Mere Belonging: The Power of Social Connections

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Four experiments examined the effect on achievement motivation of *mere belonging*, a minimal social connection to another person or group in a performance domain. Mere belonging was expected to increase motivation by creating socially shared goals around a performance task. Participants were led to believe that an endeavor provided opportunities for positive social interactions (Experiment 1), that they shared a birthday with a student majoring in an academic field (Experiment 2), that they belonged to a minimal group arbitrarily identified with a performance domain (Experiment 3), or that they had task-irrelevant preferences similar to a peer who pursued a series of goals (Experiment 4). Relative to control conditions that held constant other sources of motivation, each social-link manipulation raised motivation, including persistence on domain-relevant tasks (Experiments 1–3) and the accessibility of relevant goals (Experiment 4). The results suggest that even minimal cues of social connectedness affect important aspects of self.

Keywords: achievement, motivation, self, belonging, persistence

> No quality of human nature is more remarkable, both in itself and in its consequences, than that propensity we have to sympathize with others, and to receive by communication their inclinations and sentiments, however different from, or even contrary to our own.—Hume, *A Treatise on Human Nature*

Among the most powerful human motives is the desire to form and maintain social bonds (Baumeister & Leary, 1995). Research underscores the role of social connections in diverse domains of functioning. When people's sense of social connectedness is threatened, their ability to self-regulate suffers; for instance their IQ performance drops (Baumeister, Twenge, & Nuss, 2002). Feeling lonely predicts early death as much as major health risk behaviors like smoking (Cacioppo & Patrick, 2008).

Given the importance of social relationships for human functioning and well-being, an important question involves how social relationships affect people's personal interests and motivated behavior—qualities that form an important basis of people's sense of self-identity. In the present research, we explore the hypothesis that a mere sense of social connectedness, even with unfamiliar others, can cause people to internalize the goals and motivations of others and thus shape people's motivated behavior even in private settings. For instance, would discovering that one shares incidental musical tastes with a math major increase interest in math? If such a seemingly minor experience had a large effect on achievement motivation, this would suggest that achievement motivation and people's self-identity more broadly are highly sensitive to even minor cues of social connection.

This hypothesis draws on previous research documenting the effects of social influence on beliefs and behavior. As Hume suggested, it is not only behavior in the presence of others that is subject to social influence (e.g., Cialdini, Reno, & Kallgren, 1990; Lakin & Chartrand, 2003). In important ways, our "inclinations and sentiments"—including deep-seated values and goals—are forged in the social context. For instance, people acquire strongly felt political beliefs from valued in-groups, which can influence policy support expressed in private (Cohen, 2003) and political preferences decades later (Newcomb, Koening, Flacks, & Warwick, 1967). Similarly, romantic partners become more similar over time in their emotional experience (e.g., emotional reactivity, Anderson, Keltner, & John, 2003). Additionally, reminders of close others such as one's mother or best friend can automatically evoke in people goals and motivations associated with those relationships (e.g., achieving, helping; Fitzsimons & Bargh, 2003). More broadly, a variety of theories suggest that people's sense of self encompasses socially significant others (Aron et al., 2004; Cialdini, Brown, Lewis, Luce, & Neuberg, 1997; Gardner, Gabriel, & Hochschild, 2002; Markus & Kitayama, 1991).

This past research emphasized the influence of long-standing and valued others—important group identities and close relationship partners. Beyond these more intuitive examples, we posit a basic mechanism by which a mere sense of social connectedness

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with even unfamiliar others can cause people to adopt the interests and goals of these others as their own. To test this hypothesis, we distill social belonging to its essence—to what we call "mere belonging" (Walton & Cohen, 2011b). Mere belonging is an entryway to a social relationship—a small cue of social connection to another person or group in a performance domain. Social belonging is a sense of "relatedness" (Ryan & Deci, 2000, p. 73) that arises from "lasting, positive, and significant interpersonal relationships" (Baumeister & Leary, 1995, p. 497). As measured or manipulated in past research, social belonging has many factors conflated in it, such as shared experience, social norms, and social feedback and validation. By contrast, mere belonging is a minimal, even chance, trivial, or potential, social connection with unfamiliar others.

To manipulate mere belonging, we vary small cues of social connectedness to another person or a social group. These manipulations draw on past research, including research on the expectation of positive social interaction, shown to increase interpersonal closeness (Berscheid, Boyle, & Darley, 1968; Clark & Mills, 1979); research on incidental similarities, such as a shared birthday, shown to create a sense of social connection (Burger, Messian, Patel, del Prado, & Anderson, 2004; Jiang, Hoegg, Dahl, & Chattopadhyay, 2010; Jones, Pelham, Carvallo, & Mirenberg, 2004); and research on membership in an arbitrary or "minimal" group, shown to create a sense of group identity (Tajfel & Turner, 1986). Outcomes examined in past research either focus on people's experienced sense of social connectedness (e.g., interpersonal liking) or arise in direct interaction with the person to whom people are led to feel socially connected. For instance, incidental similarities increase nonverbal mimicry (Guéguen & Martin, 2009), cooperation (D. T. Miller, Downs, & Prentice, 1998), compliance with a request (Burger et al., 2004), and susceptibility to persuasive consumer appeals (Jiang et al., 2010) in direct or face-to-face interactions. Consistent with our theoretical account, these effects are often mediated by a sense of social connectedness to the interaction partner. But past research has not tested whether small cues of social connectedness cause people to internalize the motivations of others and, thus, affect people's own private achievement-related persistence, goals, and interests. The present research tests this question. We manipulate a sense of social connectedness to unfamiliar others in a performance setting and assess participants' sustained, freely chosen persistence on difficult, achievement-related tasks completed in private as well as privately expressed interest and motivation, free-choice behavior, and automatic goal activation. These measures allow us to assess whether the goals of others have been internalized into the self and thus shape behavior and interests in the absence of public pressure.

In examining freely chosen persistence, this research addresses a classic question in psychology: What are the bases of achievement motivation? What inspires people to persist in an endeavor in the face of frustration and without reward or incentive (McClelland, 1961)? Predominant theories emphasize the role of self-perceived autonomy and ability (e.g., Bandura, 1997; Ryan & Deci, 2000). These theories treat the social context primarily as a source of information about these key self-perceptions. For instance, role models are thought to boost motivation by demonstrating that one can succeed (Lockwood & Kunda, 1997). Complementing this past work, we suggest that a mere sense of social connectedness to others in an achievement setting can inspire achievement motivation because people readily acquire interests and motivation from others.

Why would minimal cues of social connectedness promote achievement motivation? One reason is that people have a strong and probably innate need to form and maintain positive social bonds (Baumeister & Leary, 1995). Developing shared interests and goals with relationship partners would strengthen and sustain these bonds (Aron, Norman, Aron, McKenna, & Heyman, 2000; Aronson, 2004). As Asch (1952) wrote, "To be in a social relation, it is necessary to stand on common ground with others and to face daily conditions with shared understanding and purpose" (p. 576). Additionally, because group memberships and relationships are important sources of self-worth (Leary, 2004; Sherman & Cohen, 2006; Tajfel & Turner, 1986), sharing common interests and goals with others may enhance feelings of personal worth. Further, a sensitivity to the interests of others would be adaptive. Cooperative activity is critical to human welfare (Asch, 1952; Vygotsky, 1978). A psychological mechanism by which goals become shared among relationship partners would provide humans key advantages (Carr & Walton, 2011; Walton & Cohen, 2011b). As Tomasello, Carpenter, Call, Behne, and Moll (2005) wrote, "[I]n collaborative interactions . . . to even get started, we must somehow coordinate or negotiate so that we end up with a shared goal" (p. 687).

Consistent with our reasoning, one recent line of research found that small cues of social connectedness can lead people to share another socially important aspect of self: emotions. Participants led to feel socially connected to a confederate through the sharing of incidental preferences experienced the same emotions and physiological arousal felt by the confederate (Cwir, Carr, Walton, & Spencer, 2011). These effects were mediated by participants' sense of social connectedness to the confederate. This research suggests that people can acquire important aspects of self vicariously as a consequence of cues of social connectedness, in this case as though the emotions of the other person become one's own.

Is there evidence that feelings of social connectedness contribute to motivation? No past research tests whether a precise manipulation of enhanced social connectedness increases achievement motivation. As noted, past research either examines long-standing or valued relationship partners, is confounded with other motivational factors (e.g., social norms), or assesses behavior in public not private contexts. However, four areas of past research suggest this relationship. First, self-determination theory posits that relationally supportive contexts help people feel safe to explore their environments and pursue their interests (Ryan & Deci, 2000). Our research draws on the notion that relatedness is a key human need that shapes motivation. But the present studies examine how social connectedness promotes the social transmission of interests and goals, not the sense of safety needed to pursue preexisting preferences.

A second link between social connectedness and motivation comes from developmental research, which suggests that early in life humans are sensitive to the goals of others and try to establish socially aligned goals. As early as 18 months of age, infants differentiate other people's intentions from their actions and imitate the former rather than the latter (Meltzoff, 1995). Infants also want to participate in cooperative games with adults (Ross & Lollis, 1987) and try to reengage adults who have stopped participating in such games (Warneken, Chen, & Tomasello, 2006). These findings have led some to suggest that people have an innate

drive "to create shared goals to which they are jointly committed" (Tomasello et al., 2005, p. 682). However, these studies do not distinguish children's motivation for an activity from their interest in a social experience; they do not assess children's task motivation in the absence of others. By contrast, the present studies examine motivated behavior among adults acting in private and test the role of cues of social connectedness in creating such motivation (see also Master & Walton, 2011).

Third, longitudinal research in education finds that students who feel socially connected to peers and teachers are more motivated in school, even months and years later (e.g., Furrer & Skinner, 2003; Goodenow, 1992; Hamre & Pianta, 2005). Additionally, cooperative learning activities can improve peer relationships and students' school performance, especially among minority youth (Aronson, 2004). While suggestive, this past research is either correlational in design or the independent variable of interest—social connectedness—is confounded with third variables. The present research precisely manipulates the mere sense of social connectedness with another person or group in a performance domain to test its causal effect on motivation.

A fourth link between social connectedness and motivation comes from research on threats to belonging. For instance, people told that they will spend their lives alone perform worse on intellectual tests (Baumeister et al., 2002). Additionally, worries about belonging in academic settings contribute to group disparities in academic motivation and achievement (Cheryan, Plaut, Davies, & Steele, 2009; Murphy, Steele, & Gross, 2007). One randomized field experiment found that a brief intervention to allay worries about belonging in college improved the grade point average (GPA) of African American students over 3 years (Walton & Cohen, 2011a). Yet this research has not tested the effects of creating rather than threatening social bonds, nor has it examined classic indices of achievement motivation, like persistence.

Through what mechanism would a sense of social connectedness increase motivation? We suggest that people assimilate more or less automatically the goals of socially relevant others into the self. We test this hypothesis most directly in Experiment 4, which examines effects on goal accessibility. If this mechanism exists, it would highlight the power of mere social connections to foster a key aspect of identity—achievement-related goals. This hypothesis complements recent research on the social bases of motivation and goal pursuit. For instance, research shows that goals (e.g., to be helpful) can spread from person to person in an automatic fashion (Aarts, Gollwitzer, & Hassin, 2004; see also Loersch, Aarts, Payne, & Jefferis, 2009), that close relationship partners prime goals associated with those relationships (Fitzsimons & Bargh, 2003), and that pressures to affiliate (e.g., with high-power or desirable persons) influence people's attitudes in advance of actual or anticipated social interaction (Sinclair, Huntsinger, Skorinko, & Hardin, 2005). In contrast to this past research, we hypothesize that a mere sense of social connectedness facilitates the social transmission of goals and interests. If so, this transmission should (a) occur above and beyond mere exposure to others, (b) occur even with unfamiliar others absent a shared history or pressure to affiliate, and (c) be evident on private motivated behavior in the absence of actual or anticipated social interaction.

While classic theories in social psychology view social influence as a contaminant of the self (e.g., Asch, 1952; Haney & Zimbardo, 1998; Milgram, 1974; for a review, see Markus & Kitayama, 1994), the present research explores the notion that social influence creates the self, instilling in people the goals and motivation that inspire them to act and to persevere in the face of challenge. Moreover, we suggest, even significant effects on persistence and achievement can arise from subtle, seemingly trivial cues of social connectedness.

Overview of Experiments

Four experiments manipulate people's sense of social connection to another person or group in a performance domain. The experiments then assess motivation in that domain. In each study, we manipulate a cue of social connectedness—a psychological entry-point validated in past research as creating a social connection. These include leading participants to believe that the performance domain affords opportunities for positive social interaction (Experiment 1), to believe that they share a trivial but identity-relevant attribute with a peer (a birthday, Experiment 2; incidental preferences, Experiment 4), and to believe that they belong to a minimal group associated with the domain (Experiment 3). By using diverse instantiations of mere belonging, the studies, if they yield similar effects, would provide convergent evidence that a sense of social linkage raises motivation. Experiments 1–3 assess effects on achievement-related persistence and self-expressed motivation (Deci, Koestner, & Ryan, 1999). Experiment 4 examines effects on goal accessibility. This study tests whether mere belonging gives rise to a vicarious Zeigarnik effect in which the goals of another person are experienced as one's own and, thus, mentally activated until their completion.

Experiment 1: A Relational Achievement Context

Experiment 1 tested whether perceived opportunities for positive social interactions with others in an achievement domain would lead people to internalize motivation from these others for the field. Students read a report putatively written by a recent graduate of the math department. In both key conditions, the author described having had a positive experience in math. In the relational-context condition, the report indicated that the math department promoted opportunities for collaborations and friendly social interactions. This condition was informed by research showing that the expectation of positive social interaction increases interpersonal closeness (Berscheid et al., 1968; Clark & Mills, 1979). By contrast, in the skill-promotive context condition, the report indicated that the department promoted opportunities to cultivate personal abilities and to explore curiosities in math. Insofar as feelings of mastery and autonomy increase achievement motivation (Bandura, 1997; Ryan & Deci, 2000), this condition might have positive effects (Lockwood & Kunda, 1997). It thus provides a rigorous test of the hypothesis.

In addition to assessing the effect of the relational context condition, we investigated whether this context would be most beneficial to women. On the one hand, people in general have a need to belong (Baumeister & Leary, 1995) and so may become motivated for domains that offer positive social-relational environments. On the other hand, women are negatively stereotyped in math and may doubt their belonging in math-related fields (Cheryan et al., 2009; Murphy et al., 2007). If so, a positive relational environment may be most beneficial to women. Reason-

ing that if this were the case, it would be useful to include a control group among women to confirm the directionality of condition effects, we randomly assigned some women to a condition that provided no information about the math department.

Past research finds that students who have little interest in a field benefit little from perceived opportunities for belonging and success in the field (Lockwood & Kunda, 1997). As a consequence, Experiments 1 and 2, both of which examined math motivation, included only students who were moderately or highly identified with math. Experiment 3 tested this question directly by recruiting a broader sample. In Experiment 4, we examined goal pursuit in the context of everyday tasks and included participants without regard for preexisting interests.

Method

Participants. A total of 75 European American undergraduates participated in exchange for course credit. To ensure that participants were open to pursuing math, only students who scored at or above the midpoint on a prestudy measure of identification with math were recruited (two items, e.g., "How important is math to you?"; 1 = *not at all important to me*, 7 = *extremely important to me*; Spencer, Steele, & Quinn, 1999). Three students were excluded. Two showed virtually no recall of the information contained in the report in a poststudy questionnaire, and one fell asleep during the study. The final sample contained 43 women and 29 men. Participants were randomly assigned either to the skill-promotive context condition or to the relational context condition. In addition, one-third of women were randomly assigned to the no report condition.

Procedure and manipulation. Students participated individually in a study investigating "perceptions of math." In the two "context" conditions, students read a fabricated *Chronicle of Higher Education* report ostensibly written by a recent graduate of the math department. In both conditions, the author had qualities that made him or her a positive role model. First, the author described a positive experience in the department. Second, the author's success was presented as relevant and attainable for participants (Lockwood & Kunda, 1997). It was relevant because, as noted, participants were open to math as determined by the prestudy measure. The author's gender also matched participants' gender. The author's success in math was attainable for participants because the author was several years older than participants, most of whom were first- or second-year students (85% were) and who could thus still major in a math-related field or pursue a math-related career. Participants in the no report condition read no report and proceeded immediately to the dependent measures.

The reports in the two context conditions were parallel and varied only in their characterization of the social climate of the math department. In the skill-promotive context condition, the report portrayed the department as providing students opportunities to develop their personal ability and interests in math. In the relational context condition, the report portrayed opportunities for positive, collaborative social interactions. Table 1 provides excerpts from the two reports. The manipulation was reinforced with a photograph of the author in cap and gown. In the skill-promotive context condition, the author was pictured alone. In the relational context condition, the author was pictured with a senior thesis advisor. Although the relational context condition emphasized opportunities for social connectedness in math, the two conditions held constant the sociability of the author. The difference was whether the author was represented as sociable with people outside math (skill-promotive context condition) or inside math (relational context condition; see Table 1).

Next, participants completed the dependent measures. Participants in the context conditions were then tested on their recall of the report. Finally, all participants reported their Scholastic Assessment Test (SAT) math score, the number of college math classes they had taken, and their actual or expected major (which was classified as math related or not, based on whether it required students take a math class) for use as potential covariates. Students were then probed for suspicion and debriefed. No student suspected the purpose of the study.

Measures of motivation in math. The primary measure of motivation was *time persisting on an insoluble math puzzle*. Students were presented with a puzzle said to have been developed by "topologists, mathematicians who study geometric figures." The puzzle was based on the four-color theorem (Appel & Haken, 1977), which posits that no two-dimensional map in which adjacent regions must be shaded in different colors requires more than four colors. Students were asked to create a map that would require five colors. They were each invited to "take as much or as little time as you like" and left alone in a private room to work. The experimenter unobtrusively recorded how long students persisted; students were unaware that time persisting was an outcome of interest. Because the measure of persistence was positively skewed ($Z = 3.86$, $p < .001$), it was submitted to a square root transformation, which reduced skew to nonproblematic levels ($Z < 1$).

Table 1
Excerpts From the Report in the Skill-Promotive Context Condition and in the Relational Context Conditions (Experiment 1)

Skill-promotive context condition	Relational context condition
I spent many of my late nights alone . . . working through difficult problem sets . . . . I had a number of interesting and exciting moments poring over math problems.	I spent many of my late nights with friends from class . . . working through difficult problem sets together . . . . We had a number of interesting and exciting conversations.
It is a strong department composed of many talented individuals. The department . . . sponsor[s] several competitive exams and prizes each year . . . to encourage students . . . to develop their individual abilities.	It is a small department, and many members of the faculty are excited to work with undergraduates . . . On several occasions, when my study group met . . . our professor stopped by to discuss our problem set. The professors encouraged us to work in groups.
At the end of the year, when I finished my thesis, my friends took me out for a celebratory dinner.	At the end of the year, when we all had finished our theses, our advisors . . . [took] us out for a celebratory dinner.

This transformation does not alter the results of any analysis. For intuitive clarity, means are reported in the original metric.[1]

We supplemented the behavioral measure with a measure of self-reported motivation in math (cf. Walton & Cohen, 2007). Participants were assured that their responses would be confidential. We assessed 7 constructs: (a) possible selves in math (five items, e.g., "In the future, I could see myself open to a career in math"; 1 = *strongly disagree*, 7 = *strongly agree*; Markus & Nurius, 1987; $\alpha = .86$), (b) identification with math (two items, e.g., "It is important to me to be good at math"; 1 = *strongly disagree*, 7 = *strongly agree*; Spencer et al., 1999; $r = .42$, $p < .001$), (c) self-efficacy in math (two items, e.g., "I feel confident that I understand things in math"; 1 = *strongly disagree*, 7 = *strongly agree*; Heatherton & Polivy, 1991; $r = .31$, $p = .009$), (d) interest in math (five items, e.g., "How interested would you be in learning more about math-related careers"; 1 = *not at all interested*, 7 = *extremely interested*; $\alpha = .87$), (e) potential to succeed in math (a one-item percentile score assessed relative to participants' classmates; Walton & Cohen, 2007), and (f) social fit in math (10 items, e.g., "I belong in [the] math department," "I would fit in well in [the] math department"; 1 = *strongly disagree*, 7 = *strongly agree*; Walton & Cohen, 2007; two items that did not load with the rest of the scale were dropped; $\alpha = .84$). Finally, students (g) provided three reasons why they could or could not "fit in and succeed" in the math department. The outcome of interest was the number of reasons for succeeding minus the number of reasons against succeeding.

Principal component analysis indicated that all seven self-report measures loaded on the first factor (>.60). This factor accounted for 58% of the variance (*eigenvalue* = 4.06). Examination of the scree plot confirmed a one-factor solution. No other factor accounted for more than 15% of the variance nor yielded an eigenvalue greater than 1. The seven measures were standardized and averaged to form a composite index of self-reported motivation ($\alpha = .88$).

Sense of social connectedness to math. Two measures assessed students' sense of social connectedness to math. First, we examined the reasons students generated for why they could or could not succeed in math. Two raters unaware of condition independently coded whether each reason cited (a) social-relational factors, defined as students' perceived prospects of getting along well with others in math (e.g., "[I'm] comfortable with math professors" and "supportive fellow students" vs. "I would not fit in with the people in the department"); (b) nonrelational social factors (e.g., "I find math more interesting than most students" vs. "I would not be as passionate as other students"); (c) self-efficacy (e.g., "I'm generally pretty good at math" vs. "I'm not good at math"); or (d) unspecified or miscellaneous factors. Interrater reliability was high, Cohen's kappa = .90, and discrepancies were resolved through discussion. For each category, a valence score was calculated by subtracting the number of negative reasons generated from the number of positive reasons generated. Second, as a hallmark of high-quality relationships is felt warmth and fairness (Tyler & Blader, 2003), we had students rate the department's warmth (four items, e.g., "How warm of an environment is [the] math department for students?"; 1 = *not at all warm*, 7 = *very warm*; $\alpha = .93$) and fairness (five items, e.g., "I would be treated fairly by faculty in [the] math department"; 1 = *strongly disagree*, 7 = *strongly agree*; Tyler & Blader, 2003; $\alpha = .79$). The two scales correlated ($r = .50$, $p < .001$), and they were averaged to form a measure of perceived relational supportiveness. The social-relational reasons valence measure and the measure of perceived relational supportiveness correlated ($r = .39$, $p = .001$), so they were standardized and averaged to form a composite measure of social connectedness to math.

Supplementary measures. Additional measures assessed processes relevant to potential alternative explanations. First, to assess whether effects would, as expected, be confined to math, we assessed students' sense of fit in the humanities (three items, e.g., "I belong in the humanities at [school name] [e.g., history, English, fine arts, etc.]"; 1 = *strongly disagree,* 7 = *strongly agree*; $\alpha = .83$). Second, a condition difference could arise if the report author was seen as more skilled at math in one condition than the other. To test this, students rated the author's math ability (1 = *very little ability*, 7 = *very much ability*) and estimated his or her SAT math score (out of 800) and GPA in college math classes (on a 4-point scale). A third possibility involves affiliative social tuning (Sinclair et al., 2005). If participants want to affiliate with the report author they might tune their attitudes to his or hers. This seemed unlikely, as participants had no opportunity to interact with the report author, who had previously graduated (in social tuning studies, people tune to an imminent interaction partner). But to test this possibility, we assessed affiliative motivation (one item, "How much would you like to meet [the report author]?" 1 = *not at all*, 7 = *very much*). Finally, participants completed a measure designed to tap whether the manipulation contradicted a stereotype of math majors as "nerdy." Students rated how "interesting" and "well-rounded" the author was (1 = *not at all*, 7 = *very*; $r = .53$, $p < .001$).

Results

Preliminary data analytic issues. Data were analyzed in analyses of covariance (ANCOVAs). Following Darlington (1996) and past practice (e.g., Walton & Cohen, 2007, 2011a), we *a priori* identified theoretically relevant candidate covariates, tested each in each analysis, and retained those that were predictive ($p \leq .15$). Given the focus on math, candidate covariates were SAT math score, number of math classes taken, math-related major, prestudy math identification, and participant gender (when not included as a factor).[2] A table listing the covariates retained in each analysis is

[1] During debriefing in Experiments 1–3, experimenters systematically interviewed participants to detect three potential threats to the validity of the persistence measure: (a) prior knowledge that the puzzle was impossible, (b) misunderstanding the puzzle, and (c) rushing to make a subsequent appointment (see also Carr & Walton, 2011). Twelve participants in Experiment 1 met one of these criteria (*n*s = 7, 4, and 1, respectively). Unsurprisingly, these students persisted less long (M_{adj} = 4 min 26 s) than others in this study (M_{adj} = 8 min 57 s), $F(1, 67) = 11.17$, $p = .001$. No participant in Experiment 2 met any of these criteria. One participant in Experiment 3 did (Criterion C). These participants were excluded from analyses of the persistence outcome. Retaining them does not affect the results in either study.

[2] No candidate covariate differed by condition in any study with one exception. In the pilot study for Experiment 3, baseline math identification scores were somewhat higher in the numbers group condition than in the numbers person condition. To equate for this difference, this measure was retained in all analyses in that study.

available from Gregory M. Walton upon request. In all studies, retaining all candidate covariates yields similar results.

The first analyses tested the 2 (participant gender) × 2 (relational vs. skill-promotive context condition) design excluding the no report condition. Where gender did not moderate results, we conducted follow-up ANCOVAs with all three experimental conditions and retained gender as a covariate to calculate contrasts involving the no report condition.

Motivation in math.

Persistence on the insoluble math puzzle. The ANCOVA involving participant gender and experimental condition (relational vs. skill-promotive context) yielded a main effect of participant gender, $F(1, 42) = 15.92$, $p < .001$, $d = 1.20$. Women persisted longer ($M_{\text{adjusted (adj)}}$ = 11 min 28 s) than did men (M_{adj} = 6 min 54 s). More important, the main effect of condition was significant, $F(1, 42) = 7.13$, $p = .011$, $d = 0.78$. Students persisted longer in the relational context condition than in the skill-promotive context condition. The Gender × Condition interaction was not significant ($F < 1$).

Follow-up analysis adding the no report condition found that students persisted longer in the relational context condition (M_{adj} = 11 min 8 s) than in the skill-promotive context condition (M_{adj} = 7 min 57 s), $t(53) = 2.86$, $p = .006$, $d = 0.82$, the no report condition (M_{adj} = 6 min 37 s), $t(53) = 3.12$, $p = .003$, $d = 1.14$, and the latter conditions combined, $t(53) = 3.58$, $p = .0008$. The latter conditions did not differ ($t < 1$). See Figure 1A.

Self-reported math motivation. The ANCOVA involving participant gender and experimental condition yielded a main effect of condition, $F(1, 50) = 4.52$, $p = .038$, $d = 0.58$. Students reported greater motivation for math in the relational context condition than in the skill-promotive context condition. No other effect was significant (Fs < 1). Follow-up analysis found that students reported greater motivation for math in the relational context condition ($M_{\text{adj}} = 0.20$) than in the skill-promotive context condition ($M_{\text{adj}} = -0.13$), $t(65) = 2.25$, $p = .028$, $d = 0.60$, the no report condition ($M_{\text{adj}} = -0.15$), $t(65) = 2.01$, $p = .049$, $d = 0.64$, and the latter conditions combined, $t(65) = 2.52$, $p = .010$. The latter conditions did not differ ($t < 1$). See Figure 1B.

Composite sense of social connectedness to math. The ANCOVA involving participant gender and experimental condition yielded a main effect of condition, $F(1, 52) = 29.02$, $p < .001$, $d = 1.43$. Students felt a greater sense of social connectedness to math in the relational context condition ($M_{\text{adj}} = 0.49$) than in the skill-promotive context condition ($M_{\text{adj}} = -0.45$). The main effect of participant gender and the Gender × Condition interaction were not significant: $F < 1$, and $F(1, 52) < 2.75$, $p > .10$, respectively. Follow-up analysis found that students felt a greater sense of social connectedness to math in the relational context condition ($M_{\text{adj}} = 0.50$) than in the skill-promotive context condition ($M_{\text{adj}} = -0.45$), $t(67) = 5.06$, $p < .0001$, $d = 1.34$, the no report condition ($M_{\text{adj}} = -0.13$), $t(67) = 2.83$, $p = .006$, $d = 0.90$, and the latter conditions combined, $t(67) = 4.57$, $p < .0001$. The latter conditions did not differ ($t < 1.40$, $p > .15$).

Both components of the social connectedness measure yielded a significant difference between the relational and skill-promotive context conditions, $F(1, 52)$s > 14.00, ps $< .001$, with no effect of or interaction with participant gender (Fs < 1.60, ps $> .20$). By contrast, analysis of the valence of nonrelational social reasons and of reasons related to self-efficacy for pursuing math yielded no condition effect ($F < 1$, and $F < 1.45$, respectively).

Mediation analysis. Students' sense of social connectedness to math mediated the condition effect on motivation. A composite outcome variable was created by standardizing and averaging persistence and self-reported motivation (with each controlled for its covariates). To eliminate overlap between the mediator and outcome, the number of reasons for versus against pursuing math was first removed from the self-report measure. The condition effect (relational context vs. other two conditions) on the motivation composite was significant, $t(70) = 3.16$, $p = .002$, $\beta = .35$. Adding the composite measure of social connectedness, the condition effect became marginal, $t(69) = 1.76$, $p = .082$, $\beta = .22$, while the mediator was significant, $t(69) = 2.05$, $p = .044$, $\beta =$

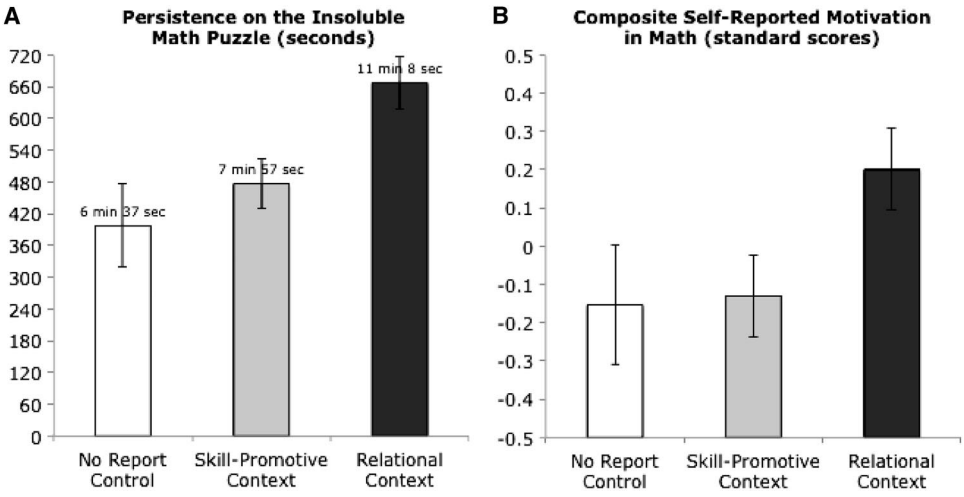

Figure 1. Math motivation in Experiment 1. All participants were moderately or highly identified with math at baseline. A: Persistence on the insoluble math puzzle. Means represent seconds. B: Self-reported motivation in math. Means are adjusted for relevant covariates. Error bars represent +/−1 standard errors.

.26. The reduction in the significance of the condition effect was significant, with asymmetric distribution of products test (ADPT) 95% confidence interval [.05, .16], $p < .05$ (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

Alternative explanations. No support was found for alternative processes. First, there was no indication that the manipulation raised students' motivation in general. This might have occurred had the manipulation improved mood or satisfied global needs for belonging. If anything, students rated their fit in the humanities lower in the relational context condition ($M_{adj} = 4.56$) than in the skill-promotive context condition ($M_{adj} = 5.00$), $F(1, 51) = 2.59$, $p = .11$, $d = 0.40$. Second, perceptions of the report author's math ability did not vary by condition, as examined by a composite of the relevant items ($F < 1$). In absolute terms, the author was seen as skilled in both conditions (e.g., the mean rating of his or her math ability was 5.96 on a 7-point scale). Third, students did not report a greater desire to affiliate with the author in the relational context condition ($F < 1.35$). Fourth, there was no indication that the relational context condition contradicted a stereotype of math as "nerdy." There was no condition difference in ratings of how "interesting" and "well-rounded" the author was (ts < 1). The mean ($M_{grand} = 4.82$) exceeded the scale midpoint (4) in both conditions (one-sample ts > 4.00, ps $< .001$).

Discussion

In Experiment 1, representing math as affording opportunities for positive social interaction raised participants' motivation for the field, increasing freely chosen persistence on a math puzzle and self-expressed motivation for math. Suggestive of the importance of social-relational opportunities for motivation, the relational framing proved more beneficial than a skill-promotive framing, in which participants learned about opportunities to develop personal skills and interests in math. Moreover, students in the relational-context condition anticipated that they would be treated with greater warmth and fairness in the department and, in open-ended responses, articulated more social-relational reasons for entering the field. These measures mediated the condition effect on motivation. Importantly, the outcomes were assessed in private and, in the case of persistence, covertly—participants did not know that how long they persisted was a measure of motivation. The condition effects did not occur because participants simply worked hard to form social connections. There was no audience to be impressed. Instead, it seems, participants internalized motivation for math in anticipation of opportunities for positive social interactions with others in the field.

There was no evidence that the relational context condition was especially effective for women. Although negative stereotypes can cause women to doubt their belonging in math-related fields (Cheryan et al., 2009; Murphy et al., 2007), both men and women exhibited increased motivation when positive social-relational opportunities in math were presented. An important aspect of the present study is that unlike past research on social identity threat, participants were not exposed to overt threatening cues, such as reminders of the numeric underrepresentation of women in math. To the contrary, in all cases in Experiment 1, participants were exposed to a positive same-gender role model in math, which can allay social identity threat (Murphy et al., 2007). In this context, the factors that undergird students' interest and motivation may arise not from a specific concern about negative stereotypes but from more general processes. Therefore, in the remaining studies, while we continue to test for interactions involving social identity, we focus on effects among students from all social groups.

If the perceived opportunity to have positive social interactions in a field of study is an important basis of motivation, would having a social tie to a peer in the field—even a tie that has a minimal basis—produce similar effects? In an effort to provide convergent validity for the effects of mere belonging, Experiment 2 tests this question.

Experiment 2: A Minimal Social Relationship

Whereas Experiment 1 assessed the impact of the anticipated opportunity for positive social interaction in a field of study, Experiment 2 assessed the impact of a social link to a peer in the field. We manipulated whether participants were socially linked to a role model in math. We tested whether this link would increase the motivational impact of the role model (cf. Lockwood & Kunda, 1997). In both conditions, participants read a report ostensibly written by a recent graduate of the math department. In one condition, the graduate's birthday matched the participant's birthday. In the other condition, it did not. Although seemingly trivial, a person's birthday is tied to his or her identity. Accordingly, sharing a birthday creates a "unit relationship" between people (Heider, 1958, p. 201) and evokes a sense of social connectedness (Burger et al., 2004; Jiang et al., 2010; Jones et al., 2004). If people adopt the interests of others to whom they feel connected, they should exhibit greater motivation for math in the same-birthday condition than in the different-birthday condition. More specifically, we anticipated that a shared birthday with a representative math major would create a sense of social connectedness to the math department as a whole and that this would mediate an increase in math motivation.

The shared-birthday manipulation draws on insights from balance theory, which asserts that people strive to maintain a state of evaluative balance between themselves and objects of evaluation (Heider, 1958; see also Greenwald et al., 2002). For example, if there is an association between the self and an achievement domain and the self is viewed positively, people may be motivated to view the achievement domain positively to establish balance between associated constructs (Nosek, Banaji, & Greenwald, 2002). However, balance theory would not predict that feelings of social connectedness would mediate effects on achievement motivation, as we expect (see also Jiang et al., 2010). Additionally, balance theory cannot account for the results of Experiment 1, in which math was represented positively in both conditions. Nor can it account for the results of Experiment 3, in which all participants were led to associate themselves with an achievement domain. Relative to balance theory, the present research highlights the importance of feelings of social connectedness as compared with nonsocial associations in performance settings and their effects on achievement motivation.

Method

Participants. A total of 27 undergraduates participated in exchange for course credit or $7. As in Experiment 1, only students who were moderately or highly identified with math at

baseline were recruited. One participant was excluded as a post-study interview revealed that one of his parents had graduated from the college's math department, providing him a preexisting social tie to the department. Retaining this participant does not change the pattern of results. The final sample included 17 European Americans and 9 African Americans (18 women).

Procedure, manipulation, and dependent measures. The procedure was similar to that of Experiment 1. Participants were told that the study concerned "perceptions of math" and read a fabricated report attributed to the *Chronicle of Higher Education*. The content of this report was identical in both conditions. Relative to both reports in Experiment 1, this report was shorter and more ambiguous in its depiction of the social climate in math. However, like the report author in Experiment 1, the report author in Experiment 2 was presented so as to be an effective role model—a person who had had a successful, positive experience in math, with this success relevant and attainable for students (e.g., the report author was older than participating students and matched to students' gender). The manipulation was embedded in a small box in the middle of the report. In both conditions, the box listed the author's name, college, hometown, and date of birth. In the same-birthday condition, the author's birthday (month and day, not year) matched the student's birthday. In the different-birthday condition, it deviated by 4 to 5 months. Students' birthdays were acquired from a university database.

Students then completed the same measures of math motivation assessed in Experiment 1. As previously, the persistence measure was positively skewed ($Z = 2.70$, $p = .007$), and skew was reduced using a square root transformation ($Z < 1$). The self-report measures yielded the same one-factor solution found previously. Students also completed the same measures assessing their sense of connectedness to math—the valence of the social-relational reasons they generated for versus against entering math and their perception of the warmth and fairness of the department. The coding of the reasons generated was again reliable, Cohen's kappa = .89. As previously, these measures were associated, but in this study the correlation did not reach significance ($r = .28$, $p = .18$), so the two measures were examined separately.

As in Experiment 1, students also completed items assessing their fit in the humanities, rated the report author's math ability, and reported their desire to meet him or her. Finally, students completed the same covariate measures used previously and were probed for suspicion and debriefed. No student guessed the purpose of the study.

Results

Preliminary data analytic issues. With one exception, data were analyzed in the same manner as in Experiment 1. Condition effects were tested in ANCOVAs. The same covariates described previously with the addition of participant race were tested and retained when predictive. No interaction between participant race or gender and experimental condition was significant (Fs < 1.65, ps $> .20$). The analytic change involved the persistence measure. Because the variance differed by condition, Levene's test $F(1, 23) = 5.76$, $p = .025$, the condition effect was tested with a nonparametric procedure. The outcome was regressed on the relevant covariates, and the residuals were subjected to a Mann-Whitney test. Because some participants failed to complete all measures, degrees of freedom vary slightly for different analyses.

Motivation in math.

Persistence on the insoluble math puzzle. Students persisted 65% longer on the insoluble math puzzle in the same-birthday condition (M_{adj} = 10 min 4 s) than in the different-birthday condition (M_{adj} = 6 min 6 s; $Z = 2.28$, $p = .022$, $d = 0.80$).

Self-reported math motivation. Students reported greater motivation for math in the same-birthday condition ($M_{adj} = 0.24$) than in the different-birthday condition ($M_{adj} = -0.29$), $F(1, 21) = 5.10$, $p = .035$, $d = 0.92$.

Sense of social connectedness to math. Both measures yielded the predicted effect. Students spontaneously generated more positive relative to negative social-relational reasons why they could succeed in math in the same-birthday condition ($M_{diff\ adj} = 0.32$) than in the different-birthday condition ($M_{difference\ adjusted\ (diff\ adj)} = -0.13$), $F(1, 23) = 4.74$, $p = .040$, $d = 0.80$. By contrast, there was no condition difference on the valence of nonrelational social factors or of reasons related to self-efficacy students provided for versus against pursuing math (Fs < 1).

Students also rated the math department as more relationally supportive (i.e., warm and fair) in the same-birthday condition (M_{adj} = 5.03) than in the different-birthday condition (M_{adj} = 4.31), $F(1, 23) = 4.97$, $p = .036$, $d = 0.91$.

Mediation analysis. Because the two measures of social connectedness to math were associated ($r = .28$, $p = .18$) and yielded the same condition effect, we combined them to conduct the same mediation analyses as in Experiment 1. The outcome was the same motivation composite used previously. As shown in Figure 2, controlling for the hypothesized mediator rendered the condition effect on the motivation composite nonsignificant, a

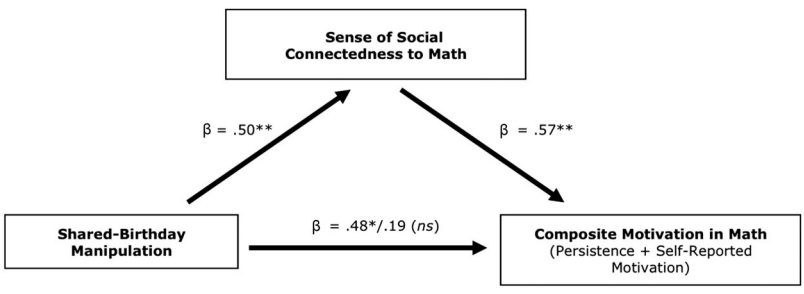

Figure 2. Mediation of the effect of shared-birthday manipulation on motivation in math by participants' sense of social connectedness to math in Experiment 2. All participants were moderately or highly identified with math at baseline. * $p < .025$. ** $p < .01$.

significant reduction (ADPT 95% confidence interval [0.22, 0.61], $p < .05$).

Alternative explanations. As in Experiment 1, students' sense of fit in the humanities showed the opposite pattern to that found for math-related outcomes: Students rated their fit in the humanities lower in the same-birthday condition ($M_{adj} = 3.93$) than in the different-birthday condition ($M_{adj} = 4.76$), $F(1, 20) = 4.71$, $p = .042$, $d = 0.90$. In addition, as in Experiment 1, there was no condition difference in perceptions of the report author's math ability along a composite index ($F < 1.85$, $p > .19$) or in the desire to meet the report author ($F < 1$).

Discussion

In Experiment 2, students freely persisted longer on a math puzzle and expressed greater motivation for math when they were led to believe that they shared a birthday with a former math major. As in Experiment 1, the effects were mediated by students' sense of social connectedness to math. The results suggest that even a minimal cue is sufficient to create a sense of social connection to a field of study and that this social connection can cause people to internalize motivation for the field. To lend further support to our theoretical account, Experiment 3 tests a third operational manipulation of mere belonging.

Experiment 3: A Minimal Social Identity

Whereas Experiment 2 led students to feel socially connected to another person in an achievement setting, Experiment 3 led them to feel connected to a group. People feel connected to fellow group members, even to members of minimal groups—groups with no shared history and for which membership is based on arbitrary criteria (Tajfel & Turner, 1986). We compared the effect of being identified as a member of a group linked to an achievement domain to the effect of being personally identified with this domain (see R. L. Miller, Brickman, & Bolen, 1975). Would a label have greater effects when it forms the basis of a social rather than personal identity (cf. Master & Walton, 2011)?

First, we conducted a pilot study. As in Experiments 1 and 2, all participants were moderately or highly identified with math at baseline. The manipulation had the same procedure as Experiment 3 described below—a minimal groups procedure, in which participants were arbitrarily identified with a group or not (Tajfel & Turner, 1986). Pilot participants ($n = 17$) were identified either as a member of the "numbers group" or as "the numbers person." Measures of motivation included persistence and the self-report items assessed previously. The latter were reworded to refer to "quantitative fields" rather than to "math" or the "math department." In the interest of time, the measure assessing reasons one could succeed in math was not included. Covariates were included following the same procedures as in Experiments 1 and 2.

Analysis of persistence yielded the predicted condition effect, $F(1, 11) = 6.99$, $p = .023$, $d = 1.50$. Students persisted twice as long on the math puzzle in the "numbers group" condition ($M_{adj} =$ 14 min 43 s) than in the "numbers person" condition ($M_{adj} = 6$ min 57 s). See Figure 3A. Interestingly, the condition effect on self-reported motivation was not significant ($F < 1$).

Although the condition effect on persistence is consistent with predictions, the pilot study is limited by its small sample size and by the absence of an effect on self-reported motivation. Experiment 3 addressed these issues by recruiting a larger sample and by changing the procedure in a small but potentially important way. Specifically, whereas the manipulations in Experiments 1 and 2 created a social connection between participants and the math department, the minimal group manipulation evoked a sense of membership in only an ill-defined "numbers group." Perhaps this is why students persisted longer on the task that defined this group (the math puzzle) but did not report greater motivation for math. To create an alternative measure, in Experiment 3, participants were randomly assigned to a "puzzles group" condition or a "puzzles person" condition. Measures included persistence on the math puzzle and self-reported motivation for challenging puzzles. In addition, Experiment 3 included a manipulation check to evaluate the validity of the minimal group manipulation.

Experiment 3 also extended the analysis in two other ways. First, it tested a potential boundary condition. As noted, when people are uninterested in a domain or have an oppositional identity around it (Fordham & Ogbu, 1986), they may be unresponsive to opportunities for growth and belonging (Lockwood & Kunda, 1997). For this reason, the previous studies were restricted to students moderately or highly identified with math. By contrast, Experiment 3 included students regardless of baseline math identification scores. We predicted that, on the math puzzle, students with greater interest in math would show larger effects of mere belonging, persisting longer in the puzzles group condition. But on measures of self-reported interest in puzzles in general (i.e., not linked to math) we anticipated main effects, assuming that our college student participants had no preexisting opposition to challenging puzzles.

Second, Experiment 3 explored the durability of the increase in motivation. If the puzzles group condition leads people to incorporate an interest in challenging puzzles into their self-concept, this interest may be apparent even in a subsequent context. After leaving the laboratory, participants were invited to complete an online study of "leisure activities" in which their motivation for other challenging puzzles was assessed in a free-choice task.

Method

Participants. A total of 116 undergraduates participated in exchange for course credit or $10. Five participants reported at the end of the study that they knew another student taking part in the same session and knew this person well (rated 4 or 5 on a 5-point scale of "how well" they knew them, 1 = *not at all well*, 5 = *very well*; 1 in the puzzles group condition, 4 in the puzzles person condition). As these participants presumably felt socially connected to others in the session, they were excluded.[3] The final sample was ethnically diverse (35 Asian Americans, 32 European Americans, 21 African Americans, 19 Latino Americans, and 4 Native Americans; 56 women, 60 men). Data on persistence from one participant were lost due to a recording error.

As in the previous studies, we assessed participants' level of math identification prior to the study. But unlike the previous studies, students with the full range of scores (1 to 7) were

[3] The results along the primary persistence outcome are unchanged both when retaining all participants and when excluding all participants who reported knowing another participant in the same session at all ($n = 33$).

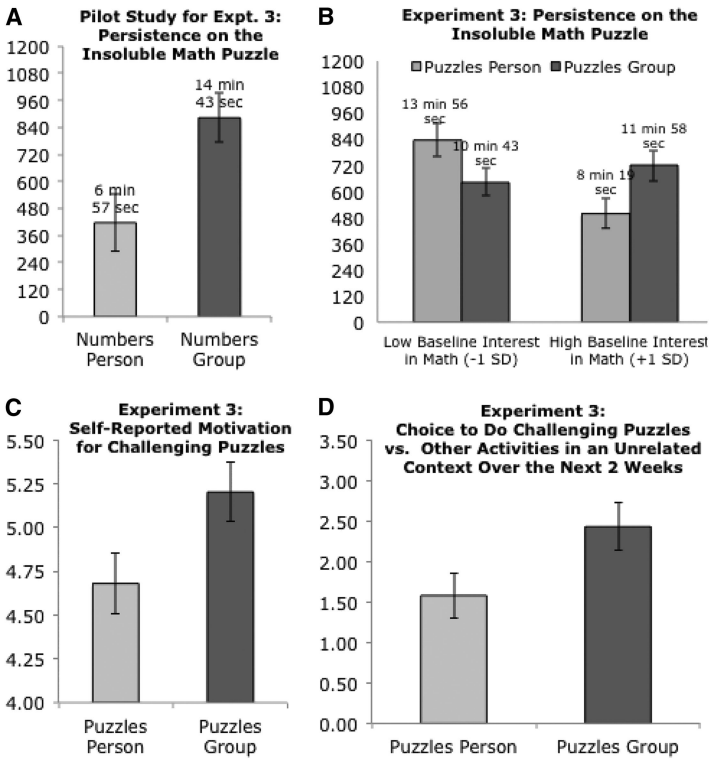

Figure 3. Motivation in the minimal group studies. Persistence on the insoluble math puzzle (A) in the pilot study (where all participants were moderately or highly identified with math at baseline) and (B) in Experiment 3. Means represent seconds. C: Self-reported motivation; D: Choice to do challenging puzzles versus other activities in an unrelated context (M = 45 hr postlab). Means are adjusted for relevant covariates. Error bars represent +/−1 standard errors.

recruited. Thus participants in Experiment 3 had both lower baseline math identification scores and greater variance in these scores ($M = 4.74$, $SD = 1.36$) than did participants in the previous studies (combined: $M = 5.17$, $SD = 0.81$), $t(222) = 2.88$, $p = .004$, and $F(1, 222) = 25.05$, $p < .001$, respectively. As a result, participants low in math identification in Experiment 3 were lower in math identification (i.e., $M_{1\ SD\ \text{below the mean}} = 3.38$) than participants low in math identification in the prior studies ($M_{1\ SD\ \text{below the mean}} = 4.36$).

Procedure and manipulation. Students participated in sessions of 5 to 8 ($M = 6.93$). Together, they exchanged names and signed consent forms and were told that the study concerned "different kinds of activities." The study used standard procedures to create a minimal group (Tajfel & Turner, 1986). Students were given a sticker to wear. Each sticker had a unique number between 1 and 8 and was either red or blue. Sticker number and color were randomized to each participant. Students were told only that the stickers were "for the purpose of this study." Each student was then sent to a private room, with students wearing red stickers directed to one set of rooms and students wearing blue stickers directed to another set of rooms. Each student chose a room from among the rooms in his or her color set and occupied this room for the remainder of the study. Beforehand, each room had been randomly paired with either the puzzles group condition or the puzzles person condition. To ensure that assignment to condition was random, the pairing of rooms to condition was not visible to students before they entered a room and was counterbalanced across experimental session.

For students in the "puzzles group" condition, a sign was taped to the wall inside the room. The sign was the same color as the student's sticker and read "Puzzles Group." When the experimenter entered the room, he or she looked at the student's sticker and said, "You're a red [blue]." The experimenter then gave the student a folder containing the study materials. Stapled to the outside of the folder was a red [blue] sheet of paper labeled "Puzzles Group." The experimenter said,

> You're a red [blue] with [names of other red (blue) participants]. As the reds [blues], you are the puzzles group, so you'll be thinking about and doing puzzles. The other group, the blues [reds], [names of the blue (red) participants], they are the physical coordination group. They'll be doing things related to motor skills and coordination.

The procedure and script in the puzzles person condition were exactly the same, except that the identity evoked was as the "puzzles person." In this condition, no sign was taped to the wall. When the experimenter entered the room, he or she looked at the student's sticker and said, "You're number [participant's number]." The experimenter then gave the student a folder containing the study materials. Stapled to the outside of the folder was a white sheet of paper labeled "Puzzles Person" and the student's number. The experimenter said,

> You're number [participant's number]. As number [participant's number], you are the puzzles person, so you'll be thinking about and doing puzzles. Other people are going to be doing other things, like things related to motor skills and physical coordination.

After completing the laboratory measures of motivation and manipulation check described below, students completed the same covariate measures used previously. Only after completing the distal measure of motivation described below were students debriefed.

Laboratory measures of motivation. Students worked on the same insoluble math puzzle used previously. Again, the puzzle was described as a math puzzle (as "developed by people who study geometric figures"). Given time constraints, students were cut off at 25 min if they had not yet stopped working (2.72% of students). As previously, the persistence measure was positively skewed ($Z = 3.28$, $p = .001$), and skew was reduced using a square root transformation ($Z < 1.15$). Subsequently students reported their *motivation for challenging puzzles* in general: how much they "enjoy" "challenging puzzles," think they are "fun" and "boring" (reverse coded), and "could fit in well in a job that involved solving challenging puzzles" (1 = *strongly disagree*, 7 = *strongly agree*; $\propto = .94$).

Manipulation check. To test whether the manipulation created a sense of social connectedness with in-group members, we adopted Cialdini et al.'s (1997) "oneness" scale. First, students reported "the extent to which you would use the term *we* to describe your relationship with the other students in today's session wearing [participant's color] stickers" (1 = *not at all*, 7 = *very much*). Second, students were shown a series of seven increasingly overlapping pairs of circles with one circle in each pair labeled "self" and the other labeled "other" (Aron, Aron, & Smollan, 1992) and were asked to select the pair that "best describes your relationship with the people wearing [participant's color] stickers." Next, students completed the same items worded to refer to students wearing other-color stickers. The two items correlated for own-color targets ($r = .68$, $p < .001$) and other-color targets ($r = .71$, $p < .001$), so we averaged each pair to create a measure of connectedness for each target. Finally, we subtracted the latter from the former to index the sense of connectedness felt for other participants wearing own-color stickers relative to other participants wearing other-color stickers.[4]

Distal measure of motivation for challenging puzzles. At the end of the laboratory session, students were invited to take part in a subsequent, ostensibly unrelated online study of "leisure activities" for an additional $5 over the following 2 weeks. Due to an experimenter error, students in three sessions ($n = 20$) were not invited to do this task. Of the remaining 91 students, 65 (71%) logged on to the online "study." The retention rate did not differ by condition, $\chi^2(1) < 1$. Four students spent less than 2 min on the online materials ($M = 1$ min 15 s) and were excluded (two in each condition); this criterion was established to ensure that participants completed the materials seriously. Retaining all 65 students does not change the pattern of results. The retained students spent an average of 11 min 16 s on the online materials.

The online materials listed 12 activities. Six involved puzzles (e.g., "Insight Puzzle 1: Coins") and 6 involved nonpuzzle activities (e.g., "Reading Activity 1: What makes a dog look guilty?"). Students were invited to "work on whichever activities you like" but were urged to do at least three activities. No reference was made to the laboratory session or puzzles group/puzzles person identity in the online materials. The primary outcome was the number of puzzles minus nonpuzzles that students chose to work on for a minimum period of time.[5] One outlier (puzzles group condition; >3 *SD*s below both the grand mean and the condition mean) was excluded.

Results

Preliminary data analytic issues. First, analyses examined the moderating role of baseline interest in math. To create a composite individual-difference measure, we standardized and averaged the four relevant measures: baseline level of math identification, SAT math score, the number of college math classes taken, and whether students' major required them to take a math class. A scale of the four items was moderately reliable ($\propto = .58$), which reflects some heterogeneity. However, dropping no items raises the alpha. Further, analysis of each individual item yields results similar to those obtained with the composite measure. We thus conducted a multiple regression analysis on each outcome with composite baseline interest in math (standardized), condition (dummy coded), and the multiplicative interaction term. Participant race and gender were tested as covariates and retained where predictive, as was academic term (because the study was run over two academic terms, unlike the previous studies).

For outcomes not moderated by baseline interest in math, we tested the main effect of condition using the same procedure as previously. We conducted ANCOVAs retaining the same *a priori* identified covariates when predictive. As previously, there were no interactions involving participant gender or participant race (i.e., Asian and European American vs. African, Hispanic, or Native American; Fs < 1.50, ps $> .20$).

Manipulation check. There was no interaction with baseline interest in math ($t < 1.15$, $p > .25$). The condition effect was significant, $F(1, 106) = 7.76$, $p = .006$, $d = 0.53$. Participants reported feeling greater "oneness" with other participants wearing same-color stickers relative to other participants wearing other-color stickers in the "puzzles group" condition ($M_{\text{diff adj}} = 1.00$; 0 = no preference for in group) than in the "puzzles person" condition ($M_{\text{diff adj}} = 0.58$).

Laboratory measures of motivation.

Persistence on the insoluble math puzzle. Multiple regression analysis yielded the predicted interaction between condition

[4] This measure serves as a manipulation check not a process variable because it assessed feelings of social connectedness to the minimal group and not to the performance domain more broadly, as did the process measures in Experiments 1 and 2. Consistent with this reasoning, mediational analyses with this measure in some cases trended but were not significant. (By contrast, the mediator assessed in Experiment 4 involves a sense of social connectedness to a confederate because there the outcome involved the activation of the confederate's goals, not motivation in a larger domain.)

[5] This was defined as 30 s for puzzles and 20 s for nonpuzzles, which represent the minimum amount of time we estimated participants would need to do each kind of activity. Different cutoffs were selected because puzzles took participants longer ($M_{\text{grand}} = 191$ s per puzzle) than nonpuzzles ($M_{\text{grand}} = 112$ s per nonpuzzle).

and baseline interest in math, $t(104) = -2.84$, $p = .005$, $\beta = 40$. As shown in Figure 3B, participants with higher levels of interest in math at baseline (1 *SD* above the mean) persisted longer in the "puzzles group" condition than in the "puzzles person" condition ($B = 219.86$ s), $t(104) = 2.18$, $p = .032$, $\beta = .29$, which replicates the pilot study. But participants with lower levels of interest in math (1 *SD* below the mean), if anything, showed the opposite pattern ($B = -193.06$ s), $t(104) = -1.86$, $p = .065$, $\beta = -.25$.

Self-reported motivation for challenging puzzles in general. There was no interaction with baseline interest in math ($t < 1.45$, $p > .15$). The condition effect was significant, $F(1, 104) = 4.53$, $p = .036$, $d = .47$. As shown in Figure 3C, participants expressed greater motivation for challenging puzzles in the puzzle group condition ($M_{adj} = 5.20$) than in the puzzle person condition ($M_{adj} = 4.68$).

Distal measure of motivation for puzzles. The distal measure was completed an average of 45 hr after the laboratory session (range: 2–238). There was no condition difference in the total number of activities participants worked on ($M_{grand} = 4.12$; $F < 1$). In addition, analysis of the number of puzzles minus nonpuzzles participants worked on showed no interaction with baseline interest in math ($t < 1$). However, the main effect of condition was significant, $F(1, 53) = 4.25$, $p = .044$, $d = 0.54$. As shown in Figure 3D, participants chose to work on more puzzles than nonpuzzles in the puzzles group condition ($M_{diff\ adj} = 2.43$) than in the puzzles person condition ($M_{diff\ adj} = 1.58$).

Discussion

Experiment 3 replicated the effect of mere belonging with a minimal group manipulation. Students interested in math at baseline freely persisted longer on a challenging math puzzle in the "puzzles group" condition than in the "puzzles person" condition. All students expressed greater enthusiasm for challenging puzzles in general in the puzzles group condition. Moreover, suggesting an enduring change in interest, these students also chose to do more challenging puzzles in an ostensibly unrelated task completed up to 2 weeks later.

In addition, we identified a boundary condition on the effects of mere belonging. While mere belonging as a member of the puzzles group increased students' interest and motivation for challenging puzzles in general regardless of their baseline interest in math, its effects were more limited when the puzzle was explicitly linked to the domain of preexisting identification, math. Mere belonging could not lead students who had disidentified from math to engage more with a math puzzle. If anything these students persisted less on the math puzzle in the "puzzles group" condition than in the "puzzles person" condition. As this pattern was not significant or predicted, we refrain from drawing strong conclusions. It may be that low interest in math makes people susceptible to reactance in the group condition, sensitive to the personal identity, or both. Our design does not disentangle these possibilities and, given the pattern's nonsignificance, it requires replication. What is clear is that while mere belonging can foster the creation of interest, it cannot reverse opposition—at least with the subtle manipulation used here.

The condition comparison in Experiment 3 provides a rigorous test of the hypothesis because a personal identity can itself increase motivation (R. L. Miller et al., 1975). Moreover, this comparison rules out two alternative explanations. First, the results would not be predicted by balance theory, as math was linked to the self in both conditions. Second, the results would not be predicted by research on social tuning, as there was no target person with defined positive views of the performance domain to whom participants could tune their attitudes and, as the groups were arbitrary, no reason for participants to infer such attitudes among members of their group. Instead, Experiment 3 finds that a third empirical realization of mere belonging—a minimal group identity—caused the same increase in motivation as did the previous manipulations.

Experiment 4: The Vicarious Zeigarnik Effect

In Experiments 1–3, minimal cues of social connectedness to unfamiliar others caused people to internalize the motivation of these others for themselves. Participants exhibited increased motivation for an achievement domain that offered opportunities for positive social interactions (Experiment 1), when they were linked to the domain through a shared birthday with a peer in it (Experiment 2), and when they were assigned to a minimal group associated with the domain (Experiment 3).

We have suggested that this increase in motivation occurs because people more or less automatically assimilate the goals of socially relevant others into the self. Experiment 4 tested this idea directly. Participants either were or were not socially connected to a confederate. The manipulation exploited a key basis of interpersonal liking—similarity (Byrne, 1997). Participants were led to believe that they shared task-irrelevant preferences with the confederate or did not. Because distinctive features of the self are more central to identity (McGuire, McGuire, Child, & Fujioka, 1978), we used preferences that were relatively unusual or idiosyncratic (see Burger et al., 2004; Jiang et al., 2010); for instance, the participant discovers that the confederate likes the same esoteric rock band they do. Past research shows that this procedure reliably creates a sense of social connectedness with new interaction partners (Cwir et al., 2011).

The confederate then pursued a series of goals in the participant's presence. We assessed the extent to which participants internalized the confederate's goals by examining three signatures of goal pursuit: whether participants (a) enacted the confederate's goals behaviorally by helping with the tasks, (b) activated the goals cognitively as the confederate pursued them, and (c) inhibited the goals cognitively after the confederate had completed them.

We assessed goal activation and inhibition by examining how quickly participants identified goal-relevant words relative to goal-irrelevant words on lexical decision tasks (LDTs). Importantly, we predicted *opposite* effects on these measures as a function of whether they were completed as the confederate pursued the goal or after she had completed it. This prediction extends past research on individual goal pursuit. As Zeigarnik (1927) first showed, people recall and resume incomplete tasks more than completed tasks. Contemporary research finds that people show enhanced accessibility of goal-relevant words before they complete a goal (i.e., activation) and reduced accessibility after they have completed it (i.e., inhibition, Förster, Liberman, & Higgins, 2005). These patterns serve a clear function: They help people complete incomplete tasks and move on after completed tasks.

Experiment 4 tested a "vicarious Zeigarnik effect." If people internalize goals from others, they should show a similar pattern of

goal activation and inhibition when the goal is pursued not by themselves but by another person to whom they are socially linked (cf. Lewis, 1944). Experiment 4 tested whether people would activate another person's incomplete goals and inhibit that person's completed goals. We expected this pattern to occur most among participants made to feel socially connected to the other person. In both conditions in Experiment 4, participants were in the presence of a confederate who pursued goals, controlling for contagion that can occur in the absence of a social link (see McCulloch, Fitzsimons, Chua, & Albarracin, 2011). In addition, unlike Experiments 1–3, Experiment 4 involved extensive interaction between the participant, experimenter, and confederate. However, the experimenter and the confederate in Experiment 4 remained unaware of participants' condition assignment.

Method

Overview. Participants were either socially linked to a confederate or not. The confederate pursued two goals in the participant's presence—searching for a coin and completing achievement-related puzzles. Participants completed measures of goal accessibility before and after each task had been completed. They also had the opportunity to enact the two goals behaviorally by helping the confederate with them.

Participants. A total of 112 Canadian undergraduates participated in exchange for course credit or $8 Canadian (U.S.$8). Only women were included so as to create same-sex pairings with one of two female confederates. The sample included 69 European Canadians, 18 Asian Canadians, and 25 people of other/unknown descent. One participant suspected that the confederate was an accomplice of the experimenter and was dropped from analysis.

Prestudy survey. One to 10 weeks before the study, participants completed an online "general interests" survey in which they listed their favorite movie, actor or actress, type of music, band or musician, book, author, class, professor, past and future travel destination, and place of birth. Participants also rated how meaningful each preference or attribute was to them (1 = *not at all meaningful*, 9 = *very meaningful*). Participants were unaware of the connection between this survey and the later laboratory study.

Procedure, manipulation, and dependent measures.

Cover story. Participants took part in the study individually but with a trained confederate posing as another participant. They were told that the study concerned "cognitive and physical tasks."

Social connection manipulation. After obtaining informed consent, the experimenter told the participant and confederate that she would ask them "background questions" so they could get to know each other. The questions the experimenter asked addressed topics included in the prestudy survey. Their purpose was to manipulate participants' sense of social connectedness to the confederate. This was done by varying some of the confederate's answers so that they either matched or did not match the participant's answers in the prestudy survey (Cwir et al., 2011). The experimenter asked the confederate two questions, then asked the participant two questions, asked the confederate three more questions, and asked the participant three last questions. No question was asked of both people.

To keep the experimenter and confederate unaware of participants' condition assignment, the questions asked of each person and the confederate's answers were prescripted for each experimental session by another investigator who never interacted with participants. Prior to each session, this investigator randomly assigned the incoming participant either to the social link condition or to the control condition. In the social link condition, this experimenter selected three responses on the participant's prestudy survey that, as far as possible, were unusual in the surveyed sample and that the participant had rated as personally important (e.g., "Bon Jovi," 9). The investigator then tailored the experimenter and confederate's scripts so that the experimenter asked three questions that targeted the participant's idiosyncratic preferences (e.g., "Who is your favorite musician?") and the confederate gave answers that matched the participant's preferences (e.g., "Bon Jovi is my favorite musician"). For participants the experience was thus of meeting a peer whose esoteric preferences matched their own (Cwir et al., 2011).

Each control-condition participant was yoked to a participant in the social link condition. Here the experimenter asked the confederate the same questions and the confederate gave the same answers as for the yoked social link participant, but the confederate's preferences did not match the participant's preferences. As noted, the prescripted nature of this interaction permitted the experimenter and confederate to remain unaware of participants' condition assignment. They did not know when the confederate's preferences matched versus mismatched the participant's preferences. In addition, the confederate was unaware of the purpose of the experiment.

Assignment to tasks. To buttress the cover story, after the manipulation the participant and confederate were ostensibly randomly assigned to complete "cognitive" or "physical" tasks. Both people drew a slip of paper from a basket. Both slips read "cognitive tasks" but the confederate said that hers read "physical tasks." Thus the participant went on to complete "cognitive tasks" while the confederate went on to complete "physical tasks."

Confederate's first task: Coin retrieval. The experimenter told the participant and confederate that they would begin their respective tasks at the same time after the instructions for each. The experimenter then showed the confederate a large tub filled with stones, washers, and water. As the participant listened, the experimenter told the confederate that her task was to find a Loonie ($1 Canadian coin [U.S.$1]) hidden in the tub. The experimenter emphasized the importance of finding the Loonie, saying, "Imagine your washing machine broke . . . this is your last Loonie so it's extremely important that you find it as quickly as you can." In fact, no Loonie was in the tub. Instead, one was hidden under a towel nearby so the confederate could retrieve it at a subsequent predetermined time.

Participants' first LDT. The experimenter sat the participant at a computer in the same room and explained that her task was to indicate whether each letter string that appeared on the screen was a word or nonword as quickly and as accurately as possible by pressing either a key labeled "word" or a key labeled "nonword." The computer measured participants' response time. This task assessed the extent to which participants had mentally activated the confederate's goal to find the Loonie (see Förster et al., 2005). The experimenter then said that the first 10 letter strings consisted of practice trials (e.g., *blink*, *elephant*). When participants sat at the computer, the confederate was to the side about six feet away. The LDT included goal-relevant words (*buck*, *coin*, *dollar*, *dough*, and *money*), goal-irrelevant words matched in length and frequency of

use (*crop*, *tune*, *patch*, *author*, and *level*), and nonwords (e.g., *enag*). After the instructions, the experimenter told the confederate and participant to begin their respective tasks.

Participants' first break. After the participant finished the first LDT, the experimenter said that it was standard procedure to take a 2-min break between tasks. In the interim, she was invited to either "read a magazine or help [the confederate] with her retrieval task." Participants were offered several magazines and told that it was "completely up to you" what they did. If the participant helped, the experimenter unobtrusively timed how long she did.

Participants' second LDT. After 2 min, the experimenter asked the participant to start the second cognitive task. This task was identical to the first task but used different letter strings. Its purpose was to assess the degree to which the participant inhibited the confederate's goal to find the Loonie after the confederate had completed that goal. About 10 s after the participant began the practice trials, the confederate unobtrusively removed the Loonie from beneath the towel, held it in the air, and exclaimed, "I found it! I found the Loonie!" The experimenter said "Great job! You found the Loonie!" The experimenter and confederate spoke loudly to ensure that the participant knew that the confederate had completed the goal. The goal-relevant words were *finance*, *poor*, *price*, *purchase*, *rich*, and *wealth*. The matched goal-irrelevant words were *counter*, *tone*, *drive*, *concrete*, *send*, and *sphere*.

Confederate's first questionnaire. The confederate then rated "how helpful" the participant had been in helping her find the Loonie (1 = *not at all helpful*, 7 = *very helpful*).

Confederate's second task: Puzzle-solving. After the participant finished the second LDT, the experimenter told her to take another 2-min break as she explained the confederate's second task to the confederate. Again the participant listened in. The task was described as a "puzzle-solving achievement task." The confederate was asked to solve six puzzles from the Raven's Progressive Matrices. Each puzzle consisted of a 3×3 grid of patterns with the pattern in the bottom right missing. Each puzzle was displayed on a large easel. For each, the confederate was given eight large cards with patterns and asked to choose the pattern that best completed the puzzle. The confederate began and solved the first puzzle in view of the participant to ensure that the participant understood the task.

Participant's third LDT. Like the first LDT, the third LDT assessed the degree to which the participant had activated the confederate's goal—here, to solve puzzles—before it had been completed. As with the first LDT, the participant completed the LDT as the confederate worked on the puzzle-solving task in the same room. The goal-relevant words were *accomplish*, *advance*, *prevail*, *progress*, and *triumph*. The matched goal-irrelevant words were *structural*, *housing*, *flannel*, *southern*, and *prairie*.

Participants' third break. After the participant finished the third LDT, the experimenter asked her to take another 2-min break. As in her first break, the participant was given a choice between helping the confederate and reading magazines. If she helped, the experimenter unobtrusively timed how long she did.

Participants' fourth LDT. After 2 min, the experimenter asked the participant to start the fourth cognitive task. Like the second LDT, the purpose of the fourth LDT was to assess the degree to which the participant inhibited the confederate's goal—to solve puzzles—after the confederate had completed that goal. As the participant began the practice trials, the confederate announced, "I'm done! I've solved all of the puzzles!" The experimenter replied, "Great! You're done!" The goal-relevant words were *analyze*, *examine*, *persist*, *strive*, and *understand*. The matched goal-irrelevant words were *flowery*, *vehicle*, *ketchup*, *thread*, and *atmosphere*.

Confederate's second questionnaire. The confederate rated how helpful the participant had been on the puzzle-solving task. She was then escorted from the room by the experimenter.

Sense of social connectedness to confederate. After the participant finished the fourth LDT, the experimenter gave her a brief questionnaire. It assessed (a) perceived similarity to the confederate (two items, e.g., "How similar are you and the other participant"; 1 = *not at all similar*, 7 = *very similar*, $\alpha = .92$) and (b) liking for the confederate (one item, "How much do you like the other participant"; 1 = *not at all like*, 7 = *very much like*). Finally, the participant was probed for suspicion and debriefed.

Cleaning of LDT Data. The LDT data was cleaned following standard procedures. First error trials, in which participants identified a word as a nonword, were eliminated. Second, outliers were eliminated. Within each condition, we calculated the mean response time and standard deviation for each item and, using cutoffs recommended by Van Selst and Jolicoeur (1994) for a nonrecursive procedure and the sample size per condition ($n \approx 50$; i.e., 2.48 standard deviations from the mean), identified and eliminated outliers (2.88% of trials).

Validation study. We conducted a separate study to evaluate the goal-relevant words used in the LDTs. Participants ($n = 40$) were randomly assigned to (a) a control condition in which they only completed the LDTs or (b) a goal activation condition in which they first worked on the coin-finding and puzzle-solving tasks and were interrupted midway in each to complete an LDT. The first LDT included goal-relevant words for the coin-finding task; the second LDT included goal-relevant words for the puzzle-solving task. Data were cleaned using the procedure described above. We conducted a mixed-model analysis of variance (ANOVA) involving LDT (within-subjects) and condition (between-subjects). To control for individual differences in processing speed, outcomes were adjusted prior to analysis for response times to matched goal-irrelevant words and to practice trials. The analysis yielded only the predicted main effect of condition, $F(1, 38) = 10.33$, $p = .003$, $d = 0.72$, with no interaction by task ($F < 1$). Responses to goal-relevant words were faster in the goal-activation condition ($M_{adj} = 548$ ms) than in the control condition ($M_{adj} = 581$ ms). The effect was significant for both LDTs (ts > 2.10, ps $< .040$).

Results

Preliminary data analytic issues. No condition effect on the measures of behavior and goal accessibility varied by task (coin-finding vs. puzzle-solving; Fs < 2.50, ps $> .10$), so we combined outcomes across tasks. We summed the time participants helped and averaged the confederate's ratings of the participant's helpfulness across the two tasks. We also created two indices of goal accessibility. One averaged response time to goal-relevant words before the goal's completion (i.e., in LDTs 1 and 3, hereafter called *activation LDTs*). The other averaged response time to goal-relevant words after the goal's completion (i.e., in LDTs 2

and 4, hereafter called *inhibition LDTs*). As controls, we created parallel indices of response times to matched goal-irrelevant words on the same LDTs and to practice trials.

Sense of social connectedness to confederate. As predicted, the social link manipulation led participants to view the confederate as more similar to themselves and to like her more. Means and analyses are reported in Table 2.

Goal-relevant behavior. The two measures of behavior—(a) time helping and (b) confederates' ratings of participants' helpfulness—correlated ($r = .87$, $p < .001$), so we standardized and averaged them to create a composite index of goal-relevant behavior. As shown in Table 2, this index yielded a significant effect of condition. Participants pursued the confederate's goal more in the social link condition than in the control condition. Both components yielded similar effects. See Table 2.

Goal activation and inhibition. To examine goal activation and inhibition, we first conducted a 2 (LDT type: activation vs. inhibition) × 2 (word type: goal-relevant vs. goal-irrelevant) × 2 (condition: social link vs. control) mixed-model ANOVA. To control for individual differences in processing speed, we adjusted each LDT for response time to practice trials prior to analysis. To do so, we regressed response time to goal-relevant and goal-irrelevant words on LDTs 1, 2, 3, and 4 on response time to practice trials and saved the residuals. We then averaged the residual response time to goal-relevant words and to goal-irrelevant words across activation trials (LDTs 1 and 3) and inhibition trials (LDTs 2 and 4). Finally, we conducted the mixed-model ANOVA. It yielded a three-way interaction, $F(1, 108) = 5.56$, $p = .020$.

We decomposed this interaction to test whether the social link manipulation affected response time to goal-relevant words or to goal-irrelevant words. First, we examined goal-irrelevant words. As predicted, the 2 (goal-irrelevant words from activation vs. inhibition LDTs) × 2 (condition: social link vs. control) interaction was not significant ($F < 1$). Next, we examined goal-relevant words. As predicted, the 2 (goal-relevant words from activation vs. inhibition LDTs) × 2 (condition) interaction was significant, $F(1, 108) = 9.15$, $p = .003$.

Analysis of this interaction yielded the predicted pattern: The social link sped responses to goal-relevant words on activation LDTs but, if anything, slowed responses to goal-relevant words on inhibition LDTs. First, we examined activation LDTs. To control for processing speed, we regressed response time to goal-relevant words on LDT 1 and on LDT 3 on response times to control trials (i.e., practice trials and matched goal-irrelevant words on the same LDT), saved the residuals, added the grand mean response time to goal-relevant words on each LDT to the relevant residuals (to preserve the original metric), and then averaged the residual response times across LDTs 1 and 3. As shown in Table 2 and in Figure 4, the condition effect on this outcome was significant. On activation LDTs, participants responded faster to goal-relevant words in the social link condition than in the control condition. This speeded response suggests that the social link increased participants' activation of the confederate's goal as the confederate pursued it.

Second, we conducted the parallel analysis of inhibition LDTs. It yielded a marginally significant effect in the opposite direction. Participants tended to respond slower to goal-relevant words in the social link condition than in the control condition (see Table 2 and Figure 4). Consistent with research on goal inhibition (Förster et al., 2005) and with a vicarious Zeigarnik effect, participants showed enhanced accessibility of the other person's goal in the social link condition, but this effect, if anything, reversed once the other person had completed the goal.

Last, we examined within-subjects effects. We conducted a 2 (goal-relevant words from activation vs. inhibition LDTs) × 2 (condition: social link vs. control) mixed-model ANOVA. Outcomes were residuals adjusted for response times to control trials as described above. The analysis yielded a significant interaction, $F(1, 107) = 8.19$, $p = .005$. Participants in the control condition showed no difference in response time to goal-relevant words in activation vs. inhibition LDTs, $t < 1$. But participants in the social link condition responded faster to goal-relevant words on activation LDTs than on inhibition LDTs, $t(107) = 4.47$, $p = .00002$, $d = 0.83$.

Mediation analyses. Participants' sense of social connectedness to the confederate mediated the condition effect on both goal-relevant behavior and goal accessibility. We created a candidate mediator by averaging participants' felt similarity to and liking of the confederate (these correlated: $r = .51$, $p < .001$). We

Table 2
Effects of Condition in Experiment 4

Category	Dependent measure	Social link condition	Control condition	Statistical test
Sense of social connectedness to confederate	Perceived similarity to confederate	5.35 (1.15)	3.42 (0.97)	$t(109) = 9.55$, $p < .001$, $d = 1.34$
	Liking of confederate	5.52 (0.94)	4.92 (0.78)	$t(109) = 3.59$, $p < .001$, $d = 0.65$
Goal-relevant behavior	Composite index of goal-relevant behavior	0.16 (0.96)	−0.24 (0.94)	$t(109) = 2.23$, $p = .028$, $d = 0.42$
	Time spent helping confederate (out of 4 min)	1 min 50 s (86 s)	1 min 23 s (86 s)	$t(108) = 1.67$, $p = .098$, $d = 0.32$
	Helpfulness rated by confederate	4.09 (2.06)	3.00 (1.99)	$t(103) = 2.76$, $p = .007$, $d = 0.52$
	Percent who helped at all	74%	55%	$\chi^2 = 4.58$, $p = .032$
Goal accessibility	Goal activation: Response time to goal-relevant word, LDTs 1 and 3	522 ms (33 ms)	535 ms (34 ms)	$t(107) = 2.13$, $p = .036$, $d = 0.40$
	Goal inhibition: Response time to goal-relevant words, LDTs 2 and 4	553 ms (49 ms)	537 ms (42 ms)	$t(107) = 1.81$, $p = .072$, $d = 0.34$

Note. Standard deviations shown in parentheses. Goal accessibility outcomes are adjusted for response time to practice words and to matched goal-irrelevant words on the same lexical decision tasks (LDTs).

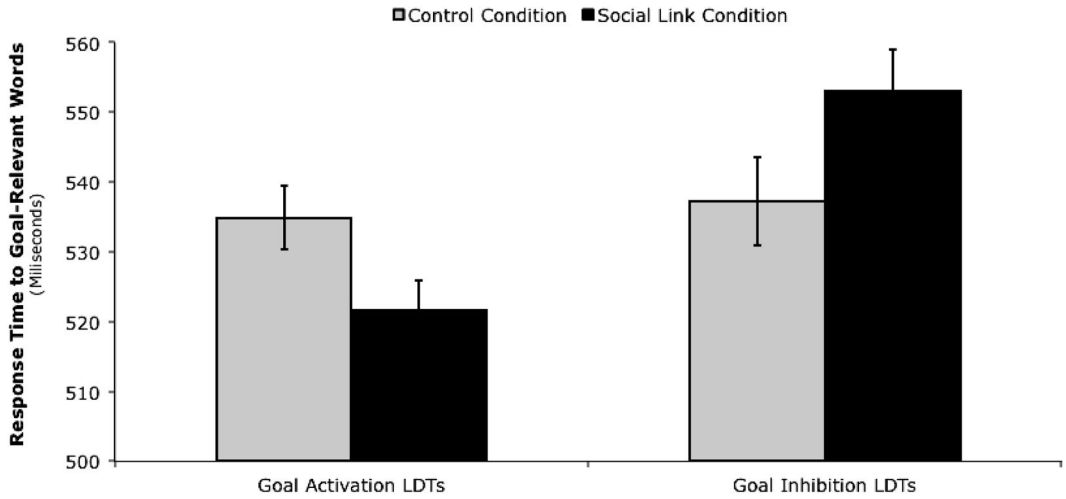

Figure 4. Mean response time to goal-relevant words on goal activation lexical decision tasks (LDTs; completed as the confederate pursued the goal, i.e., LDTs 1 and 3) and to goal-relevant words on goal inhibition LDTs (completed after the confederate had completed the goal, i.e., LDTs 2 and 4) in Experiment 4. Outcomes are adjusted for individual differences in processing speed (i.e., response time to practice trials and to matched goal-irrelevant words on the same LDTs). Greater activation is indexed by faster responses; inhibition is indexed by slower responses. Error bars represent +/−1 standard error.

examined effects on (a) the composite measure of goal-relevant behavior described above and (b) a composite measure of goal accessibility. This was the average of the reverse-scored goal activation response times (LDTs 1 and 3) and the goal inhibition response times (LDTs 2 and 4). Outcomes were residuals adjusted for response times to control trials as described above. Higher values signify greater accessibility of goals before their completion and less accessibility after their completion. As shown in Table 3, for both outcomes controlling for participants' sense of social connectedness to the confederate rendered the condition effect nonsignificant, and these reductions in the condition effect were significant.

Discussion

In Experiment 4, participants were socially linked to a peer by being led to believe that they shared incidental preferences with her. The peer then pursued a series of goals. As predicted, this cue of social connectedness caused participants to adopt the other person's goals as their own. Three signatures of goal pursuit emerged. Compared with control participants, participants in the social link condition were more likely to enact the other person's goals behaviorally, to show heightened accessibility of these goals before the other person completed them (i.e., activation) and, marginally, to show decreased accessibility of these goals after the other person had completed them (i.e., inhibition). The latter findings are suggestive of a vicarious Zeignarnik effect. Research has long suggested that people's goals remain psychologically accessible until completed (Förster et al., 2005; Zeigarnik, 1927). Experiment 4 shows the same effect can occur when the goal initially belongs to someone else. With only a minimal social link, the goals of another person can become our own. The results

Table 3
Mediation Analyses in Experiment 4

	Goal-relevant behavior				Goal accessibility			
	Regression 1A: condition effect		Regression 1B: mediation		Regression 2B: condition effect		Regression 2B: mediation	
Predictor	β	*t*	β	*t*	β	*t*	β	*t*
Experimental condition	.21	2.23*	.01	0.12	.26	2.86*	.14	1.20
Sense of social connectedness to confederate			.32	2.75*			.20	1.75†
ADPT 95% confidence interval			[0.23, 0.52*]				[10.90, 2.85*]	

Note. The outcomes are composites of the relevant variables. To control for individual differences in processing speed, goal accessibility is a residual controlling for response time to goal-irrelevant words and to practice trials. ADPT = asymmetric distribution of products test.
† $p < .10$. * $p < .05$.

suggest that minimal social links may promote shared motivations in part by leading people to assimilate the achievement-related goals of others into the self.

General Discussion

The present research finds that the mere sense of social connectedness enhances achievement motivation. Although long-standing relationships with family, friends, and colleagues can affect motivation, the present studies examined mere belonging—small cues of social connectedness to another person or group in a performance domain. Participants were led to believe that an achievement domain offered opportunities for positive social interaction (Experiment 1), that they shared a birthday with a peer in an achievement domain (Experiment 2), that they belonged to a minimal group tied to an achievement domain (Experiment 3), or that they shared incidental preferences with a peer who completed a series of tasks (Experiment 4). Each manipulation boosted participants' motivation in the domain at hand, enhancing freely chosen persistence on domain-relevant tasks (Experiments 1–3), task choice in a distal, unrelated context (Experiment 3), self-expressed interest and motivation (Experiments 1–3), and goal pursuit and goal accessibility as assessed by automatic reaction-time measures (Experiment 4). While past research finds that people can develop shared motivations with valued and long-standing relationship partners, the present research shows that people acquire goals and motivation even from unfamiliar others relatively automatically, as a consequence of small cues of social connectedness. That small, even trivial, cues caused large shifts in motivation underscores the importance of social relationships as a source of people's interests, motivation, and broader self-identity.

The diverse manipulations of mere belonging and measures of motivation used in the present studies provide convergent evidence for the mere belonging hypothesis. Each study provides evidence that a mere sense of social linkage leads people to adopt the goals and motivation of others for themselves. By contrast, alternative approaches do not parsimoniously explain the results. For instance, balance theory—in which positive qualities are attributed to entities linked to the self—would not explain the results of Experiment 1, where participants were presented with positive opportunities in math in both conditions, or of Experiment 3, where the self was associated with the performance domain in both conditions. Also consistent with our theoretical account, measures of social connectedness consistently mediated the condition effects on motivation (Experiments 1, 2, and 4). Past research highlights the collective basis of learning (Bandura, 1977), attitudes (Asch, 1952; Cohen, 2003), and emotion (Anderson et al., 2003; Cwir et al., 2011). The present research highlights the collective basis of motivation.

Our emphasis on social connectedness enriches predominant theories of motivation. Such theories emphasize instead self-perceptions of autonomy and competence (e.g., Bandura, 1997). Complementing this work, the present research suggests that people acquire interests and goals from others, especially others to whom they feel socially connected. The conclusion that motivation is highly sensitive to social relationships is consistent with research on social identity threat, which finds that subtle cues that convey to students that they do not belong or that their group does not belong in a field of study can undermine motivation (Cheryan et al., 2009; Murphy et al., 2007). For instance, boorish behavior from a male peer can undermine women's engineering performance (Logel et al., 2009). Also suggestive of the social-relational foundations of motivation, cues that evoke just a sense of working together on a challenging task, rather than of working in parallel to others, robustly increase intrinsic motivation, even when people work alone (Carr & Walton, 2011).

Taken together, this research suggests that people draw motivation from a sense of belonging in an intellectual community. They are sensitive to subtle cues that suggest whether they and their group belong in a performance setting and respond to such cues with large shifts in motivation. This conclusion suggests new avenues for raising motivation in applied settings. For instance, in addition to fostering a sense of self-efficacy, as by creating proximal goals (Bandura & Schunk, 1981), forestalling attributions of inability (Wilson, Damiani, & Shelton, 2002), or changing maladaptive theories of intelligence (Blackwell, Trzesniewski, & Dweck, 2007), effective strategies to enhance a sense of social connectedness to others in a school or work setting may raise people's motivation and achievement (e.g., Walton & Cohen, 2011a).

The finding that people readily adopt the goals and motivations of others also deepens our understanding of the psychological mechanisms that contribute to social coordination and cooperation. A foundation of human culture is the capacity of people to cooperate to pursue joint goals, create cultural products, and forge technological innovations (Asch, 1952; Vygotsky, 1978). Classic research in biology and in psychology emphasizes factors that make it in individuals' self-interest to cooperate, even in nonobvious ways. For instance, individuals may assist genetic relations even at a risk to the self (i.e., kin selection; Hamilton, 1964) or establish mutually beneficial patterns of cooperation with others, as in reciprocal altruism (Trivers, 1971) and the "tit-for-tat" strategy in prisoner's dilemma games (Axelrod, 1984). Similarly, research on cooperative learning finds that structuring school assignments so that it is in students' interest to cooperate rather than compete can increase cooperation and improve school outcomes (Aronson, 2004). Complementing this research and consistent with recent theorizing (e.g., Cialdini et al., 1997; Tomasello et al., 2005; Walton & Cohen, 2011b), we suggest that people have a basic psychological mechanism by which they adopt for themselves the interests and goals of relationship partners. This mechanism would afford social coordination and collective goal pursuit even in contexts not clearly tied to self-interest (see also Fitzsimons & Finkel, 2011).

Hume wrote that we "receive . . . inclinations and sentiments" from others. What inspires us to act—the tasks, activities, and fields of study that we choose to pursue—forms a fundamental part of our self-identity. Past research shows that potent social factors like close relationship partners (e.g., Anderson et al., 2003; Aron et al., 2004; Fitzsimons & Bargh, 2003) and valued group identities (e.g., Cohen, 2003; Newcomb et al., 1967) have a profound influence on the self, attitudes, and behaviors. The present research finds that a mere sense of social connectedness, even with unfamiliar others, can cause significant changes in the self, personal interests, and motivation. This finding implies that long-standing relationship partners may exert a more profound influence on the self than is now understood. More broadly, in contrast to much research in psychology, which emphasizes

processes that occur in the isolated minds of individuals, this research illustrates the value of conceptualizing the self and important psychological qualities like motivation as arising collectively among networks of individuals connected to one another in social relationships.

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