Understanding the Impact of Cross-Group Friendship on Interactions With Novel Outgroup Members

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We examined the cognitive processes that might account for the impact of cross-group friendship on novel intergroup situations. Study 1 demonstrated that closeness with outgroup members predicts an association of the outgroup with the self, both in terms of the group itself and the personality traits stereotypically associated with the group. In Studies 2 and 3, we manipulated the accessibility of either a same-group friendship or cross-group friendship. Participants who described a cross-group friend exhibited a greater association of the friend's ethnicity with the self, and this association mediated the effects of friendship accessibility on positive expectations for intergroup contact (Study 2) and adaptive hormonal responses during a real interaction with a novel outgroup member (Study 3). These findings imply that cross-group friendship improves novel intergroup experiences to the degree that outgroups become associated with the self.

Keywords: cross-group friendship, close relationships, novel intergroup contact, neuroendocrine responses, social interaction

Although prior research has characterized social interactions between members of different social groups as laden with anxiety and threat (Blascovich, Mendes, Hunter, Lickel, & Kowai-Bell, 2001; Stephan & Stephan, 1985, 2000), a growing body of research suggests that cross-group friendship—platonic, interpersonal closeness between people from different social groups—is related to positive experiences during interactions with unfamiliar outgroup members (Islam & Hewstone, 1993; Page-Gould,

Mendoza-Denton, & Tropp, 2008; Paolini, Hewstone, Cairns, & Voci, 2004). Nonetheless, the cognitive mechanisms that underlie interpersonal closeness and that may account for the relation between cross-group friendship and positive intergroup experiences are only beginning to be examined. In the present research, we tested whether self-expansion processes of interpersonal closeness (Aron, Aron, & Smollan, 1992)—cognitively associating a close other's characteristics with oneself—may account for the beneficial effects of cross-group friendship for social interactions with novel outgroup members.

Intergroup Social Interactions

In research, intergroup social interaction has generally been characterized as prone to discomfort and anxiety. In their early work, Stephan and Stephan (1984, 1985) observed that Latino, Latina, and White participants reported anxiety about interactions with members of the other ethnic group. People may feel vulnerable to rejection in intergroup encounters (Mendoza-Denton, Downey, Purdie, Davis, & Pietrzak, 2002; Stephan & Stephan, 1985; Tropp, 2003; Vorauer, Hunter, Main, & Roy, 2000). Furthermore, fears of confirming negative stereotypes about oneself and one's group (Aronson & Inzlicht, 2004; Dunton & Fazio, 1997; Gaertner & Dovidio, 1986; 2000) or concerns about appearing prejudiced (Dunton & Fazio, 1997; Gaertner & Dovidio, 1986; Johns, Schmader, & Lickel, 2005; Plant & Devine, 1998; Vorauer et al., 2000; Vorauer & Turpie, 2004) present obstacles to successful intergroup interactions that are not relevant to same-group interaction. As such, anxiety during intergroup social interactions has been related to avoidance of people of other groups (Goff,

Steele, & Davies, 2008; Paolini, Hewstone, Voci, Harwood, & Cairns, 2006; Plant & Devine, 2003).

Not all intergroup interaction is bound to go awry, however. Recent experimental work suggests that the development of cross-group friendship reduces anxiety in intergroup contexts and increases initiation of intergroup contact, particularly among those who are most likely to avoid outgroup members in the first place (Page-Gould et al., 2008). Indeed, a number of theorists have considered interpersonally close intergroup contact—such as the contact involved in cross-group friendship—to be an integral component of intergroup harmony (Allport, 1954; Amir, 1976; Islam & Hewstone, 1993; Pettigrew, 1998. It is possible that cross-group friendship magnifies the effects of intergroup contact by improving the tenor of these contact experiences.

Recent research on both naturally occurring and experimentally induced cross-group friendships suggests that cross-group friendship improves intergroup experiences. Cross-group friendship has been associated with decreases in self-reported intergroup anxiety (Levin, van Laar, & Sidanius, 2003; Paolini et al., 2004; Paolini et al., 2006; Wright, Aron, & Tropp, 2002), and the attenuation of intergroup anxiety occurs early in the development of cross-group closeness (Page-Gould et al., 2008). Implicitly prejudiced participants who had recently made a cross-group friend in the laboratory reported more initiation of daily interactions with people of other ethnicities, compared with those who had made a same-group friend in the lab (Page-Gould et al., 2008). Similarly, two large, nationally representative surveys of U.S. adults associated cross-ethnic friendship with greater openness to future intergroup interaction and support of policies that encouraged interethnic interaction (de Souza Briggs, 2007; Emerson, Kimbro, & Yancey, 2002). Research among school children shows that cross-race friendship is related to perceiving race-based exclusion as unfair and to less use of stereotypes (Killen, 2007; Killen, Kelly, Richardson, Crystal, & Ruck, in press). In a meta-analysis of contact research to date, Pettigrew and Tropp (2006, footnote 4) reported the largest effect sizes for prejudice reduction when contact was operationalized as naturally occurring cross-group friendship. Taken together, this set of findings suggests that cross-group closeness leads to more positive experiences during intergroup social interactions. Nevertheless, the processes that mediate this relation are only beginning to receive empirical attention (e.g., Paolini, 2005; Paolini et al., 2004; Turner, Hewstone, Voci, & Vonofakou, 2008). This work has shown that self-report measures of including a cross-group friend in the self explain the impact of cross-group friendship on explicit intergroup attitudes. In the present studies, we experimentally test whether implicitly measured inclusion of an outgroup member in the self-concept can explain benefits of cross-group friendship for explicit and hormonal responses to novel outgroup members. As such, we extend past findings by causally testing whether cross-group friendship leads to an association of an outgroup with the self and whether this process mediates positive experiences with novel members of social outgroups.

Explaining Intergroup Benefits of Cross-Group Friendship

Taken together, past work suggests that the positive intergroup experiences observed as a function of cross-group friendship are an emergent property of the closeness that characterizes the friendship. In social–cognitive approaches to close relationships, interpersonal closeness is conceptualized as an association of close others with the concept of self (Aron et al., 1992), which is a process known as self-expansion. For example, Aron, Aron, Tudor, and Nelson (1991) asked participants to categorize personality traits as self-descriptive or non–self-descriptive, using two buttons labeled *me* and *not me*, respectively. Participants took significantly longer to classify traits as nondescriptive if they had explicitly rated the trait as not descriptive of themselves but highly descriptive of their spouse than if the trait was not descriptive of either their spouse or themselves. The inhibited ability to classify a close other's unique traits as non–self-descriptive implies that one associates the characteristics of close others with oneself.

Self-expansion theory has added significance when closeness develops across the boundaries of social groups: If individual characteristics (i.e., personality traits) of close others become automatically associated with the self then collective characteristics (i.e., group membership) might also become associated with the self (Aron & McLaughlin-Volpe, 2001; Aron et al., 2004; Paolini, 2005; Shubert & Otten, 2002; Turner et al., 2008; Wright, Aron, McLaughlin-Volpe, & Ropp, 1997), similar to the way social ingroups are associated with the self (Smith & Henry, 1996; Tropp & Wright, 2001). As such, intergroup interaction may begin to seem more like same-group interaction through a broadened view of the ingroup (Gaertner & Dovidio, 2000; Pettigrew, 1998; Pettigrew & Tropp, 2006; Wright et al., 1997). Social interactions with members of that outgroup should be experientially equivalent to same-group interactions for individuals who implicitly identify with an outgroup (Aron et al., 2004). Thus, the self-expansion theory of closeness (Aron et al., 1992) provides a potential explanation for the relation between cross-group friendship and positive intergroup interaction (Aron & McLaughlin-Volpe, 2001). The present research tested the mediating role of self-expansion with a friend's ethnicity in the relation between cross-ethnic friendship and enjoyment of interactions with novel members of a friend's ethnic group.

Overview of Research

Incorporating implicit, explicit, and hormonal measurements, we tested whether collective characteristics of cross-group friends are incorporated into the self and whether the incorporation of outgroups in the self affects intergroup experiences. In the first study, we used a reaction time procedure to test the hypothesis that people with close cross-ethnic friends identify with their friend's ethnic groups. More specifically, we tested whether cross-group friendship predicts people's reaction time to classify their friend's ethnicity, as well as characteristics stereotypically associated with that ethnicity, as descriptive of themselves. The next two studies used a new experimental paradigm that manipulates the accessibility of a type of friendship to heighten the accessibility of concepts that are contextually associated with that friendship. More specifically, in Study 2, we tested whether associations of a friend's group with the self explained the relation between cross-group friendship and expected enjoyment of an imagined intergroup encounter. In the final study, we extended the mediational model of Study 2 to the context of a real intergroup social interaction. This research incorporated multiple methods of measure-

ment to capture both controlled and automatic responses to novel intergroup situations (c.f., Blascovich, 2000; Dovidio, Kawakami, & Gaertner, 2002).

Study 1

Although theory suggests that close relationships with outgroup members should involve the inclusion of the close others' collective identities as one's own (Aron & McLaughlin-Volpe, 2001; Aron et al., 2004; McLaughlin-Volpe, Mendoza-Denton, & Shelton, 2005; Shubert & Otten, 2002), to our knowledge the hypothesis that a cross-group friend's group is incorporated in the self has yet to be tested with the implicit procedures of the original test of self-expansion theory. Specifically, the third study reported by Aron and colleagues (1991) demonstrated that people took longer to classify non–self-descriptive personality traits when the trait was descriptive of a close other. We extended the paradigm used in that study to close friends' collective characteristics by including ethnic group labels (e.g., Asian, Native American) with personality trait stimuli. We hypothesized that people with close cross-group friends would take longer to categorize the ethnicity of their cross-group friend as non–self-descriptive.

Furthermore, if individuals who have developed closeness with an outgroup member include that friend's group in the self, then those individuals should demonstrate processes similar to ethnic identification with a cross-group friend's group. Therefore, we investigated whether cross-group friendship leads people to behave as though they were, in a sense, self-stereotyping. Smith and Henry (1996) have demonstrated that individuals are faster to categorize traits as self-descriptive if those traits are consistent with cultural stereotypes of their ingroup. Furthermore, these self-stereotyping effects vary as a function of identification with an ingroup (Coats, Smith, Claypool, & Banner, 2000). If the self-expansion involved with cross-group friendship leads to phenomena similar to ingroup identification then differential responses to traits that are stereotypical, versus counterstereotypical, of a friend's group should reflect a cognitive overlap between the self and a cross-group friend's ethnicity. It is of note that Smith and Henry (1996) compared the self-stereotyping effects with ingroup stereotypes and outgroup stereotypes and found no response time differences as a function of outgroup stereotypes. The nuance to our hypothesis is that response times to traits should vary according to consistency with outgroup stereotypes if participants feel close to members of that outgroup.

Research on shared reality theory (Lun, Sinclair, & Cogburn, 2005; Tice & Wallace, 2003) explains self-stereotyping as a function of the expectations of those around us and the degree to which we want to be affiliated with them. As reviewed by Sinclair and Huntsinger (2006), individuals adapt their self-views to stereotypes of their ingroup if they want to become close with someone whom they believe holds intergroup attitudes consistent with cultural stereotypes. Thus, we further hypothesized that participants would be faster to label trait words with *me* if they explicitly rated the trait as self-descriptive and the trait was stereotypical of a cross-group friend's ethnic group, thereby demonstrating behaviors similar to self-stereotyping with the cultural stereotypes held about their friend's group. In addition, we hypothesized that they would make more "errors" (i.e., labeling a trait with *me* when it was explicitly rated as non–self-descriptive) if the trait is stereo-

typical of a cross-group friend's ethnic group. These expected responses to stereotypical traits should be moderated by the degree of closeness felt with their cross-group friends.

Method

Participants. Primary participants were 41 college undergraduates (85% female) participating for course credit or $10 compensation. The mean age of this sample was 19.35 years ($SD = 1.15$ years). The ethnic distribution of the sample was as follows: 53.7% East Asian American, 7.3% East Indian, 17.1% European American, and 21.9% Latino or Latina. To ensure that our findings were not driven by one ethnicity or age group within this diverse sample, we included age and ethnicity as covariates in subsequent analyses.

An independent sample of 38 participants (64% female) was used to collect ratings of the stereotypicality of trait stimuli used in the experiment. This ethnic composition of this sample was approximately 61.0% Asian American, 17.1% European American, and 21.9% Latino or Latina. Participants ranged in age from 19 years to 36 years.

Procedure. Study 1 had a correlational, within-participants design. Extending the paradigm of Aron and colleagues (1991), we measured the speed with which participants categorized different ethnicities using the labels *me* or *not me* as a function of closeness with friends of that ethnicity. First, participants completed a social network questionnaire from which cross-group friendship quality was calculated, and the names of close friends were collected. Second, a computer randomly chose one same-ethnicity and one cross-ethnicity friend from the social network questionnaire, and participants were asked to describe themselves and these two friends, using the 90 Adjectives Checklist (Anderson, 1968). Third, participants completed a reaction time task to assess the degree to which the described cross-group friend's ethnic group was associated with the self. Fourth, participants completed an explicit scale of outgroup identification with the described cross-group friend's ethnicity. After the final survey, participants were fully debriefed, thanked, and dismissed.

Materials.

Social network questionnaire. We assessed cross-group friendship quality through the use of a social network questionnaire designed to measure demographic characteristics of close friendships (Smith, 2002). Participants indicated their closeness with and provided the name, age, sex, and ethnicity of their 10 closest friends. Due to space restrictions, closeness was measured with a single item, "How close do you feel to this friend?" which was rated on a 1 (*not at all*) to 7 (*extremely*) scale. With the emphasis on both friendship quality and quantity in the sociological and psychological literatures on cross-group friendship (e.g., Damico, Bell-Nathaniel, & Green, 1981; Hunter & Elias, 1999; McLaughlin-Volpe et al., 2005; Reagans, 1998), we wanted a measure that could capture both the quantity and quality of participants' cross-group friendships from the social network questionnaire. Therefore, closeness ratings with friends from the described cross-group friend's ethnicity were summed to create an overall index of cross-group friendship quality. This calculation method was chosen because it allowed us to weight the index of number of cross-group friends by closeness with these friends,

such that higher numbers reflect having many close cross-group friendships from that ethnic group. All participants listed at least one friend of another ethnicity.

Adjective Checklist. Similar to the protocol of Aron et al. (1991), participants completed the 90-item Adjective Checklist (ACL; Anderson, 1968) three times—for the self, a cross-group friend, and a same-group friend—to obtain explicit personality ratings. The ACL provides 90 personality traits that vary in desirability. The ACL is rated for descriptiveness on a 1 (*not at all*) to 7 (*very*) Likert-scale. Self-ratings were always made first, but the order of rating the same- and cross-group friends was randomly assigned. The order of rating either the same-group friend or the cross-group friend first was used as a covariate to control for order effects between participants.

The independent sample rated each trait word from the Adjectives Checklist (Anderson, 1968) on a scale of −3 (*opposite of the stereotype of this group*) to +3 (*very stereotypical of this group*) for each ethnic group represented among the options for friends' ethnicities in the social network questionnaire. The samples' mean ratings were sorted within each ethnicity, and the 10 most stereotypical and 10 most counterstereotypical traits for each ethnicity were flagged for the self-stereotyping analyses below.

Self-expansion reaction time task. Inclusion of a cross-group friend's ethnic group in the self was assessed with a reaction time task that participants were told was an implicit personality test (see Aron et al., 1991, for a full description of this procedure). The reaction time portion of the experiment was administered with DirectRT software from Empirisoft (Jarvis, 2006a). Participants were asked to categorize trait words that appeared on a computer screen with keyboard buttons labeled *me* or *not me* for traits that were self-descriptive or non–self-descriptive, respectively. Participants were instructed to categorize these words as *me* if the word described them and as *not me* if the word did not describe them. Participants were told the task would measure their personality through their responses. Each trait from the 90 ACL (e.g., honest, rude, persistent) was randomly presented three times. In addition, the names of six ethnic groups (i.e., American Indian, Asian, Black, East Indian, Hispanic, White) were randomly presented three times along with 90 personality-related adjectives from the ACL.[1] There were 288 trials in total, and the computer recorded the speed of participants' responses in milliseconds for each trial. Following the recommendations of previous researchers (Aron et al., 1991; Ratcliff, 1993, p. 517; Smith & Henry, 1996), all trials with reaction times less than 300 ms or greater than 5,000 ms (less than 2% of all reaction times) were excluded from analysis to account for reaction-time outliers.

Explicit outgroup identification. Explicit identification with a cross-group friend's ethnic group was measured with a scale of outgroup identification (Brown, Condor, Mathews, Wade, & Williams, 1986; Wright et al., 2002) adapted to be specific to the ethnic group of the cross-group friend that was described in detail. Participants were asked the degree to which they identified with the ethnic group of their accessible cross-group friend. We chose the outgroup identification scale as an explicit measure of adoption of a close cross-group friend's ethnicity into the self ($\alpha = .64$).

Results

Replication of Aron et al. (1991): Reaction times to friend's unique traits. Aron et al. (1991) observed that participants took significantly longer to classify personality traits if that trait was descriptive of a spouse but not descriptive of the self. A repeated-measures general linear model revealed a strong main effect of friend-descriptiveness, $F(1, 30) = 19.18$, $p < .001$, such that participants took significantly longer to classify non–self-descriptive traits that were descriptive of a close cross-group friend ($M = 1,114.14$ ms, $SD = 297.88$ ms) than traits that were not descriptive of either the self or a close cross-group friend ($M = 914.59$ ms, $SD = 148.84$ ms). Thus, we replicated effects of interpersonal closeness on contextual associations with the self that were first documented by Aron et al. (1991) and demonstrated that self-expansion effects with individual characteristics apply across group boundaries.

Responses to friend's ethnicity.

Analytic plan. Our primary hypothesis was that collective characteristics of a cross-group friend—specifically a cross-ethnic friend's ethnicity—become associated with the self as a function of interpersonal closeness. We approached these data in three different ways to test the primary hypothesis as well as its specificity and discriminability. The first set of analyses directly tested the hypothesis that people with high quality cross-group friendships would associate themselves with a cross-group friend's ethnic group. Next, we examined the specificity of this relation by testing whether closeness with a member of one ethnic outgroup would be related to reaction times to classify a different cross-group friend's ethnicity as non–self-descriptive. Finally, we tested the discriminability of this relation by examining responses to outgroups with whom participants had no cross-group friends.

Primary hypothesis. We tested the primary hypothesis that close cross-group friendship involves an automatic association of the self with an ethnic outgroup in two ways. First, we correlated reaction times to the described cross-group friend's ethnic group with the quality of that specific friendship. If the computer randomly chose an Asian cross-group friend for a White participant to describe in detail, then we correlated the quality of that particular friendship with response times to categorize the *Asian* stimuli as non–self-descriptive. This first analysis tests whether closeness with one outgroup member predicts an association of that friend's group with the self. Second, we correlated reaction times to all ethnic groups in the close social network with the friendship quality of all cross-group friendships in the social network. That is, if an Asian participant listed cross-group friends from the ethnic groups of Latino, White, and American Indian, then we correlated the quality of friendship with all friends from these groups with mean reaction times to categorize the *Latino*, *White*, and *American Indian* stimuli as non–self-descriptive. This second analysis tests

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[1] We were concerned that participants would take longer to classify the ethnic stimuli than the trait stimuli because we had not prepared them to expect group labels, so reaction times to group stimuli might be larger and thus reflect more controlled processes. However, a *t* test between classifying ethnic groups and personality traits revealed the opposite effect: Participants were quicker at categorizing the ethnic terms as descriptive or nondescriptive ($M = 827.51$ ms, $SD = 138.37$) than trait stimuli ($M = 1,003.57$ ms, $SD = 182.36$), $t(39) = 7.96$, $p < .0001$.

whether an inclusion of an outgroup in the self can occur with as many outgroups as are represented among one's close cross-group friends.

The first analysis revealed that cross-group friendship quality was positively related to reaction times when correctly categorizing a cross-group friend's ethnic group as non self-descriptive, $r(41) = .39$, $p = .02$, such that close cross-group friendship predicted longer reaction times when categorizing a friend's ethnicity with the *not me* button. Next, we correlated the closeness with all cross-group friends in the social network with the mean reaction time to categorize all ethnic outgroups in the social network as non–self-descriptive. Similar to the first analysis, the quality of all cross-group friendships listed by the participant was positively correlated with the average reaction time to classify all outgroups in the social network as non–self-descriptive, $r(41) = .42$, $p = .01$. The greater the quality of all cross-group friendships, the longer the reaction times to classify outgroups in the social network as nondescriptive. Further clarifying the meaning of these reaction times, error responses (i.e., responding *me* to a cross-group friend's ethnicity) were correlated with reaction times, $r(40) = .32$, $p = .049$, such that participants who took longer to categorize a cross-group friends' ethnicity as non–self-descriptive were also more likely to press the *me* button when their friends' ethnicity appeared on the screen.

Specificity. Next, we wanted to test the specificity of this effect within ethnic groups that were represented among participants' close cross-group friends. We hypothesized that there would be a degree of specificity, such that a participant's friendship quality with a Black cross-group friend would not predict their response times when categorizing *Asian* as non–self-descriptive, even though the participant had Asian cross-group friends. In this example case, we expected that only closeness with one's Asian friends would predict response latencies when categorizing *Asian* stimuli as non–self-descriptive. This hypothesis was based on meta-analytic findings by Pettigrew and Tropp (2006) that contact with members of one ethnic outgroup had only small effects on attitudes about other outgroups.

To test the specificity question, we correlated quality of the described friendship with the average reaction time to classify all other outgroups in the social network as nondescriptive. This correlation was significant, $r(40) = .40$, $p = .010$, such that closeness with a member of one outgroup predicted the degree to which the ethnicities of other cross-group friends were associated with the self. To ensure that the friendship quality with the described friend was uniquely related to response times to other outgroups in the social network, we conducted the same correlational analysis while using the friendship quality of the other cross-group friendships as a partial variable. Even when controlling for closeness with the other cross-group friends, the friendship quality of the described cross-group friendship uniquely predicted response times to categorize the ethnicities of the other cross-group friends as non–self-descriptive, $r(40) = .43$, $p = .007$, suggesting that friendship with members of one outgroup relates to how ethnic groups of other cross-group friends are cognitively processed.

Discriminability. Finally, we tested whether cross-group friendship affects the way ethnic outgroups, as a whole, are processed. That is, if a participant has a very close Black friend but no Latino friends, does that participant associate themselves

with the Black ethnicity only or with both Blacks and Latinos? We addressed this question by correlating cross-group friendship quality with reaction times to classify the self-descriptiveness of ethnic groups that were not represented among participants' closest friends. If cross-group friendship is related to a global sense of identification with other social groups, then the quality of one's cross-group friendships should predict longer reaction times when classifying all ethnic outgroups as non–self-descriptive. For each participant, ethnicity stimuli were coded for representation in the social network and then mean reaction times to categorize ethnic groups as non–self-descriptive were calculated separately for ethnic groups that were represented in the social network and for ethnic groups that were not represented in the social network.

First, we tested whether the quality of participants' cross-group friendships predicted mean reaction times when categorizing the descriptiveness of ethnic groups that were not represented in the social network. Cross-group friendship quality was not correlated with reaction times when categorizing ethnic groups that were not represented in participants' social networks, $r(40) = .11$, $p = .50$. Thus, cross-group friendship quality does not predict associations of the self with outgroups that are not represented among one's closest friends.

Second, we compared the relative speed of classifying ethnic outgroups that were represented in participants' social network with outgroups that were not represented in the social network. Mean reaction times to outgroups in the social network and outgroups not in the social network were regressed on cross-group friendship quality in a 2 (within-subjects, nominal: presence or absence of ethnic group in social network) × 2 (between-subjects, continuous: cross-group friendship quality) mixed-measures general linear model. This analysis revealed a marginal main effect of social network, $F(1, 38) = 3.36$, $p = .07$, and a significant main effect of cross-group friendship quality, $F(1, 38) = 6.34$, $p = .02$. These main effects were qualified by a significant interaction between social network and cross-group friendship quality, $F(1, 38) = 6.00$, $p = .02$. Simple effects analysis revealed that participants who were one standard deviation above the mean of cross-group friendship quality took significantly longer to classify ethnic outgroups as non–self-descriptive if those ethnicities were present in the social network ($M = 954.78$ ms) than if the ethnic groups were not present in the social network ($M = 851.64$ ms), $t(38) = 2.42$, $p = .02$. Participants who were one standard deviation below the mean of cross-group friendship quality were marginally faster to classify ethnicities that were present in the social network ($M = 732.95$ ms) than to classify ethnic groups that were not present in the social network ($M = 819.20$ ms), $t(38) = 2.02$, $p = .051$.

Convergence with measures of group identification.

Explicit outgroup identification. We hypothesized that if response latencies to cross-group friend's ethnicities represent the inclusion of a friend's group in the self then reaction times should also be related to self-reports of identification with the friend's ethnicity. Indeed, there was a significant positive association between reaction times to an accessible cross-group friend's ethnicity and self-reported identification with that friend's ethnic group, $r(41) = .37$, $p = .024$. Similarly, cross-group friendship quality

was also positively correlated with explicit outgroup identification, $r(41) = .36$, $p = .027$.

Responses to traits that are stereotypical of a friend's ethnicity. In line with prior research on self-stereotyping, we hypothesized that cross-group friendship quality would predict faster reaction times to traits that were explicitly rated by the participant as self-descriptive and independently rated as stereotypical of members belonging to a cross-group friend's ethnic group. For example, the independent sample rated *loyal* as being stereotypical of Latinos and *academic* as being counterstereotypical to the Latino ethnic group. We expected that non-Latinos who consider themselves to be loyal and academic would be faster to categorize *loyal* than *academic* with the *me* button to the degree that they felt close with Latino friends.

Reaction times to the 60 stereotypical and counterstereotypical trait stimuli were analyzed with a mixed model ANOVA in which reaction times were regressed on the between-subjects factor of cross-group friendship quality and a within-subjects variable of trait stereotypicality for the described friend's ethnic group. This revealed a significant interaction of cross-group friendship quality and stereotypicality of stimulus trait, $F(1, 32) = 4.66$, $p = .039$.[2] This interaction is illustrated in Figure 1, in which means of reaction times to self-descriptive words by trait stereotypicality are plotted for participants one standard deviation above and below the mean of friendship quality. Simple effects of this interaction revealed that stereotypicality of trait words was a significant predictor of response times among participants who had high-quality cross-group friendships, $t(32) = -2.91$, $p = .013$, but not for participants who had low-quality cross group friendships, $t(32) = 0.41$, $p = .680$. Similarly, cross-group friendship quality predicted faster response times among stereotypical traits, $t(32) = -4.50$, $p < .001$, but there were no significant differences by friendship quality among response times for counterstereotypical traits, $t(32) = 0.51$, $p = .611$. There was also a significant main effect of cross-group friendship quality, $F(1, 32) = 20.23$, $p < .001$, but no significant main effect of trait stereotypicality, $F(1, 32) = 1.14$, $p = .295$.

We conducted a parallel test of the reaction time effect with stereotypical traits by examining the frequency of errors when classifying explicitly non–self-descriptive traits that were stereotypical of a cross-group friend's ethnicity. If participants associate themselves with their cross-group friend's ethnic group, then they should be more likely to incorrectly respond with *me* to stereotypical traits that were explicitly rated as non–self-descriptive. Error counts follow a Poisson distribution rather than a normal curve, so error responses were analyzed with SAS proc genmod with a Poisson distribution. Consistent with our hypothesis, there was a significant interaction between cross-group friendship quality and stereotypicality of trait word, $\chi^2(1, N = 32) = 21.03$, $p < .001$. This interaction is illustrated in Figure 2, in which mean number of errors to non–self-descriptive words by trait stereotypicality are plotted for participants one standard deviation above and below the mean of cross-group friendship quality. Simple effects of the interaction of cross-group friendship quality and trait stereotypicality revealed that cross-group friendship quality significantly predicted errors for stereotypical traits, $\chi^2(1, N = 32) = 44.26$, $p < .001$, but cross-group friendship quality did not predict error rates to counterstereotypical traits, $\chi^2(1, N = 32) = 0.59$, $p = .442$. Furthermore, stereotypicality of the trait word significantly

predicted error rates for participants with high-quality cross-group friendships, $\chi^2(1, N = 32) = 132.57$, $p < .001$. Stereotypicality was not a significant predictor of error rates among participants with low quality cross-group friendship, $\chi^2(1, N = 32) = 1.36$, $p = .245$. There were overall main effects of both cross-group friendship quality, $\chi^2(1, N = 32) = 5.34$, $p = .021$, and stereotypicality of trait word, $\chi^2(1, N = 32) = 6.39$, $p = .012$.

Summary and discussion. This study replicated the findings of Aron et al. (1991) with close others who belong to social outgroups. Similar to the findings of Aron and colleagues (1991), participants took longer to classify personality traits as non–self-descriptive if the traits uniquely described a cross-group friend than if the traits described neither themselves nor their cross-group friends. We also extended the original findings with personality traits to collective characteristics. As hypothesized, participants with high quality cross-group friendships took significantly longer to categorize a cross-group friend's ethnicity as nondescriptive of themselves. These results provide supporting evidence for the hypothesis that closeness with outgroup members involves an expansion of the self to include the ethnic identities of close cross-group friends.

The specificity and discriminability analyses allowed for a deeper understanding of the extent to which cross-group friendship predicts an inclusion of outgroups in the self-concept. The specificity analyses suggested that the relationship between cross-group friendship quality and inclusion of friend's ethnic groups in the self-concept generally applies to all ethnic groups with which participants had cross-group friendships. On the one hand, these results suggest that the quality of one cross-group friendship in the social network may affect the quality of other cross-group friendships. Given the correlational nature of the data, however, another possible explanation is that people who had high quality friendships with one cross-group friend are more likely to have high quality friendships with their other cross-group friends and thus are more likely to associate themselves with other friends' ethnic groups. On the contrary, the results of the discriminability analyses imply that people who have close cross-group friends do not generally feel close with outgroups on the whole. Taken together, the specificity and discriminability analyses demonstrate that the quality of cross-group friendship with members of one social outgroup predict the degree to which other outgroups are associated with the self, but this generalizability is limited to other outgroups with which one has close cross-group friendships. For the self to become associated with an outgroup, one must have close friends who are members of that group.

Furthermore, we observed a significant relation between self-reported outgroup identification and reaction times to friend's ethnicities, suggesting that reaction times to friends' ethnicities

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[2] We were curious whether reaction times to stereotypical traits would be moderated by whether the stereotypical traits were positive or negative in valence. Anderson (1968) published the likability of the ACL trait words used as stimuli in our study, and thus we coded the traits for positivity and regressed reaction times to classify stereotypical traits with *me* on trait positivity and cross-group friendship quality. This model yielded no significant main effects and no interaction effects on speed to classify stereotypical traits as self-descriptive (Fs < 0.51, ps $> .48$). These findings are consistent with past work on self-stereotyping that demonstrates the effect even for undesirable stereotypes (e.g., Sinclair & Huntsinger, 2006).
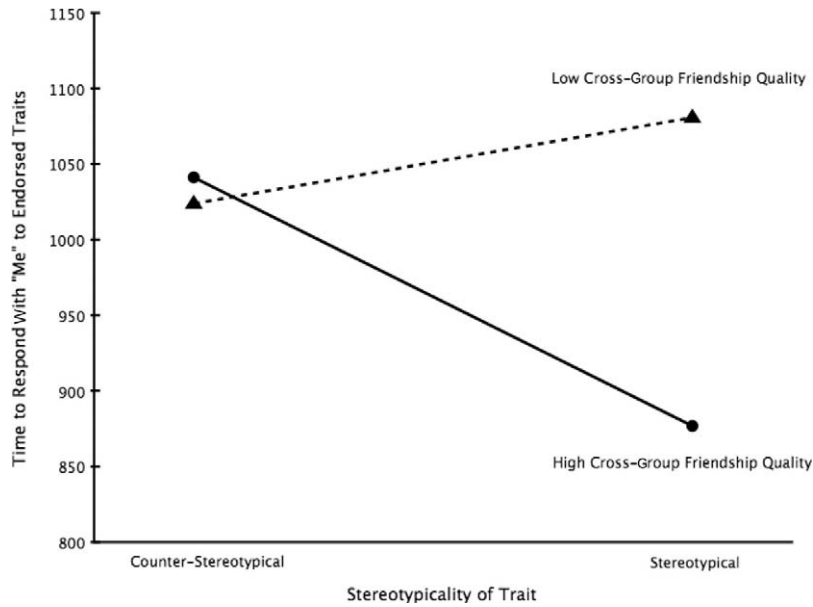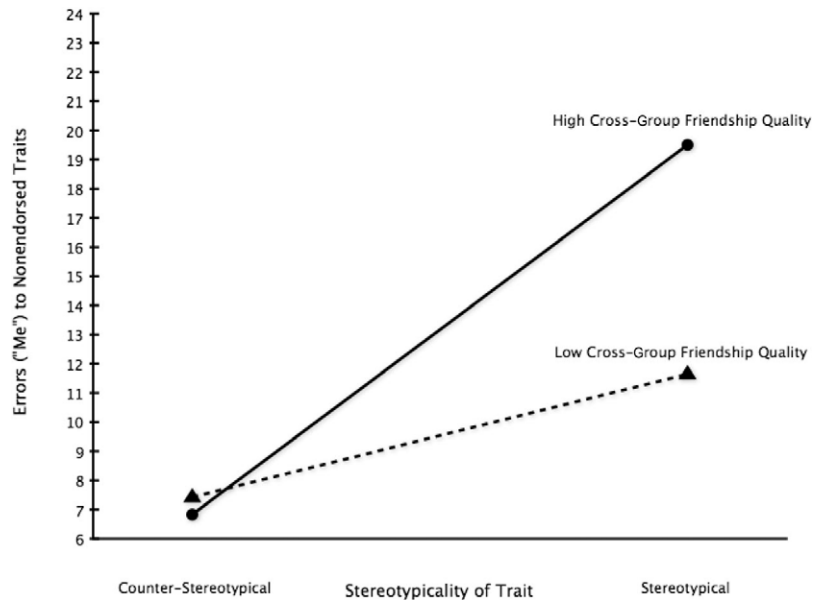
Figure 1. Reaction times by trait stereotypicality for self-descriptive traits. Least-squares means for reaction times of correct *me* responses to traits that were explicitly rated as self-descriptive for traits that were rated as stereotypical or counterstereotypical of a close cross-group friend's ethnic group. Mean estimates are plotted at one standard deviation above the mean of cross-group friendship quality (solid line) and one standard deviation below the mean of cross-group friendship quality (dashed line).

and self-reports of identification with friends' ethnicities are convergent methods of measuring inclusion of other groups in the self concept. A further test of convergence was provided by the self-stereotyping analysis; greater closeness with ethnic outgroup members facilitated the categorization of stereotypical words that were self-descriptive and predicted more errors when categorizing stereotypical words that were not explicitly considered self-descriptive.

Figure 2. Error rates by trait stereotypicality for non–self-descriptive traits. Least-squares means for number of incorrect *me* responses to traits that were explicitly rated as non–self-descriptive for traits that were rated as stereotypical or counterstereotypical of a close cross-group friend's ethnic group. Mean estimates are plotted at one standard deviation above the mean of cross-group friendship quality (solid line) and one standard deviation below the mean of cross-group friendship quality (dashed line).

It should be noted that we were limited to examining responses to the ethnic groups represented among participants' 10 closest friends—their close social network. As such, participants may have had cross-group friends that were not reported among their 10 closest friends. However, given that this was an open-ended measure, the friends that were listed as being the 10 closest friends are likely people whom are most readily accessible in the participants' minds. This implies a certain degree of closeness with the friends listed in the social network questionnaire. As the social network is expanded to include the ethnicities of cross-group friends who are distal network members, the responses of participants to the ethnic groups represented in the distal network would most likely mirror the responses of participants who were low in cross-group friendship quality.

By establishing a link between cross-group friendship quality and reaction times to friend's ethnicities, this study provides an empirical basis for hypothesizing that self-expansion with a cross-group friend's ethnicity may mediate observed improvements in intergroup interaction among people with close cross-group friendships, which is the model tested in Studies 2 and 3. All the same, the correlational design of this study made it impossible to disentangle whether cross-group friendship leads to a strengthened association between the self and other groups or whether people who innately feel connected to other people and groups are more likely to acquire cross-group friends. Thus for Study 2, we developed an experimental methodology to test the cognitive impact of closeness with a member of a social outgroup.

Study 2

In Study 2, we examined whether the strength of associations of the self with a cross-group friend's ethnic group predicts positivity of expectations for an interaction with a new outgroup peer. As Study 1 demonstrated an implicit association of the self with a cross-group friend's group, cross-group friendship might influence daily intergroup experiences only insofar as a cross-group friend is readily brought to mind. Concepts that are easily brought into working memory are considered to be cognitively accessible (Higgins, 1996). Similarly, concepts that are closely related to concepts currently active in working memory become more accessible than concepts that are distally related. We took advantage of this representational structure to examine the cognitive impact of cross-group friendship. We measured collective self-expansion and expectations for an imagined intergroup interaction after a cross-group friendship or same-group friendship had been made accessible.

Method

Participants. Participants were 38 Asian- and European-American college undergraduates (70.0% female) participating for course credit. The mean age of this sample was 20.16 years ($SD = 3.78$ years). The ethnic distribution of the sample was 42.5% Asian American and 57.5% European American. We chose these ethnic groups to avoid confounding the effects of ethnicity and minority or majority status among people with cross-group friends. Asian- and European-American students both hold ethnic pluralities on the University of California Berkeley campus (Office of Student Research, 2007); thus we were able to take advantage of this

unique atmosphere and examine the effects of cross-group friendship in a context in which all friendships would be majority–majority pairs. All the same, we controlled for ethnicity to ensure our results were not attributable to ethnic group membership.

Design. This study had a two-level (friendship prime: same-group or cross-group) single-factor between-participants design. The same-group friendship prime was used as a control condition so that the effects of cross-group friendship prime could be compared with the effects of priming a friendship that does not have an intergroup component.

Procedure.

Prescreening. In a mass-prescreening questionnaire administered at the beginning of each semester, potential participants provided the first names and last initial of their three closest friends from each of four ethnic groups: Asian American, Black American, Caucasian American, and Latino or Latina. Participants also rated their closeness with each friend on a 7-point Likert scale, on which high numbers indicate greater closeness. Eligible participants were chosen by selecting Asian- and European-American participants who provided at least one same-group and one cross-group friend (Asian American or European American) and who rated those friends as being 6 or 7 on closeness. The prescreening assessment was administered among many researchers' measures, and the prescreening survey was completed at least 3 weeks prior to the laboratory session. Thus, the use of the course credit participant pool allowed us to minimize the extent to which participants would remember the specifics of our prescreening items.

Condition assignment. After participants scheduled a laboratory session, they were randomly assigned to a friendship prime condition, and idiographic stimuli were created for each participant's friendship prime. These idiographic friendship primes were installed on experiment computers prior to participants' scheduled laboratory sessions.

Laboratory session. Participants were run in groups of 1 to 4. Upon arriving at the laboratory, participants were told the researcher was testing the "language used to describe close friends and the relations among friendship, sociability, and social interaction." Consenting participants were led to individual computer cubicles that were sectioned so that participants could not see each other.

Participants began the experiment with the friendship prime; they described either a same-group friend or a cross-group friend in detail. The friendship prime was self-paced, and most participants took between 5 min and 10 min to describe their friend. After the friendship prime, participants completed the reaction time task on which they were asked to respond to a series of words as self-descriptive or nondescriptive. Participants then read a vignette describing an interaction with a new person of another ethnicity. They were instructed to read the vignette a few times while imagining that the person was looking at them. After visualizing the situation, participants wrote a paragraph about what they would say to the person described in the vignette and how much they expected to enjoy the social interaction. After this task, participants were fully debriefed, thanked, and dismissed.

Materials.

Friendship prime. On the basis of the prescreening data and condition assignment, the first name and last initial of either a close same-group friend or a close cross-group friend were inserted into survey questions as idiographic stimuli. On the

basis of the condition assignment, a computer script written in Perl 5.8 generated a personalized web survey that served as the friendship prime.[3] The web survey was administered and processed through the HTML special input feature of MediaLab software from Empirisoft (Jarvis, 2006b). If the participant was assigned to the same-group prime condition, the personalized friendship prime would ask a series of questions about one of the participant's close same-group friends provided in pre-screening. If the participant was assigned to the cross-group prime, the personalized friendship prime would ask a series of questions about one of the participant's close Asian-American or European-American cross-group friends provided in pre-screening, depending on the ethnicity of the participant. After answering a few Likert-scale questions about the friend (e.g., "How close do you feel to [friend's name]?" "How likely would you be to turn to [friend's name] for help with a problem?"), participants were prompted to write about their friend in an open-ended format, as per Wright and Mischel (1988). Specifically, participants were asked to describe how the friendship began and to "describe [friend's name] in a few paragraphs, so we may know [friend's name] as well as you do." Taken together, these prompts were used to make either a same-group friend or a cross-group friend accessible in the participants' minds.

Self-expansion reaction time task. As with the self-expansion reaction time task of Study 1, the same 90 adjectives from the ACL and the six ethnic groups were used as stimuli, and the participants were asked to categorize each stimulus with *me* if the word was self-descriptive and *not me* if the word was not self-descriptive. The reaction time task was administered with DirectRT software from Empirisoft (Jarvis, 2006a). The speed of reaction times to the ethnicity stimuli were recorded as measurements of implicit associations of an outgroup with the self. As with Study 1, all trials with reaction times less than 300 ms or greater than 5,000 ms were excluded from analysis to account for reaction-time outliers (less than 5% of total responses).

Vignette of interaction with novel outgroup member. An independent sample of 79 undergraduates used a 1 (*not at all*) to 10 (*very*) scale for rating nine potential situations for believability ("How common/believable do you think this situation is for college students?"), nine person descriptions for someone they would be motivated to impress ("How attractive does this person sound?"), and nine discussion topics for evoking concerns of self-evaluation ("How worried would you be that your opinions on this topic would affect the way the person would think about you?") so that the imagined situation would trigger sufficient variability among participants' responses. The pilot sample rated meeting a friend of a friend at a party as the most common scenario ($M = 8.35$, $SD = 1.61$), a tall person with well-kept straight hair who is dressed very stylishly as the most attractive description ($M = 7.15$, $SD = 1.81$), and the topic of affirmative action as evoking the most worry about social judgment ($M = 5.32$, $SD = 2.56$).

In the final vignette, participants were asked to imagine meeting a new person of another ethnicity at a party at which the discussion turns to affirmative action policies. The new person in the story was described as being a "tall [Asian/European] American person with well-kept straight hair who is dressed very stylishly" and who is introduced to them by one of their friends. European American

participants read about meeting an Asian American person and Asian American participants read about meeting a European American person.

Expectations for imagined interaction. Participants were asked to describe their expectations for the imagined intergroup interaction with a version of the intergroup anxiety scale (Stephan & Stephan, 1984) that was adapted to be specific to the imagined interaction. The intergroup anxiety scale consists of 16 adjectives that capture anxious experiences in intergroup contexts (e.g., *anxious*, *uneasy*). In addition, we included five questions that were specific to the study hypotheses (i.e., "How much would you enjoy this discussion?" "How enthusiastic would you feel while having this discussion?" "How much would you like the other person?" "How interested would you be in friendship with this person?" "How likely would you be to wave at this person if you saw them randomly on campus?"). All ratings were made on a 7-point Likert scale with negatively valenced items recoded so that higher numbers indicated more positive expectations for the imagined interaction. These ratings were averaged together to form a composite index of positivity of the imagined intergroup interaction ($\alpha = .91$).

Results

To test the hypothesis that the cross-group friendship prime would improve expectations for the imagined intergroup interaction, positivity of the imagined intergroup interaction was regressed on friendship prime (dummy-coded: 0 = same-group, 1 = cross-group). All analyses are considered significant at the $p < .05$ level.

Friendship prime was a significant predictor of expectations for the intergroup interaction ($\beta = .35$), $t(36) = 3.86$, $p < .001$, implying that expectations for intergroup interaction are more positive when a cross-group friend is accessible. Next, the hypothesized mediator of self-expansion with a friend's ethnic group was regressed on friendship prime, revealing an effect of friendship prime on the time it took participants to categorize a friend's ethnicity as *not me* ($\beta = .31$), $t(36) = 2.74$, $p = .009$, such that participants took significantly longer to classify a friend's ethnicity as nondescriptive if their cross-group friend was accessible. Finally, positivity of the imagined intergroup interaction was regressed on friendship prime and reaction times to friend's ethnicity simultaneously. As shown in Figure 3, the full model yielded a strong effect of collective self-expansion ($\beta = .58$), $t(35) = 6.04$, $p < .001$, and the predictive impact of the friendship prime was reduced ($\beta = .17$), $t(34) = 2.44$, $p = .020$, albeit still significant. A Sobel's test revealed that this partial mediation was significant (Sobel's $Z = 2.50$, $p = .013$).

Summary and Discussion

These results provide initial evidence that cross-group friendship improves intergroup interaction through identification with a

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[3] For the benefit of future research, the Perl 5.8 script that generates same- and cross-group friendship primes can be downloaded from our lab website (http://rascl.berkeley.edu/tools). The README file that accompanies this script explains its use. This script is provided as an open-source tool for noncommercial use, and thus other researchers are welcome to tweak the code to adapt it to new research questions.
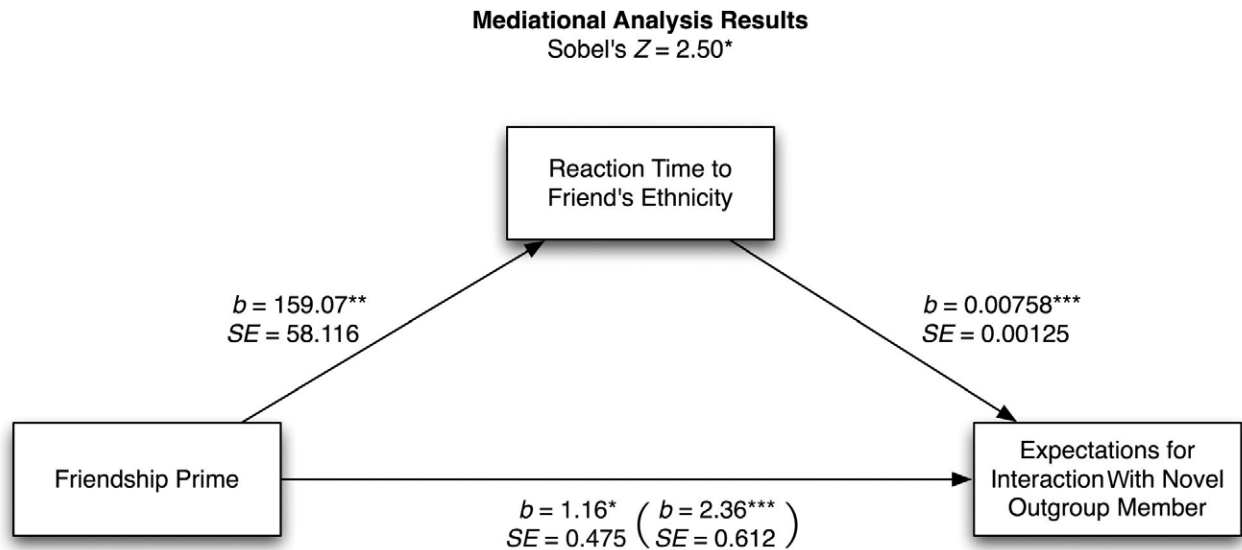
Mediational Analysis Results
Sobel's $Z = 2.50$*

Figure 3. Mediational model tested in Study 2. Unstandardized regression coefficients and the associated standard errors are reported along the paths they model. Statistics reported within parentheses are from the main effects model prior to adding the mediating term. In this regression equation, friendship prime was coded with 0 = same-group friendship prime and 1 = cross-group friendship prime. * $p < .05$. ** $p < .01$. *** $p < .001$.

cross-group friend's ethnicity. The significant effect of friendship prime implies that cross-group friendship improves expectations for intergroup interaction. This effect was significantly mediated by collective self-expansion, implying that greater association between oneself and a cross-group friend's ethnicity partially explains why cross-group friendship relates to positive intergroup social interactions. Considering that all prescreened participants had at least one very close cross-group friend, the effects observed in Study 2 imply that the intergroup benefits of having a cross-group friend depend on the degree to which that friend is in mind.

Although these results are promising, only self-report data were used to assess imagined experiences and thus were susceptible to experimental demand and social desirability issues. Furthermore, it may be argued that our grouping of Asian American was too broad (Ying, Lee, Tsai, Yu, & Tsang, 2001). Ying and colleagues found that Chinese Americans at the University of California Berkeley were just as likely to have a Black friend as they were to have a Korean friend; thus, ethnicity (e.g., Chinese, Japanese, Vietnamese) may be the level at which group barriers to friendship are built rather than the pan-ethnic grouping of Asian American. Study 3 sought to address these issues systematically. Foremost, unstructured social interactions between 2 real participants were observed in the laboratory, during which uncontrollable hormonal responses to the social interaction were assessed. To more accurately examine cross-group friendship, we examined such friendship among Chinese-American and European-American participants who had close Chinese- and European-American friends.

Study 3

Study 3 extended the findings of Study 2 to experiences during a real (laboratory) intergroup interaction. Chinese- and European-American undergraduates were randomly assigned to describe a same-group or cross-group friend in detail and to then interact with

a cross-group partner while hormonal responses were assessed. Hormonal correlates of stress during intergroup social interactions provide at least two advantages as a dependent variable over self-reported measures: (a) Physiological measures are uncontrollable and thus are able to capture nuances of experience in the intergroup context that typically involve social pressures on behavior (Blascovich et al., 2001; Dovidio et al., 2003), and (b) hormonal responses, in particular, have implications for health in diverse societies (Mendes, Gray, Mendoza-Denton, Major, & Epel, 2007; Page-Gould et al., 2008). Although the use of hormonal outcomes in intergroup research has been relatively rare, two stress hormones, cortisol (Mendes, Blascovich, Hunter, Lickel, & Jost, 2007; Page-Gould et al., 2008) and a ratio of dehydroepiandrosterone sulfate (DHEA-S) to cortisol, referred to as anabolic balance (Mendes, Gray, et al., 2007), have demonstrated predictive validity in intergroup contexts.

Cortisol is a catabolic steroid hormone released in response to stress by the hypothalamic pituitary adrenal (HPA) cortical axis of the endocrine system (Kaltsas & Chrousos, 2007), and increases in cortisol are predicted by implicit prejudice and concerns of race-based rejection during interethnic social interactions (Page-Gould et al., 2008). Catabolic hormones break down muscle tissue in an effort to respond powerfully and quickly to the demands of a stressor (Kaltsas & Chrousos, 2007). Chronically elevated levels of cortisol are related to serious health conditions like heart disease and cancer (Chrousos & Gold, 1992; Wei et al., 2001), so cortisol responses are only adaptive if they are followed by recovery (Epel, McEwen, & Ickovics, 1998). DHEA-S is the sulphate ester of the anabolic steroid hormone dehydroepiandrosterone that is also released in response to stress but is related to recovery from that stressor and adaptive coping (Epel et al., 1998). In particular, DHEA-S appears to protect the body from tissue damage caused by the catabolic effects of cortisol (Debigaré et al., 2003; Epel et

al., 1998; Labrie et al., 2005; Minetto et al., 2004). Therefore, the ratio of DHEA-S to cortisol provides a measure of healthy responses to demanding situations.

Mendes, Gray, and colleagues (2007) found that White participants low in implicit prejudice responded with increases in anabolic balance during an interaction with Black evaluators, whereas implicitly prejudiced Whites had significant decreases in anabolic balance during the intergroup interaction that were driven primarily by increases in cortisol. In the present study, we hypothesized that the cross-group friendship prime would predict adaptive hormonal stress responses (i.e., increases in anabolic balance) during a social interaction with an unknown outgroup member, and this effect would be mediated by the degree to which a cross-group friend's ethnic group is included in the self.

Method

Participants. Sixty-two Chinese-American and European-American participants were recruited over the spring semesters of 2007 and 2008. Of this sample, 9 participants were excluded from the analysis because at least one of their hormone samples was contaminated by blood in the saliva (bleeding gums) or because there was not enough saliva to assay both DHEA-S and cortisol. One pair was canceled halfway through the experiment because one of the participants declined the second consent (see Procedure below). Thus, we report data for the remaining 49 participants with full data. This sample comprised 25 Chinese Americans and 24 European Americans (67.3% female). Participants who met our screening criteria (see Prescreening below) were invited to participate in a 2-hr psychophysiological study of friendship and social interaction for course credit.

Design. This study had a 2-level (condition, between-participants: same-group or cross-group friendship prime) single-factor dyadic design. As in Study 2, the same-group prime condition served as a control condition.

Procedure and materials. The procedures and materials of Study 3 were the same as in Study 2, with the following exceptions: Hormonal dependent measures were assessed in the context of a real intergroup interaction as described below.

Procedure. Chinese- and European-American participants were selected from a large psychology department research participant pool if they reported both a Chinese-American friend and a European-American friend with whom they felt at least a 6 on a 7-point scale of closeness (approximately 22% of the prescreening sample was eligible). The names of one cross-group friend and one same-group friend were stored for use as idiographic stimuli for the friendship prime. Participants' self-reported height in inches and weight in pounds were collected to limit participation to individuals with body mass indexes (BMIs) between 18 and 27, given that individuals with BMI outside this range exhibit different physiological reactions to stress (Berntson, Quigley, & Lozano, 2007; Schwartz et al., 2003). Eligible participants were invited to participate through e-mail. Interested participants who responded to the invitation were scheduled with another participant of the opposite ethnicity (all pairs were Chinese Americans with European Americans). Participants were paired according to coordinating schedules, although they did not know about the other participant until well into the laboratory session.

Participants were run in pairs by two undergraduate experimenters blind to experimental condition. Participants were instructed to arrive at different laboratory rooms so they would not see each other prior to the social interaction task. Participants provided an initial baseline saliva sample by expectorating into a 2-ml test tube approximately 15 min after the start of the laboratory session. Next, they completed the friendship prime and the self-expansion reaction time tasks that were used in Study 2. As in Study 2, a computer inserted a same-group friend's or a cross-group friend's name into the friendship prime after randomly assigning the participant to the same-group condition or the cross-group condition, respectively. Immediately following the friendship prime, participants completed the self-expansion reaction time task as in studies 1 and 2.

Participants were then told about the social interaction task; we could not tell participants about the social interaction task prior to the physiological baseline as the nature of the task may be differentially stressful to some participants and baseline values would be randomly affected. Therefore, a second consent was sought from the participants after learning about the social interaction. If the participants were comfortable with continuing the experiment, the two participants were brought to a third room for the social interaction task. The room was arranged for a social interaction, with two comfortable chairs, a coffee table, lamps, and nature pictures. Participants were introduced to each other briefly and were instructed that the goal of the social interaction was to get to know each other. At this time, the experimenters confirmed with the participants that they had never had a conversation with each other prior to the laboratory session. Participants were then left alone to talk for 20 min. At the end of the social interaction task, participants were brought back to their individual rooms and were asked to provide the second saliva sample to assess relative changes in cortisol and DHEA-S during the task. At this time, participants were fully debriefed, thanked, and dismissed.

Materials. The prescreening survey, friendship prime, and self-expansion reaction time task were identical to those used in Study 2. Approximately 2 ml of saliva were collected from each participant to assess baseline and postinteraction levels of cortisol and DHEA-S. Participants expectorated through a sanitary straw into 1.9-ml test tubes approximately 15 min after arriving at the lab for the baseline sample and immediately after the social interaction task for the reactivity sample. Baseline and postinteraction ratios of DHEA-S to cortisol were calculated to measure adaptive stress responses (Charney, 2004; McEwen & Seeman, 1999; Mendes, Gray, et al., 2007). There were two samples taken per participant (baseline and postinteraction samples), and these samples were frozen at temperatures below $-20\,°C$ for a period of 1 to 4 months until transported to an independent lab for assay. Intra- and interassay coefficients of variation for cortisol (measured in nMol/L) were 1.44 and 2.33, respectively. Intra- and interassay coefficients of variation for DHEA-S (measured in ng/ml) were 1.10 and 8.34, respectively.

Results

Analytic strategy. Analyses were conducted with a multilevel model to account for the dependence of cases within participant dyads. Analyses were conducted with SAS proc mixed with random intercepts modeled at the level of dyads and participants

Figure 5. Response times to a cross-group friend's ethnic group by friendship prime. Least squares means of reaction times (in milliseconds) to classify a close cross-ethnic friend's ethnicity with the button *not me* are plotted by friendship prime.

Mediational analysis. Our final question was whether collective self-expansion would explain the relationship between friendship prime and anabolic balance. To test this model, we regressed postinteraction anabolic balance on friendship condition and reaction times to the friend's group simultaneously, controlling for baseline anabolic balance and ethnicity. As depicted in Figure 6, response times to classify a friend's ethnic group as non–self-descriptive significantly predicted postinteraction anabolic balance, $F(1, 45) = 10.59$, $p = .002$, and the relation between friendship condition and anabolic balance were significantly reduced with reaction times included in the model, $F(1, 45) = 1.17$, $p = .284$. A Sobel's test revealed that this mediation was significant (Sobel's Z $= 2.16$, $p = .030$). The population covariance for this model was estimated to be $\sigma_{ab} = .0187$, $p = .903$. This implies that the mediational model was consistent across dyads (Kenny et al., 2003). Thus, associations of a close cross-group friend's ethnic group with the self mediated the relationship be-

tween friendship prime and hormonal responses during a social interaction with a novel outgroup member.

Summary and discussion. As hypothesized, participants who were primed to think about a close cross-group friend exhibited hormonal reactivity consistent with adaptive responses to stress during an interaction with a novel person of another ethnicity. Moreover, the cross-group friendship prime predicted longer reaction times to classify a cross-group friend's ethnic groups as non–self-descriptive, and this collective self-expansion explained the relationship between friendship prime and anabolic balance reactivity. The mediation implies th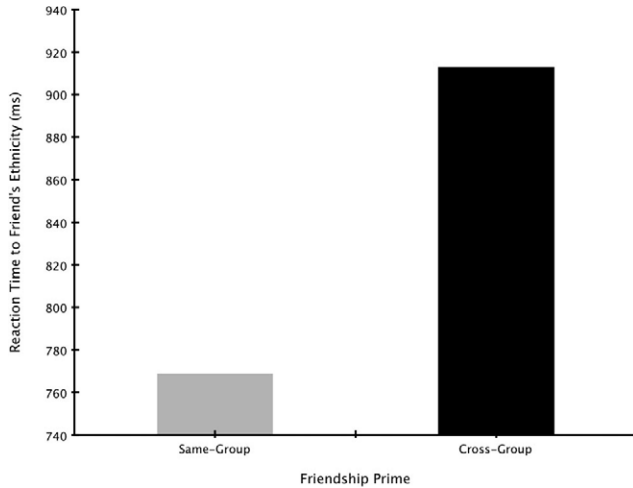at associations of the self with a friend's group explain why the accessibility of a cross-group friendship improves social interactions with novel outgroup members.

General Discussion

The primary purpose of this project was to identify a mechanism of closeness that might explain the intergroup benefits that have been associated with cross-group friendship in past research. In the service of this goal, we sought a process that has been used to understand the social–cognitive aspects of close relationships that also seemed relevant to intergroup cognition (c.f., Aron et al., 2004; Wright et al., 1997; Wright et al., 2002). Study 1 provided a conceptual replication of Aron et al. (1991) by empirically demonstrating that collective characteristics of close others are adopted into the self, as has been previously observed with individual characteristics of close others. Study 2 introduced a new experimental paradigm and provided inceptive evidence that including collective characteristics of a close cross-group friend in the self impacts experiences with novel members of the friend's group. Study 3 replicated the effectiveness of the friendship prime used in Study 2 in the context of a real intergroup interaction between strangers. Together, this work demonstrated that social–cognitive processes of interpersonal closeness have special implications for intergroup relations when closeness develops across group boundaries. The findings presented here illuminate the fluidity of social- and even self-categorization.

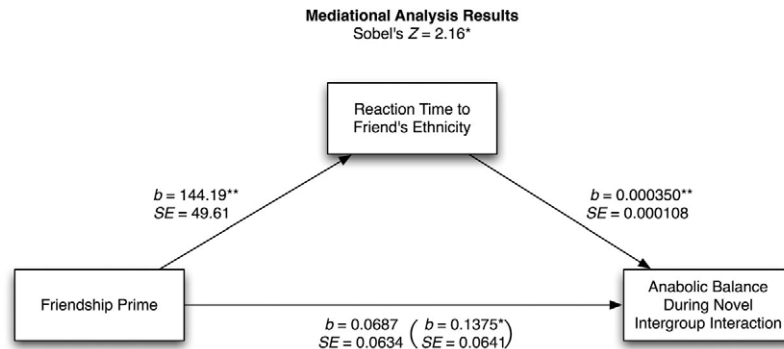*Figure 6.* Multilevel mediational model tested in Study 3. Unstandardized regression coefficients and the associated standard errors are reported along the paths they model. Statistics reported within parentheses are from the main effects model prior to adding the mediating term. In this model, friendship prime was coded with $0 = $ same-group friendship prime and $1 = $ cross-group friendship prime. * $p < .05.$ ** $p < .01.$

Implications for Intergroup Relations

Self-expansion leads to the extension of self-serving biases such as resource allocation and situational attributions for behavior (Aron et al., 1991). Self-serving biases mirror many processes of ingroup favoritism (Tajfel & Turner, 1979), and so self-expansion with people from different social groups may be a method through which social identification enhances intergroup relations instead of fostering conflict. Indeed, cross-group friendship has been associated with improvements in many classic components of intergroup behavior (Tajfel & Turner, 1979), like perceiving greater variability among outgroup members (Islam & Hewstone, 1993; Paolini et al., 2004), increasing resource allocation (Wright et al., 1997), and improving intergroup attitudes (Pettigrew & Tropp, 2006; Wright et al., 2002). Therefore, it seems the closeness that defines cross-group friendship may be the mechanism through which cross-group friendship affects intergroup cognition, affect, and behavior.

Similar to our concerns is a question that is currently of central interest in intergroup relations (Pettigrew & Tropp, 2006): What features of intergroup contact lead to reduced prejudice? Pettigrew (2006) proposed that reductions in anxiety, increased knowledge of the outgroup, and increased empathy were three potential mediators of the relation between contact and prejudice reduction. Although this work has focused on intergroup contact in the absence of friendship (e.g., transaction between two business owners with different ethnic backgrounds), cross-group friendship has been associated with the greatest reductions in prejudice out of all forms of contact (Pettigrew & Tropp, 2006). Taken together with the present research, the strong effects of friendship on prejudice reduction could be explained through the self-expansion processes proposed here. Specifically, our past work (Page-Gould et al., 2008) and Studies 2 and 3 demonstrated that cross-group friendship reduces correlates of anxiety in intergroup contexts, thus improving the tenor of daily contact experiences with novel outgroup members. Furthermore, self-expansion is related to perspective-taking and empathy with close others (Aron et al., 1991), and the adoption of a social outgroup in the self theoretically involves an adoption of the customs and traditions of the group (Aron et al., 2004). It is thus possible that cross-group friendship is such a powerful predictor of prejudice reduction because processes of interpersonal closeness enhance the features of successful intergroup contact emphasized by Pettigrew (2006).

In the last decade, researchers have been investigating the idea that indirect or expanded contact may be an effective method of reducing prejudice and intergroup anxiety (Paolini et al., 2004; Wright et al., 1997). An individual would be said to have an indirect cross-group friendship if they only have same-group friends, but one or more of their same-group friends has a close cross-group friend (Wright et al., 1997). Viewed through the lens of self-expansion theory, indirect friendship occurs because important friends of close others are incorporated into the self (Wright et al., 2002), such as feeling close to your spouse's best friend. Recent work strongly suggests that the benefits of indirect friendship also occur through self-expansion processes (Paolini, 2005; Turner et al., 2008). The implication of the indirect contact effect is that only one person needs to actually develop a direct cross-group friendship in order for an entire close social network to have improved attitudes. Thus, the beneficial effects of cross-group friendship can spread at multiplicative rates. Indeed, in their

seminal work on the indirect contact effect, Wright et al. (1997) observed improved attitudes among multiple individuals after they had viewed a single ingroup member greet an outgroup member as if they were good friends. Although the present collection of studies was an investigation of the basic psychological processes that underlie the intergroup benefits of cross-group friendship, public policy will likely be more fruitful with a focus on indirect friendship, simply due to its ability to affect more people simultaneously. An important caveat to the indirect contact effect, however, is that the intergroup benefits afforded through associations of a person or group with the self should diminish linearly as the distance between the self and the outgroup member increases.

Recent work by Turner, Crisp, and Lambert (2007) demonstrated that vicarious experiences of intergroup contact were an effective method of improving intergroup attitudes and intergroup anxiety. They assigned participants to imagine themselves interacting with an outgroup member and then asked questions regarding intergroup anxiety, outgroup heterogeneity, and how much they would prefer to interact with an ingroup member versus an outgroup member. They found that participants who imagined interacting with an outgroup member reported less relative preference for interacting with an ingroup member, less intergroup anxiety, and greater outgroup heterogeneity. However, Study 2 of Turner et al. (2007) directly compared imagining interacting with an outgroup member and simply thinking about an outgroup member. They found that thinking about an outgroup member did not reveal the intergroup benefits that imagining an interaction with an outgroup member did. Our Study 2, by contrast, had an imagined intergroup interaction as a dependent variable following a manipulation in which participants described a friend. We found that participants who had described a same-group friend did not imagine this interaction to be as positive as our participants who had just described a cross-group friend, underscoring the power of cross-group friendships in influencing subsequent intergroup interactions. Combining insights from both studies, we predict that thinking about an interpersonally close outgroup member might yield improvements in intergroup bias. The divergence of our findings from those of Turner and colleagues (2007) likely stems from the relationship held with the outgroup member that our participants imagined.

Inference and Implications of Hormonal Responses

In Study 3, we manipulated psychological phenomena and observed changes in a physiological outcome. Thus, our data cannot speak to whether hormonal reactivity affects the tenor of intergroup interactions but rather indicates that psychological states (i.e., accessibility of a same-group or cross-group friendship) predict hormonal reactions in relevant situations (Cacioppo, Tassinary, & Berntson, 2007). However, we were somewhat surprised by the extent to which the same-group friendship prime elicited hormonal responses that were similar to nonegalitarian individuals in other research (c.f., Mendes, Gray, et al., 2007). We had assumed that having a same-group friendship accessible would be irrelevant to the success of the intergroup interaction among this special population and that describing a cross-group friendship would simply enhance good intergroup experiences. Instead, participants who described a same-group friend had average increases in cortisol from baseline, whereas participants primed with a

cross-group friend experienced significant decreases in cortisol from baseline. Even though the average increase in cortisol among participants in the same-group condition was not a reliable change from baseline, it is an interesting trend given that there were significant differences between the experimental groups. Furthermore, the lack of a decrease in cortisol among the same-group condition and the significant increases in DHEA-S among the cross-group condition is particularly interesting, given that all sessions were run in the afternoon, a phase in the diurnal cycle when both cortisol and DHEA levels are typically decreasing (Hucklebridge et al., 2005).

The responses of participants primed with a same-group friend may be a similar physiological reaction to intergroup interactions exhibited by people who are without intergroup contact (Blascovich et al., 2001; Mendes, Blascovich, Lickel, & Hunter, 2002) or who are high in implicit prejudice (Mendes, Gray, et al., 2007; Page-Gould et al., 2008). The aforementioned stress response is related to heart disease, cancer, and Type II diabetes when chronically activated (Chrousos & Gold, 1992; Raikkonen, Keltikangas-Jarvinen, Adlercreutz, & Hautenen, 1996; Wei et al., 2001), and these are all diseases targeted by the U.S. Department of Health and Human Services (2000) as psychosocial health disparities between ethnic groups. Furthermore, low anabolic balance has been implicated in psychiatric pathology such as depression (Wolkowitz et al., 2001) and the acceleration of the destruction of muscle tissue in cardiac patients (Anker et al., 1997; Debigaré et al., 2003). On the flip side, participants who were randomly assigned to describe a cross-group friend before the interaction with a novel outgroup member responded with increases in anabolic balance. This latter stress response is related to speedy recovery after a stressor and physiological thriving over elongated periods of time (Epel et al., 1998; Mendes, Gray, et al., 2007). Therefore, there exists a clear need to systematically examine when and how cross-group friendship may buffer individuals from the health consequences of responses to intergroup interaction in diverse societies.

Manipulation of Friendship Accessibility

Methodologically, the present research introduced a new experimental paradigm for examining the cognitive effects of a cross-group relationship through the use of same-group and cross-group friendship primes. By having participants describe a cross-group friend, the concepts that were contextually associated with that friend became more accessible. We were interested in the degree to which cross-group friendship affected associations with the self, and so we used the reaction time task developed by Aron et al. (1991) to access the strength of association between the self and different ethnic groups. This aspect of the design could be easily tweaked to assess any concept of relevance to one's research question. Among a population of individuals who have a cross-group friend, the friendship prime presents a cheap and easy method of testing causal claims about the impact of cross-group friendship, particularly when compared with manipulations of friendship (e.g., Mendoza-Denton & Page-Gould, 2008; Page-Gould et al., 2008; Paolini, 2005; Wright et al., 2002). We need to rely on future research to delineate the contexts in which the accessibility of a cross-group friendship is—and is not—applicable.

This experimental manipulation of friendship accessibility has interesting implications for individual differences in baseline accessibility of close friends. Individuals who enjoy detecting patterns and complex associations, such as those high in need for cognition (Cacioppo, Petty, Feinstein, & Jarvis, 1996), may have representations of cross-group friends triggered more readily by novel outgroup members. Similarly, individual differences in mindfulness (Langer, 1989) may predict behaviors during social interactions that are similar to those observed for individuals with accessible cross-group friends in the present work. Experimental work on mindfulness—a practice that emphasizes a detachment from the self and the development of compassion—has demonstrated that regular mindfulness training facilitated the development of cross-cultural competence among Chinese immigrants to the United States (Ying, 1999). Mindfulness might affect intergroup interactions similarly to cross-group friendship through a greater sense of connection with humanity.

It is also of note that although we do not use the reaction time measure of self-expansion—billed as an implicit personality test—to discern any measure of individual differences, responses to specific stimuli within this task proved to have predictive validity for our purposes. Thus, it is possible that personality researchers could adapt this procedure, which has primarily been used for basic social–cognitive research on the self-concept (Aron et al., 1991; Kuiper, 1981; Markus, 1977), for use as an actual measure of implicit personality. Similar to the predictive divergence between explicit and implicit measures of prejudice (c.f., Dovidio et al., 2002), it would be interesting if explicit measures of individual differences predicted controllable responses and implicit individual difference measures predicted more automatic responses like nonverbal behavior.

Limitations and Future Directions

We have relied on past research (e.g., Blascovich et al., 2001; Mendes et al., 2002; Mendes, Blascovich et al., 2007; Stephan & Stephan, 1985, 2000) to establish that the positive intergroup experiences of people with cross-group friends are the exception to the rule and thus did not compare responses among people who do and do not have cross-group friends. We argue that most research on intergroup social interaction has extensively documented stress and anxiety as the de facto for intergroup interaction across self-reports (Britt, Boniecki, Vesio, Biernat, & Brown, 1996; Stephan & Stephan, 1985, 1989), behavioral measures such as physical distance maintained (Goff et al., 2008; Plant & Devine, 2003), and physiological responses correlated with stress, such as autonomic reactivity (Blascovich et al., 2001; Mendes et al., 2002) and catabolic hormonal responses (Mendes, Gray, et al., 2007). Rather, our data speak to the power of cross-group friendship such that participants whose close cross-group friend was accessible exhibited adaptive hormonal responses associated with resilience and physiological thriving (Epel et al., 1998). Our data also reflect the power of accessible significant other representations for interactions with novel social objects (e.g., Anderson, Glassman, Chen, & Cole, 1995), as participants who had been thinking about a same-group friend responded to the intergroup interaction similarly to people with low intergroup contact or less egalitarian attitudes (c.f. Blascovich et al., 2001; Mendes, Gray, et al., 2007).

In the present work, we focused on friendship quality as a key variable in Study 1, and only recruited participants with cross-group friends rated with a 6 or higher on a 7-point scale of closeness for Studies 2 and 3. Thus, we focused our work on high-quality cross-group friendship. The study was not designed to dissect the nuances of friendship quality, but further research in this domain is clearly needed. Not all friendships are created equal. For your best friend, you might risk your life without hesitation, but perhaps you would not do so for the person you regularly join for lunch. Similarly, certain individual processing styles, such as interpersonal rejection sensitivity (Downey & Feldman, 1996), have direct relevance to the quality of interpersonal relationships (e.g., Downey, Freitas, Michaelis, & Khouri, 1998), and thus expectations for novel members of a cross-group friend's group may not be positive if the friendship is marked by conflict. Research among children implies that cross-group friendships have much higher risk for early dissolution than do same-group friendships (Hallinan & Williams, 1987) and low-quality cross-group friendship is sometimes ironically associated with biased attitudes (Damico et al., 1981). Thus, there remains much that is unknown about low quality cross-group friendship or the phase during which a burgeoning cross-group friendship translates into a close bond or a dropped acquaintance.

Future research is needed to elaborate on processes through which novel outgroup members trigger representations of the friend. Recent theorizing in cognitive neuroscience suggests that people navigate through the world by making predictions that facilitate rapid top-down processing of encountered stimuli (Bar, 2007; Kveraga, Ghuman, & Bar, 2007). Predictions are made quickly, based on representations triggered by contextual cues. To the extent that group membership can be extracted from the social environment, outgroup members should heighten the accessibility of concepts related to a close cross-group friend. Research suggests that race is extracted from the environment through preattentive processes and serves as a cue toward coalitional membership (Cosmides, Tooby, & Kurzban, 2003; Susskind, Maurer, Thakkar, Hamilton, & Sherman, 1999). As such, concepts related to a given racial group should be readily activated by novel outgroup members. Representations activated by people of other races should in turn guide predictions for interracial social interactions. As predictability plays a key role in appraisals of situational demands (Mendes, Blascovich, et al., 2007), it is possible that the accessibility of a cross-group friend's individual and collective characteristics facilitated adaptive hormonal responses during the intergroup interaction by reducing uncertainty surrounding intergroup contexts. Altogether, we need to rely on future work to systematically test the cognitive processing dynamic through which associative representations are used in prediction formation for novel outgroup members and intergroup situations.

Conclusion

This set of studies contributes to the knowledge about cross-group friendship by demonstrating that a close relationship with one outgroup member predicts positive experiences during social interactions with outgroup strangers. Furthermore, we found convergent evidence that self-expansion processes of interpersonal closeness extend to collective characteristics. This provides a social–cognitive explanation for improvements in intergroup interaction when self-expansion occurs across group boundaries. By manipulating the accessibility of a cross-group friendship, this research demonstrated that cross-group closeness impacts the way social information is accessed and applied to novel outgroup members. In sum, this work suggests that the intergroup benefits of cross-group friendship are an emergent property of the closeness that characterizes the relationship.

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