to imagining best friends forming new, potentially closer relationships with *same-sex* strangers, participants were also asked to imagine best friends forming new, potentially closer relationships with *opposite-sex* strangers. This allowed me to test the prediction that, because new same-sex friends are more likely to pose "replacement threats" than are new opposite-sex friends, participants would report greater friendship jealousy when best friends form new, potentially closer same- versus opposite-sex friendships.

Second, in addition to imagining best friends forming new, potentially closer romantic relationships, participants were also asked to imagine *close* friends forming new, potentially closer romantic relationships. This allowed me to perform a complementary test of the hypothesis that replacement threat evokes friendship jealousy, such that—as participants did with best friends—participants would report greater jealousy when a close friend forms a new, potentially closer bond with a same-sex stranger versus a new romantic partner.

Finally, rather than being asked to imagine best friends forming new, potentially closer relationships with romantic partners (in general), participants were asked to imagine two related and more specific scenarios: one in which the best friend formed a new, potentially closer short-term romantic relationship (e.g., a one- or few-night stand), and one in which the best friend formed a new, potentially closer long-term romantic relationship.

In all, participants imagined six scenarios: an acquaintance forming a new, potentially closer friendship with a same-sex stranger; a close friend forming a new, potentially closer friendship with a same-sex stranger; a close friend forming a new, potentially closer romantic relationship; a best friend forming a new, potentially closer friendship with a same-sex stranger; a best friend forming a new, potentially closer friendship with an opposite-sex stranger; a best friend forming a new, potentially closer romantic relationship with a short-term partner; and a best friend forming a new, potentially closer romantic relationship with a long-term partner.

Method

Adult participants (N = 289; 122 female; M_{age} = 20.67, SD_{age} = 1.92) were recruited from an undergraduate subject pool and participated in this study after completing an unrelated study on stigma. The first and second parts of this task were identical to those in Study 1, with the above-mentioned modifications.

Results and Discussion

Does jealousy vary as a function of friend value? Findings replicate those from Studies 1 and 2. I explored specific predictions in light of a significant omnibus test indicating differences in reported jealousy across the six scenarios, $F(6, 1728) = 126.11$, $p < .001$, $\eta_p^2 = .305$. As expected, the prospective loss of the best friend to a same-sex stranger evoked greater reported friendship jealousy (M=3.95, SE=.10) than did the prospective loss of a close friend to a same-sex stranger ($p < .001$, 95%CI =[2.161, 2.628]), and the prospective loss of a close friend to a same-sex stranger evoked greater reported friendship jealousy (M=2.40, SE=.09) than did the prospective loss of an acquaintance to a same-sex stranger (M=1.57, SE=.07, $p < .001$, 95%CI =[.651, 1.030]).

Does jealousy vary as a function of "replacement threat"? To test this, I first explored reported jealousy in reaction to the close friend forming either a same-sex friendship or a romantic relationship. As expected, people reported significantly lesser levels of friendship jealousy at the close friend forming a new romantic relationship (M=1.91, SE=.08) as compared to the close friend forming a new friendship with a same-sex stranger (M=2.40, SE=.09, $p < .001$, 95%CI =[.-.657, -.319]).

Next, I tested the prediction that people would report greater jealousy at the best friend's new friendship with a same-sex stranger than at the best friend's new short- or long-term relationship. Replicating findings from Studies 1 and 2, people reported greater friendship jealousy at the best friend's new friendship with a same-sex stranger (M=3.95, SE=.10) than the best friend's new short-term relationship (M=2.04, SE=.08, $p < .001$, 95%CI =[1.664, 2.157]), or long-term relationship (M=2.27, SE=.09, $p < .001$, 95%CI =[1.475, 1.895]). People also reported greater friendship jealousy at the best friend's forming a new long- versus short-term romantic relationship ($p = .007$, 95%CI =[.062, .388]).

Finally, I tested the prediction that people would report greater jealousy at the best friend's new friendship with a same-sex stranger versus an opposite-sex stranger. As predicted, people reported greater friendship jealousy at the best friend's new friendship with a same-sex stranger (M=3.95, SE=.10) than with an opposite-sex stranger (M=2.79, SE=.10, $p < .001$, 95%CI =[.961, 1.375]).

APPENDIX E

JEALOUSY RESULTS FOR STUDY 4

Study 4 further explored predicted sex differences in the features of friendship jealousy. Specifically, Study 4 assessed the prediction that men (but not women) would report greater levels of friendship jealousy at the prospective loss of same-sex friends-*cum*-teammates to a rival team, as compared to the loss of these very same friends to a rival person. If males' are particularly attuned to the threatened loss of same-sex group members to rival groups, this would provide further support that friendship jealousy may possess some evolutionarily-cogent sex-differentiated design features.

Method

Adult participants ($N = 175$; 119 female; $M_{age} = 35.64$, $SD_{age} = 11.61$) were recruited from the MTurk online participant platform and participated in return for small monetary compensation.

Similar to Studies 1 and 2, participants first filled out information about a series of same-sex friends (best friend, close friend, [non-specified] friend, acquaintance), including friends' first names and last initials, and then participants were asked to imagine several scenarios of friends becoming potentially closer with others.

Participants were asked to imagine these scenarios in two different contexts, counterbalanced: In one context, which was largely similar to scenarios in Studies 1 and 2, participants were asked to imagine various friends becoming potentially closer with a same-sex person who was described here as being a same-sex *rival*; in the other context, participants were asked to imagine that they were on a "team" working together with their same-sex friends, and that these same-sex friends become potentially closer with a rival team. Within each context, participants reported their levels of jealousy to each scenario, with scenarios presented in randomized order within counterbalanced

conditions. Jealousy was embedded among other response items, Participants responded on 7-point Likert-scales (1 = *Not at all*, 7 = *Very*).

Results and Discussion

To test predictions, I first conducted a 2 (Participant sex) x 2 [Context: "rival person", "rival team"] x 4 [Friend: best friend, close friend, non-specified friend, acquaintance] mixed-factors ANOVA. This revealed a main effect of participant sex, $F(1, 173) = 8.18$, $p = .005$, $\eta_p^2 = .045$, such that women reported greater overall levels of friendship jealousy (M=3.71, SE=.13) than men did (M=3.08, SE=.18), and a main effect of friend, $F(3, 519) = 64.99$, $p = .017$, $\eta_p^2 = .273$, with closer friends evoking greater levels of friendship jealousy. This was qualified by two two-way interactions—an interaction between participant sex and friend, $F(3, 519) = 3.89$, $p = .009$, $\eta_p^2 = .022$, and also the predicted interaction of participant sex and context, $F(1, 519) = 9.44$, $p = .002$, $\eta_p^2 = .052$.

Exploring the interaction of participant sex and friend reveals that, compared to men, women report reported greater friendship jealousy at the prospective loss of best friends (M_{men}=3.78, SE_{men}=.22; M_{women}=4.76, SE_{women}=.15), $F(1, 173) = 13.15$, $p < .001$, $\eta_p^2 = .071$, and close friends (M_{men}=3.13, SE_{men}=.23; M_{women}=3.99, SE_{women}=.16), $F(1, 173) = 9.55$, $p = .002$, $\eta_p^2 = .052$, but no sex differences in reported friendship jealousy at the prospective loss of (non-specified) friends (M_{men}=2.87, SE_{men}=.22; M_{women}=3.30, SE_{women}=.15; $p = .097$) or—unlike results from Studies 1 and 2— acquaintances (M_{men}=2.53, SE_{men}=.21; M_{women}=2.80, SE_{women}=.15; $p = .297$).

Exploring the predicted participant sex by context interaction revealed that, whereas males reported greater friendship jealousy at the prospect of friends-*cum*-

teammates defecting to a rival team (M=3.23, SE=.21) than to a rival person (M=2.92, SE=.18), $F(1, 173) = 5.13$, $p = .025$, $\eta_p^2 = .029$, women reported greater friendship jealousy at the prospect of friends defecting to a rival person (M=3.81, SE=.13) than to a rival team (M=3.61, SE=.14), $F(1, 173) = 4.54$, $p = .035$, $\eta_p^2 = .035$.

Whereas women reported greater jealousy than men did at the prospect of losing friends to a rival person, $F(1, 173) = 16.10$, $p < .001$, $\eta_p^2 = .085$, consistent with findings from Studies 1 and 2, there was no significant sex difference in reported jealousy at the prospect of losing friends to a rival team ($p = .134$). This suggests particularly males are made more jealous by the prospect of losing friends-*cum*-teammates to rival teams. This finding is consistent with the theoretical proposition that males' same-sex friends may have ancestrally served some sex-specific functions related to intergroup warfare, such that the defection of friends to rival social groups is an especially salient threat for men, causing greater jealousy at their prospective loss.

APPENDIX F

MATERIALS FOR STUDY 5

Beginning Instructions

Today's session consists of a study assessing your emotions, social networks, and reactions to social events. In the course of the study, we'll be asking you about your social relationships. We'll also be asking you to imagine social events by imagining yourself in a social scenario; in doing so, we are testing your social emotionality and empathy. Be sure to fully and completely immerse yourself in the scenario.

We're going to begin by collecting some basic social information about you and your social networks.

Introductory Demographic Questions

What is your sex?

1. Male
2. Female

What is your age?

How do you choose to label your sexual orientation?

1. Straight/heterosexual
2. Gay/lesbian
3. Bisexual
4. Other

What is your relationship status? Check all that apply.

1. Single and UNINTERESTED in dating?
2. Single and interested in dating
3. Casually dating
4. Dating one person exclusively but not engaged or married
5. Engaged or married
6. Separated
7. Divorced
8. Widowed

Post-demographic Instructions and Friend Questions

Most of the next questions ask you about **SAME-SEX people you know**. If you are male, we want to know about other men you know; if you are female, we want to know about other females you know.

We are most interested in **people you see on a daily basis**, people you go to school with or who live near you----not someone who lives in another State or country.

Best friend.

A best friend is the ONE person to whom you are closest, a person who would help you in dire times.

What is the first name and last initial of your **SAME-SEX best friend**? (If you have a best friend from growing up, but don't see this person on a daily basis, please tell us about your best friend from school or work instead.)

(If you have a same-sex romantic partner you consider your "best friend" please INSTEAD choose a same-sex best friend in whom you are not sexually interested.)

Please write it below---using the first name (e.g., John G.).

Close friend.

What is the first name and last initial of another **SAME-SEX close friend**----a close same-sex friend **who is not also friends with your best friend**? (E.g., this person has perhaps met your best friend, but they've never hung out without you.)

Please write it below--using the first name (e.g., John G.).

Acquaintance.

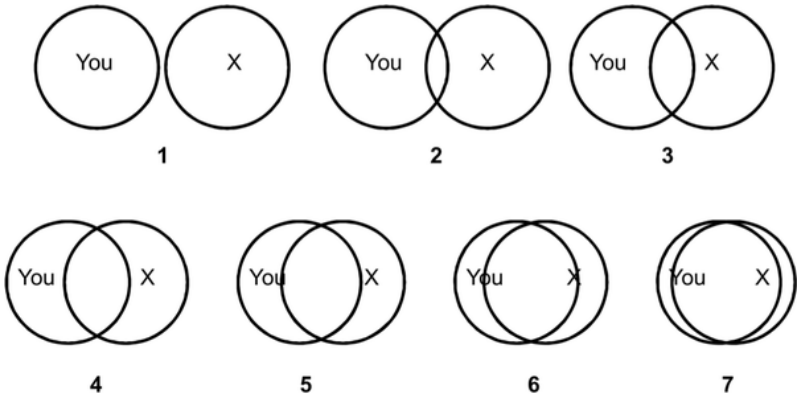
What is the first name and last initial of another SAME-SEX person----a same-sex **ACQUAINTANCE** of yours? This is a person you might see often, but are not necessarily friends with.

Please write it below--using the first name (e.g., John G.).

Best Friend Questions

How long have you known your best friend?

How close to your best friend do you feel? Please mark the picture below—where in you are “You” and your best friend is “X” to answer this question.



The next questions ask about **[best friend]?**
1 = Not at all – 7 = Very much

1. How much do you TRUST this person?
2. How much does this friendship MATERIALLY BENEFIT you?
3. How much does this friendship provide you STATUS BENEFITS?
4. How IRREPLACEABLE is this person to you?
5. How SIMILAR are you to this person?
6. How FAMILIAR are you with this person?

For the next set of questions, think about **[best friend].** Rate your agreement with the following statements. (Sznycer et al., in prep.)
1 = I totally disagree – 7 = I totally agree

1. When [best friend] succeeds, I feel good
2. When [best friend] fails, I feel bad
3. [Best friend]'s gain is my gain
4. [Best friend]and I rise and fall together
5. Honestly, I don't really care whether [best friend] thrives or not

Focal Task

Instructions.

We are now going to begin the main task of the "social emotions study". You will be asked to read—and truly imagine yourself immersed within—a social event.

Be sure to carefully read the following event. **As you're reading the event, try to immerse yourself in what's happening to you.** After the scenario, we'll ask for your emotional reactions. We simply want your honest, gut reactions.

Base scenario.
Imagine that [best friend] and another man[woman], [best friend]'s new close friend, have started to really enjoy one another's company. You didn't know this new man [woman] very well before he[she] became friends with [best friend] just recently, but now [best friend] and he[she] have clearly become close. [Best friend] has introduced this new person into your friend group, as well.

Time threat—high threat.
You notice that [best friend] and this new man[woman] are hanging out together a lot; they are really spending lots of time together—having lunch together and hanging out together a lot.

Time threat--low threat.
You notice that [best friend] and this new man[woman] are not hanging out together a lot; they aren't really spending lots of time together—they don't have lunch together or hang out together a lot.

Replacement threat—no-information control.
A few days ago, you found out that your best friend has received a much-wanted invitation to an upcoming birthday party--it's a party for another guy[girl] you really like, but haven't had time to get to know very well. This party is going to be a swanky, exclusive dinner party. Although you're not that close with the person having the party, your best friend is. And a few of your other, mutual friends have also been invited.

It's a dinner party at a small new restaurant, so space is limited. But your best friend is allowed to take one friend to the party with him[her]. You really want to go! You also know that [best friend] 's new friend already asked [best friend] if he[she] would take him[her].

Both you and [best friend] 's new close friend really want to go, so your best friend is going to have to choose which one of you to take to the party.

Replacement threat—high threat.
A few days ago, you found out that your best friend has received a much-wanted invitation to an upcoming birthday party--it's a party for another guy[girl] you really like, but haven't had time to get to know very well. This party is going to be a swanky, exclusive dinner party. Although you're not that close with the person having the party, your best friend is. And a few of your other, mutual friends have also been invited.

It's a dinner party at a small new restaurant, so space is limited. But your best friend is allowed to take one friend to the party with him[her]. You really want to go! You

also know that [best friend] 's new friend already asked [best friend] if he[she] would take him[her].

Both you and [best friend] 's new close friend really want to go, so your best friend is going to have to choose which one of you to take to the party.

Today, [best friend] tells you that he[she] has decided to take his[her] new friend to the party instead of you.

Replacement threat—low threat.
A few days ago, you found out that your best friend has received a much-wanted invitation to an upcoming birthday party--it's a party for another guy[girl] you really like, but haven't had time to get to know very well. This party is going to be a swanky, exclusive dinner party. Although you're not that close with the person having the party, your best friend is. And a few of your other, mutual friends have also been invited.

It's a dinner party at a small new restaurant, so space is limited. But your best friend is allowed to take one friend to the party with him[her]. You really want to go! You also know that [best friend] 's new friend already asked [best friend] if he[she] would take him[her].

Both you and [best friend] 's new close friend really want to go, so your best friend is going to have to choose which one of you to take to the party.

Today, [best friend] tells you that he[she] has decided to you to the party instead of his[her] new friend.

Dependent Variable

Would you feel...
1 = *Not at all* - 7 = *Very much*

1. Happy
2. Jealous
3. Disgusted
4. Angry
5. Sad
6. Proud
7. Guilt
8. Relieved
9. Enthusiastic
10. Nothing

Additional Demographics and Individual Difference Questions

What is your race or ethnicity?

1. African-American
2. Asian/Asian-American
3. Latino/Latina/Hispanic
4. Native American
5. Middle-Eastern
6. Caucasian/White
7. Biracial/Multiracial
8. Other

How many children do you have?

Approximately how many friends do you have?

Approximately how many FACEBOOK/ONLINE friends do you have?

Approximately how many SAME-SEX friends do you have?

If you were having a true crisis (e.g., the death of a loved one or a financial disaster), how many people do you think that you could turn to for help?

How many of those people are friends (NOT parents, romantic partners, etc.)?

Rosenberg Self-esteem Scale (Rosenberg, 1965)

Below is a list of statements dealing with a person's general feelings about oneself. Please rate how much you agree or disagree with each statement.

1 = Strongly agree – 4 = Strong disagree

1. On the whole, I am satisfied with myself.
2. At times, I think I am no good at all.
3. I feel that I have a number of good qualities.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.
6. I certainly feel useless at times.
7. I feel that I am a person of worth, at least on an equal plane with others.
8. I wish I could have more respect for myself.
9. All in all, I am inclined to feel that I am a failure.
10. I take a positive attitude toward myself.

APPENDIX G

TABLE OF EMOTIONAL RESPONDING FOR STUDY 5

Appendix G Table 1

Means (standard deviations) of reported reactions across conditions

Emotion		Low Replacement Threat	No-Information Replacement Threat (Control)	High Replacement Threat
Jealousy	Low time threat	1.58 (1.31)	1.90 (1.32)	4.38 (1.98)
	High time threat	1.45 (1.03)	2.90 (1.90)	4.38 (2.00)
Happiness	Low time threat	5.79 (1.38)	3.27 (1.95)	2.10 (1.47)
	High time threat	5.66 (1.40)	4.29 (1.81)	2.17 (1.37)
Disgust	Low time threat	1.49 (1.20)	1.51 (1.17)	2.91 (1.78)
	High time threat	1.39 (0.90)	1.53 (1.07)	2.63 (1.72)
Anger	Low time threat	1.51 (1.26)	1.59 (1.15)	3.60 (1.90)
	High time threat	1.45 (1.01)	1.93 (1.45)	3.47 (1.92)
Sadness	Low time threat	1.71 (1.58)	1.75 (1.09)	4.50 (2.01)
	High time threat	1.45 (1.00)	2.41 (1.72)	4.31 (1.96)
Pride	Low time threat	4.97 (1.85)	2.45 (1.71)	1.71 (1.30)
	High time threat	4.79 (1.88)	3.33 (1.95)	1.83 (1.36)
Guilt	Low time threat	2.07 (1.58)	1.58 (1.08)	1.74 (1.32)
	High time threat	1.96 (1.55)	1.58 (1.08)	2.07 (1.44)
Relief	Low time threat	4.56 (2.01)	2.59 (1.73)	1.86 (1.29)
	High time threat	4.21 (1.87)	2.36 (1.71)	2.00 (1.42)
Enthusiasm	Low time threat	5.56 (1.51)	2.72 (1.83)	1.87 (1.40)
	High time threat	5.45 (1.35)	3.52 (1.92)	1.96 (1.37)
Nothing	Low time threat	2.15 (1.73)	4.56 (2.00)	2.56 (1.80)
	High time threat	2.15 (1.64)	3.08 (2.24)	2.60 (1.79)