Health Psychology

Relational Effects on Physical Activity: A Dyadic Approach to the Theory of Planned Behavior

Maryhope Howland, Allison K. Farrell, Jeffry A. Simpson, Alexander J. Rothman, Rachel J. Burns, Jennifer Fillo, and Jhon Wlaschin

Online First Publication, February 25, 2016. http://dx.doi.org/10.1037/hea0000334

Health Psychology

0278-6133/16/$12.00 http://dx.doi.org/10.1037/hea0000334

Relational Effects on Physical Activity: A Dyadic Approach to the Theory of Planned Behavior

Maryhope Howland
University of Connecticut Health Center

Allison K. Farrell, Jeffry A. Simpson, and Alexander J. Rothman
University of Minnesota

Rachel J. Burns
McGill University

Jennifer Fillo
University of Houston

Jhon Wlaschin
University of St. Thomas

Objective: Despite growing appreciation of how close relationships affect health outcomes, there remains a need to explicate the influence romantic partners have on health behavior. In this paper, we demonstrate how an established model of behavior change—the theory of planned behavior (TPB)— can be extended from an individual level to a dyadic (couple) model to test the influence that relationship partners have on a key determinant of health behavior—behavioral intentions. ***Methods:*** Two hundred romantic couples (400 individuals) completed TPB measures regarding physical activity for themselves and their romantic partner as well as a measure of relationship quality. ***Results:*** Above and beyond the individual-level TPB predictors of behavioral intentions (i.e., attitudes, subjective norms, and perceived behavioral control), the romantic partner's perceived behavioral control (PBC) regarding physical activity predicted each individual's behavioral intentions and moderated the influence of each individual's PBC on his or her own behavioral intentions. Additionally, the romantic partner's perceptions of each individual's TPB measures predicted each individual's behavioral intentions to be physically active. Quality of the relationship also moderated some partner influences on individuals' intentions. ***Conclusions:*** This paper provides a roadmap for integrating a dyadic framework into individual-level models of behavior change. The findings suggest that data from *both* partners and relationship quality are important to consider when trying to understand and change health-related behavior such as physical activity. The results broaden the potential applications of the TPB as well as our understanding of how romantic partners might influence important health-related practices.

Keywords: close relationships, exercise, health behaviors, theory of planned behavior

Supplemental materials: http://dx.doi.org/10.1037/hea0000334.supp

In recent years, the top causes of death in the United States have shifted to illnesses that have significant lifestyle and behavioral components, such as heart disease, chronic respiratory diseases, and certain cancers (Centers for Disease Control, 2015). Thus, psychological models that shed light on the factors that regulate people's behavior have a crucial role to play in shaping efforts to treat, mitigate, and eventually reduce rates of morbidity and mortality.

Efforts to understand the psychological processes by which individuals develop and alter their behavioral intentions—and ultimately health behaviors—have focused on *intra*personal factors, such as self-control (e.g., Mann, de Ridder, & Fujita, 2013), personality (e.g., Raynor & Levine, 2009), and the attitudes an individual holds regarding his or her own health-related behaviors and activities (e.g., Lawton, Conner, & McEachan, 2009). Research that has examined external factors has largely focused on nonsocial features of the environment, such as the impact of neighborhood qualities (e.g., sidewalks) on physical activity (for a review, see Feng, Glass, Curriero, Stewart, & Schwartz, 2010) or physical features of the social environment, such as the presence of others on meal size (e.g., de Castro, 1991). However, a potentially important and largely unassessed source of influence in the social environment are the beliefs held by a person's romantic partner or spouse.

Maryhope Howland, Department of Community Medicine and Health Care, University of Connecticut Health Center; Allison K. Farrell, Jeffry A. Simpson, and Alexander J. Rothman, Department of Psychology, University of Minnesota; Rachel J. Burns, Department of Psychiatry, McGill University; Jennifer Fillo, Department of Psychology, University of Houston; Jhon Wlaschin, Department of Psychology, University of St. Thomas.

Correspondence concerning this article should be addressed to Maryhope Howland, Department of Community Medicine and Health Care, University of Connecticut Health Center, Mail Code: 6325, 263 Farmington Avenue, Farmington, CT 06030-6325. E-mail: mhowland@uchc.edu

There is considerable evidence that close relationships impact physical health (see Stadler, Snyder, Horn, Shrout, & Bolger, 2012, and Robles, Slatcher, Trombello, & McGinn, 2014, for a recent review and meta-analysis, respectively). This research, however, has focused primarily on how relationship partners influence physiological markers of health (e.g., immune functioning) and has largely neglected how relationship partners shape each other's health-related behaviors. A review of 103 studies examining the concordance of couples' mental health, physical health, and health behaviors identified only 19 studies that investigated behaviors (Meyler, Stimpson, & Peek, 2007). All 19 studies found evidence for the concordance of health-behavior in couples, but they provided little theoretical explanation for these effects aside from attributing the concordance to a shared environment and similar health-relevant expectations. Importantly, research has documented that concordance develops over time in the case of physical activity (Cobb et al., 2015), suggesting that it is not merely attributable to partner selection effects.

The need to specify and clarify dyadic influence in health-relevant behavior has been noted in prior reviews (e.g., Karney et al., 2010; Pietromonaco, Uchino, & Dunkel Schetter, 2013; Troxel, 2010). However, dyadic versions of traditional models of health behavior have not been fully outlined or tested. In this paper, we offer a roadmap for how to extend existing *intrapersonal* models of health behavior change to a dyadic level so that *interpersonal* and relationship factors can be examined. Bringing the partner and important characteristics of the relationship into well-established models of health behavior change cannot only enhance our understanding of individual-based models, but also extend our understanding of *how* partners and relationships impact an individual's intentions and behaviors.

The most commonly used and well-supported theoretical models of health behavior, which include the health belief model (Rosenstock, 1974) and the theory of planned behavior (TPB; Ajzen, 1985), describe how intrapersonal factors can and do shape intentions and behavior. Yet, these models can easily be reconceptualized within a dyadic context. In the current paper, we situate the TPB in the context of romantic partners' physical activity, which has previously been proposed as a good theoretical starting-point to bring a dyadic perspective to health-related behavior change (see Karney et al., 2010).

The TPB (Ajzen, 1985) posits that an individual's attitudes (i.e., his or her positivity about a behavior), subjective norms (i.e., perceived social pressure regarding a behavior), and perceived behavioral control (PBC; one's perceived ability to engage in a behavior) influence his or her behavioral intentions, which in turn influence his or her health behavior over time (see the solid lines in Figure 1). Meta-analyses have supported predictions derived from the model for both health and nonhealth outcomes (e.g., Armitage & Conner, 2001; Godin & Kok, 1996), and, importantly, there is considerable evidence linking behavioral intentions to target behaviors (see Albarracin, Johnson, Fishbein, & Muellerleile, 2001). In particular, a meta-analysis of the experimental evidence regarding the effect of behavioral intentions on behavior revealed that a medium-to-large change (effect size) in behavioral intentions led to a small-to-medium change in behavior (Webb & Sheeran, 2006).

To transform the TPB into a dyadic model, we applied the Actor–Partner Interdependence Model (APIM; Kenny, Kashy, & Cook, 2006), which assesses the influences of each individual and his or her partner on the individual's outcomes—in this case, behavioral intentions to be physically active. The intrapersonal paths constituting the traditional individual-level TPB model, depicted as solid lines in Figure 1, are known as *actor effects*. Consider a hypothetical couple—Harry and Sally. *Actor effects* depict how Harry's own attitudes, subjective norms, and PBC predict his own behavioral intentions, statistically controlling for Sally's scores on these same TPB variables. *Partner effects* (dashed lines in Figure 1) indicate how *Sally's* attitudes, subjective norms, and PBC impact Harry's behavioral intentions, controlling for Harry's scores on these TPB variables. In APIM analyses, Harry and Sally are each both an "actor" and a "partner" because they are nested within the same relationship.

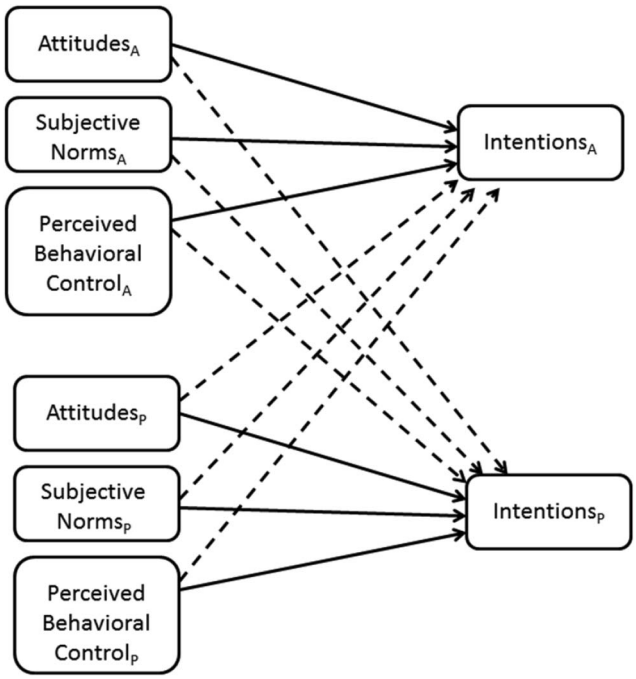

Figure 1. The dyadic version of the theory of planned behavior model.

Working within the APIM framework, one can capitalize on the relationship context in two additional ways. First, one can consider how relationship variables, such as relationship quality, might interact with established predictors of behaviors *within* the relationship context. Although relationship quality is an important moderator of the impact of relationship status on health outcomes (e.g., Kiecolt-Glaser & Newton, 2001), there is considerably less work on how it impacts health *behaviors* specifically. Within the APIM framework, one can test whether relationship quality (and other variables) moderate the impact of a partner's influence on the actor's behavioral intentions (see Figure 2 for how moderators are incorporated).

Second, a partner can provide additional perspectives on the actor's own attitudes, subjective norms, and PBC. This goes beyond the attitudes$_p$, subjective norms$_p$, and PBC$_p$ paths by adding additional partner paths (see, e.g., the attitudes$_{pa}$ path in Figure 2). In the current study, we explore whether partner's beliefs *about the actor* (e.g., Harry's attitudes, norms, and PBC about Sally's exer-

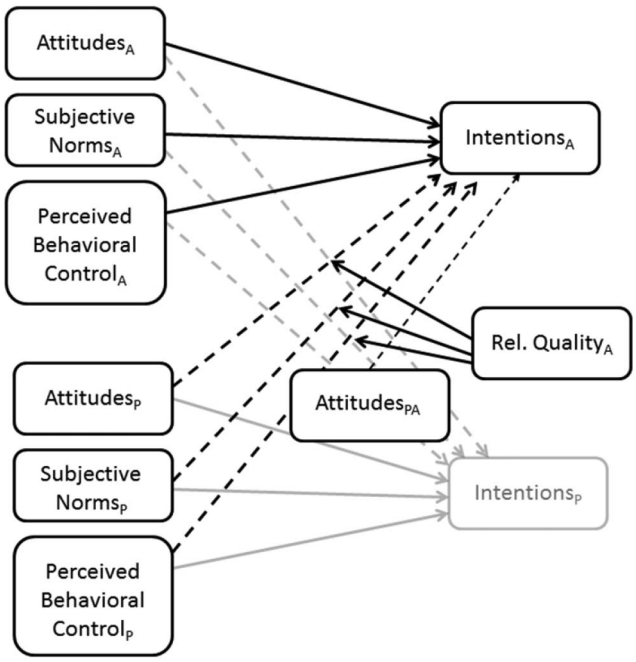

Figure 2. The dyadic version of the theory of planned behavior model moderated by actor relationship quality.

cising) contribute to predicting actors' behavioral intentions above and beyond the partner's beliefs about him/herself. Adding these partner perspectives might be redundant with the actor's perspective, but they could also "correct" for the actor's motivated beliefs and provide a more accurate index of TBP constructs.

We tested three hypotheses in the current study. First, we predicted that the *partner's* TPB variables regarding his or her own physical activity would predict an individual's (actor's) physical activity behavioral intentions, above and beyond the individual's (actor's) own TPB variables (Hypothesis 1). Second, we predicted that partners' perspectives on the actors' TPB variables would predict actor behavioral intentions, above and beyond both the individual-level predictors and the other partner predictors (Hypothesis 2). Third, we examined whether relationship quality moderated the partner effects described above, such that the intentions of actors who were in higher-quality relationships were more influenced by their partners' beliefs (Hypothesis 3).

Given the novelty of this dyadic framework and the dearth of dyadic studies in this area, all three hypotheses are exploratory to some degree. Thus, even though we anticipated the general patterns of effects described above, we did not derive formal predictions about *which* constructs in the TPB model would yield the strongest effects.

Method

Participants

Two hundred couples (200 men and 200 women, 400 total participants) were recruited for two larger studies on couple processes. Participants had to be at least 18 years old, involved with their current partner in a heterosexual relationship for at least 6 months (relationship length $m = 4.62$ years, $SD = 5.47$ years), and native English speakers to be eligible for the study. Participants were instructed to not discuss the survey with their partner. For more information regarding demographic information, see the supplemental materials. Both studies used campus and community flyers and classroom announcements to initiate recruitment. One study recruited couples for a study called "How Couples Communicate in a Modern World," and another for a study called "Decision-Making in Relationships." Participants e-mailed the researchers to express interest in participating.

Procedure

Participants (both couple members) first completed demographic items and relationship measures privately and online at their home. Following this, they completed two sets of measures of the TPB constructs regarding physical activity, either in the lab or at home. The first set included the standard individual measures assessing actors' own attitudes, subjective norms, and PBC with respect to being physically active (e.g., What does Harry/Sally believe about physical activity for him/herself?) The second set contained parallel items asking participants to report their attitudes, subjective norms, and PBC *for their partner* (e.g., What does Harry believe about Sally's physical activity?).

Measures

Because all couples were heterosexual, there were two versions of the questionnaires. One was worded for male actors to complete about themselves and their female partners; the other was worded for female actors to complete about themselves and their male partners. For ease of explanation, all written descriptions of items below are given from the perspective of a male actor with a female partner. Items were developed to measure the TPB constructs following instructions by Ajzen (2015). Items including bold text are written exactly as they were presented to participants.

Actor and Partner TPB constructs. The items assessing actor and partner TPB constructs were preceded by the following instructions: "For each of the following questions, we are interested in **your** thoughts about **your** behavior and beliefs." Attitudes were assessed by the question "**In my opinion**, **my** being regularly physically active is:" which then had 4 corresponding responses, all on semantic differential scales (range 0–6) anchored with the bipolar adjectives *very bad–very good, very unpleasant–very pleasant, very unimportant–very important, very undesirable–very desirable*. Responses were averaged across items for a single index of attitudes ($\alpha = .80$). Subjective norms were assessed by averaging the responses to three items: "During a typical month, how physically active **are** people similar to **you** (of your age and gender)?", "During a typical month, how physically active **should** people similar to **you** (of your age and gender) be?" both answered on a 0 (*never*) to 6 (*extremely often*) Likert-type scale, and "I believe I should be regularly physically active," answered on a 0 (*definitely false*) to 6 (*definitely true*) Likert-type scale ($\alpha = .47$). Perceived behavioral control was assessed with 1 item: "I believe **I** have complete control over how physically active **I** am," answered on a 0 (*definitely false*) to 6 (*definitely true*) Likert-type scale.

Perceived partner TPB variables. Perceived partner constructs reflect Harry's beliefs about Sally's exercise. Items mea-

suring perceived partner TPB constructs were preceded by the instructions: "For the next set of questions, try to think about what **you** think and feel about your **partner**. Specifically, we are interested in your thoughts about *your partner's* behavior and beliefs." Perceived partner attitudes were measured with parallel items to those described above, except the question was stated: "**In my opinion**, **my partner's** being regularly physically active is . . ." ($\alpha = .87$). Perceived partner subjective norms were assessed with items parallel to those described above, except the questions referenced how physically active people similar to the **partner** are and should be ($\alpha = .51$). Perceived partner PBC was assessed with a parallel item: "I believe **my partner** has complete control over how physically active she is."

Actor behavioral intentions. Actor behavioral intentions were assessed with a single item: "During the next month, how often do **you** expect to be physically active?" rated on a 0 (*never*) to 6 (*extremely often*) Likert-type scale.

Relationship quality. Relationship quality was assessed by the 18-item Perceived Relationship Quality Components Scale (PRQC; Fletcher, Simpson, & Thomas, 2000), which measures 6 components of relationship quality (*satisfaction, commitment, intimacy, trust, passion, love*). Example items are: "How content are you with your relationship?" (satisfaction) and "How devoted are you to your relationship?" (commitment). All items were rated on 1 (*not at all*) to 7 (*extremely*) Likert-type scales. The total relationship quality index (the average of all items) was used ($\alpha = .95$).

Results

Descriptive statistics and correlations among variables are displayed in Table 1. Consistent with norms in relationship research, gender was included as a covariate in all models (coded 1 = male and 2 = female). Preliminary analyses concerning our hypotheses indicated no significant gender interactions, so except where noted, gender interaction terms are not included in the models presented below. All analyses were conducted using SPSS software (version 21); example syntax for dyadic analyses can be found in the supplemental materials.

Actor–Partner Interdependence Model Analyses

Given the dyadic interdependence in the data we used the APIM (Kashy & Kenny, 2000) described above to analyze the data. Because the APIM captures the statistical interdependence that naturally exists between partners, it provides separate and statistically independent tests of actor and partner paths. Using this approach, the dyad is treated as the unit of analysis. In each of the models reported below, we also included the interaction between attitudes and perceived behavioral control (PBC) in each set of analyses because this interaction has been a significant predictor of some behavioral intentions in prior TPB studies (Conner & McMillan, 1999).

To establish that the traditional individual-level TPB model fit these data, we began by estimating the model at the individual level with no partner predictor variables (results are displayed in Table 2). All predictor variables were grand-mean centered. As predicted and consistent with prior research (Armitage & Conner, 2001), attitudes, subjective norms, PBC, and the interaction between attitudes and PBC were all positive, significant predictors of behavioral intentions regarding physical activity (Table 2, Model 1). The interaction term indicates that the impact of positive attitudes on behavioral intentions is intensified for those who report greater PBC (see Figure 3, panel A). Gender was also a significant predictor, indicating that males reported higher behavioral intentions than females.

Hypothesis 1: The Dyadic TPB

To test the dyadic version of the TPB, two sets of predictors were included in these analysis: The actor predictor variables described in the preceding model, the same predictors reported by the partner (i.e., each partner's TPB variables for himself/herself), and the two-way interactions between actors' and partners' TPB parallel variables (e.g., actor's attitudes by partner's attitudes).

As displayed in Table 2 (Model 2), the individual-level TPB predictors remained significant and similar in magnitude to those found in the standard TPB individual-level model. Even controlling for these predictors, however, the partner's PBC significantly and positively predicted the actor's behavioral intentions. This

Table 1
Descriptive Statistics and Correlation Matrix for All Constructs

Construct, *M* (*SD*)	1	2	3	4	5	6	7	8	9	10	11
1. Behavioral Intentions 4.50 (1.29)											
2. Relationship Quality 6.21 (.72)	.15***										
3. A's Gender (Men = 1, Women = 2)	−.03	.02									
4. A's Attitudes 4.86 (1.13)	.48***	.03	.01								
5. A's Norms 4.73 (.65)	.31***	.04	.18*	.43***							
6. A's PBC 5.02 (1.34)	.32***	.23***	.15**	.28***	.32***						
7. P's Attitudes 4.86 (1.13)	.13*	−.04	−.02	.23**	.16***	.02					
8. P's Norms 4.73 (.65)	.05	−.00	−.19***	.16**	.12*	.05	.43***				
9. P's PBC 5.02 (1.34)	.10†	.16***	−.15**	.02	.05	.18**	.28**	.32***			
10. P's Attitudes about A 4.82 (1.17)	.33***	.03	−.05	.42***	.23**	.11*	.50***	.22***	.22***		
11. P's Norms about A 4.52 (.75)	.10†	.02	−.22**	.13*	.08	.07	.32***	.68***	.29***	.34***	
12. P's PBC about A 5.04 (1.23)	.24***	.08	−.15	.14*	.14**	.23***	.18***	.24***	.46***	.31***	.29***

Note. A = Actor; P = Partner; PBC = Perceived behavioral control. Constructs 4 through 6 reflect actor beliefs about themselves, constructs 7 through 9 reflect partner beliefs about themselves, and constructs 10 through 12 reflect partner's beliefs about the actor.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2
Results for Hypotheses 1 and 2

Parameter	Model 1 Individual (R^2 = .23) *B* (*SE*)	Model 2 Dyadic (R^2 = .25) *B* (*SE*)	Model 3 P perceptions (R^2 = .34) *B* (*SE*)
Intercept	4.46 (.06)***	4.41 (.07)***	4.46 (.07)***
Gender	.19 (.06)*	.14 (.06)*	.11 (.06)
A attitudes	.45 (.06)***	.47 (.06)***	.39 (.06)***
A subjective norms	.24 (.10)*	.26 (.10)*	.22 (.10)*
A PBC	.21 (.05)***	.23 (.05)***	.19 (.05)***
A attitudes × A PBC	.09 (.04)*	.08 (.04)*	.07 (.04)†
P attitudes		.05 (.06)	−.05 (.06)
P subjective norms		−.15 (.10)	−.17 (.13)
P PBC		.10 (.05)*	−.00 (.05)
P attitudes × PBC		.04 (.04)	−.01 (.04)
A attitudes × P Attitudes		.05 (.05)	
A subjective norms × P subjective norms		−.11 (.16)	
A PBC × P PBC		.09 (.03)**	
P's attitudes about A			.19 (.07)**
P's subjective norms about A			.02 (.12)
P's PBC for A			.11 (.06)†
A's attitudes × P's attitudes about A			−.01 (.04)
A's subjective norms × P's subjective norms about A			.11 (.13)
A's PBC × P's PBC for A			.02 (.03)

Note. A = Actor; P = Partner; PBC = Perceived behavioral control.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

indicates, for example, that Harry's PBC predicts Sally's behavioral intentions to be physically active, above and beyond the main effect of Sally's own beliefs have on her behavioral intentions.

The interaction between actors' and partners' PBC also significantly predicted actors' behavioral intentions. This interaction reveals that the positive association between Sally's own PBC and her behavioral intentions was intensified when her partner (Harry) also believed he could control his own behavior (see Figure 3, panel B). These results suggest that in the case of PBC, when partners' beliefs align with those of actors it amplifies the strength of their associations with behavioral intentions.

In sum, these results provide partial support for Hypothesis 1. When added to the standard TPB model, partners' PBC provided additional predictive information about actors' behavioral intentions, above and beyond actors' own TPB variables. Partners' attitudes and perceived subjective norms, however, did not.

Hypothesis 2: The Partner's View of the Actor

To examine the influence of the partner's view of the actor, the dyadic model that tested Hypothesis 1 was rerun with the addition of the partner's perceptions of the TPB variables for the actor (e.g., Harry's attitudes about Sally's physical activity). Also, the actor–partner interactions in this model were those between the actor's own TPB variables and the corresponding partner perceptions of the actor (e.g., Sally's own attitudes by Harry's attitudes about Sally).

As shown in Table 2 (Model 3), except for the interaction between actor attitudes and actor PBC, the individual-level TPB predictors remained significant and were similar in magnitude to those obtained in tests of the standard individual-level TPB model and the dyadic model. The estimate for partners' own PBC was nonsignificant, but the main effect of partners' perceptions of actors' PBC was marginally significant. In addition, the main effect of partners' attitudes about actors' physical activity was a significant predictor.

In sum, these results largely support Hypothesis 2. When added to the model, partners' views on actors' attitudes and PBC predicted actors' physical activity behavioral intentions, above and beyond the individual-level predictors of both partners. However, there was no association between partners' views of actors' subjective norms and actors' behavioral intentions.

Hypothesis 3: The Role of Relationship Quality

Overall, actors' and partners' behavioral intentions and their relationship satisfaction scores were positively correlated (actor–

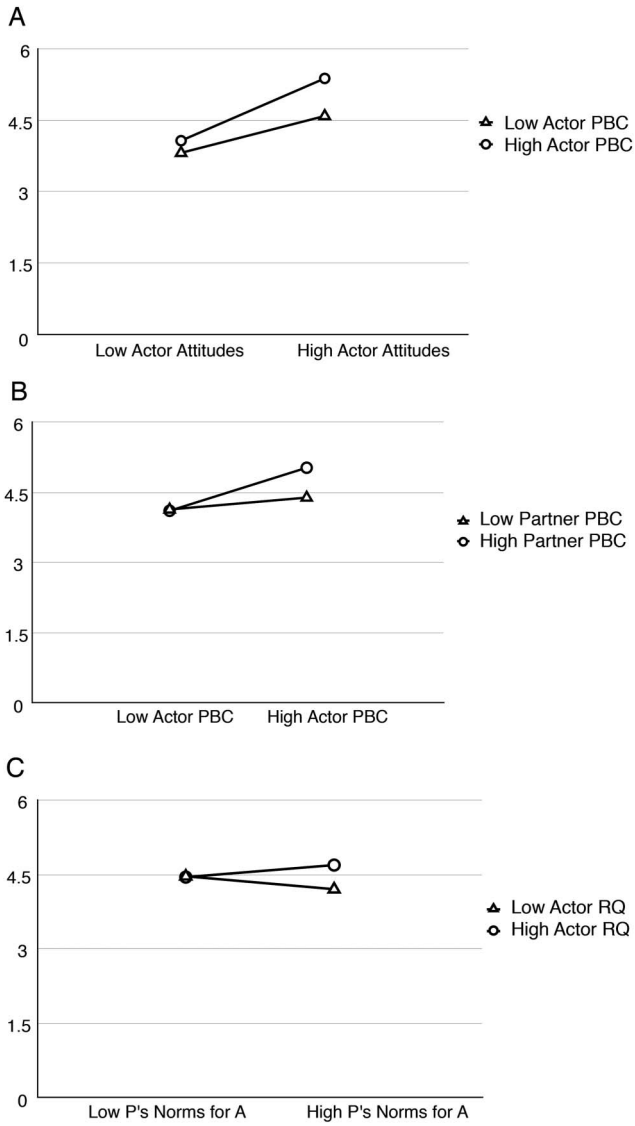

Figure 3. Two-way interactions predicting behavioral intentions to exercise. High/low designations reflect values one *SD* above/below the mean.

partner intentions, $r = .19$, $p < .01$; actor–partner satisfaction, $r = .42$, $p < .01$). To examine the moderating role of relationship quality in the basic dyadic model, the model for Hypothesis 1 was rerun controlling for actors' relationship quality and the interactions between relationship quality and the partner variables. Importantly, the individual-level TPB predictors remained significant and were similar in magnitude to those obtained in tests of the standard individual-level TPB model and the dyadic model. The main effect of partners' PBC became nonsignificant, but the interaction between actors' and partners' PBC was significant and once again similar in magnitude (b = .09, $p < .01$) to the model without relationship quality. Relationship quality did not moderate any of the partner effects.

To test the role of relationship quality with partners' views of actors, the model for Hypothesis 2 was rerun controlling for actors' relationship quality and including the two-way interactions between relationship quality and actors' own TPB variables, the two-way interactions between relationship quality and partners' perceptions of actors' TPB variables, and the three-way interactions between relationship quality, actors' TPB variables, and partners' perceptions of actor TPB variables.

As reported in Table 3, the individual-level TPB predictors remained significant and were similar in magnitude to those obtained in tests of both the standard individual-level TPB model and the dyadic model, and the main effect of partners' perceived attitudes of actors also remained significant. In addition, relationship quality moderated the main effect of partners' subjective norms for the actor. Specifically, for actors who reported higher relationship quality, there was a positive association between partner's subjective norms and actors' behavioral intentions (see Figure 3, panel C). Additionally, a three-way interaction between actors' relationship quality, actors' PBC, and partners' PBC regarding the actor was marginally significant ($p = .07$). It indicated that, for actors who reported higher relationship quality, the association with PBC was intensified when the partner's perceptions of the actor's PBC were also higher (slope = .645, $t = 3.04$, $SE = .213$, $p = .003$; see Figure 4).

Table 3
Results for Hypothesis 3

Parameter	Estimate (*SE*) ($R^2 = .27$)
Intercept	4.47 (.07)***
Gender	.13 (.06)*
RQ	.09 (.10)
A attitudes	.38 (.06)***
A subjective norms	.31 (.11)**
A PBC	.18 (.05)***
A attitudes × A PBC	.09 (.04)*
P attitudes	−.05 (.07)
P subjective norms	−.14 (.13)
P PBC	−.00 (.05)
P attitudes × PBC	−.02 (.04)
P's attitudes about A	.21 (.07)**
P's subjective norms about A	−.01 (.11)
P's PBC for A	.05 (.06)
A's attitudes × P's attitudes about A	−.01 (.04)
A's subjective norms × P's subjective norms about A	.07 (.13)
A's PBC × P's PBC for A	.02 (.03)
RQ × A's attitudes	.05 (.11)
RQ × A's subjective norms	−.31 (.18)†
RQ × A's PBC	−.01 (.18)
RQ × P's attitudes about A	−.05 (.08)
RQ × P's subjective norms for A	.25 (.19)*
RQ × P's PBC for A	.13 (.09)
RQ × A's attitudes × P's attitudes about A	.04 (.07)
RQ × A's subjective norms × P's subjective norms for A	.07 (.16)
RQ × A PBC × P's PBC for A	.08 (.04)†

Note. A = Actor; P = Partner; PBC = Perceived behavioral control; RQ = relationship quality.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion

Both involvement in and the quality of close relationships have a positive impact on a wide range of health outcomes (e.g., Berkman, Glass, Brissette, & Seeman, 2000; Robles et al., 2014). To our knowledge, this is the first empirical test of a fully dyadic version of an intrapersonal model of health behavior. Our findings reveal that what individuals in romantic relationships think about their own as well as their partner's physical activity predicts both their own as well as their partner's behavioral intentions to engage in physical activity.

We focused on physical activity for several reasons beyond its relevance to health outcomes. First, physical activity is not an inherently dyadic behavior in that it does not necessarily require the participation of both partners to be done successfully. Second, there is evidence for concordance on physical activity between spouses, which suggests that interpersonal influence occurs in this domain (Cobb et al., 2015). Finally, physical activity is a domain about which many individuals are likely to have fairly well-defined beliefs. As a consequence, partners may be more likely to observe and discuss their beliefs about physical activity with one another than is true of other, more private health behaviors (e.g., dental hygiene).

One component of the dyadic TPB model predicting intentions to be physically active—the partner's PBC— proved to be a particularly important partner-level variable. Specifically, partners' PBC regarding physical activity predicted individuals' behavioral intentions, above and beyond individuals' own PBC. When individuals and partners both believed they could control their own physical activity, individuals held particularly strong behavioral intentions, especially if they were in higher-quality relationships. It is possible that partners are more vocal about their own PBC and their PBC with regard to the actor, thereby increasing the salience of these constructs to actors. Previous research has demonstrated that in a process called self-expansion, individuals tend to adopt aspects of their romantic partners into their own self-concept (Aron, Aron, Tudor, & Nelson, 1991). Thus, even though actors view their partner's attitudes or subjective norms to be relevant only to their partner, the partner's PBC may become incorporated into the actor's self-concept. Future research should replicate and clarify the role of partner-level PBC in both physical activity behavior and health behavior more generally.

Viewed more broadly, our findings underscore the potential value of measuring and modeling critical aspects of the *relational contexts* in which individuals live their daily lives. Many behaviors and psychological constructs previously conceptualized as mainly intrapersonal, such as memory (Wegner, 1987) and self-control (Fitzsimons, Finkel, & vanDellen, 2015), can be affected by the

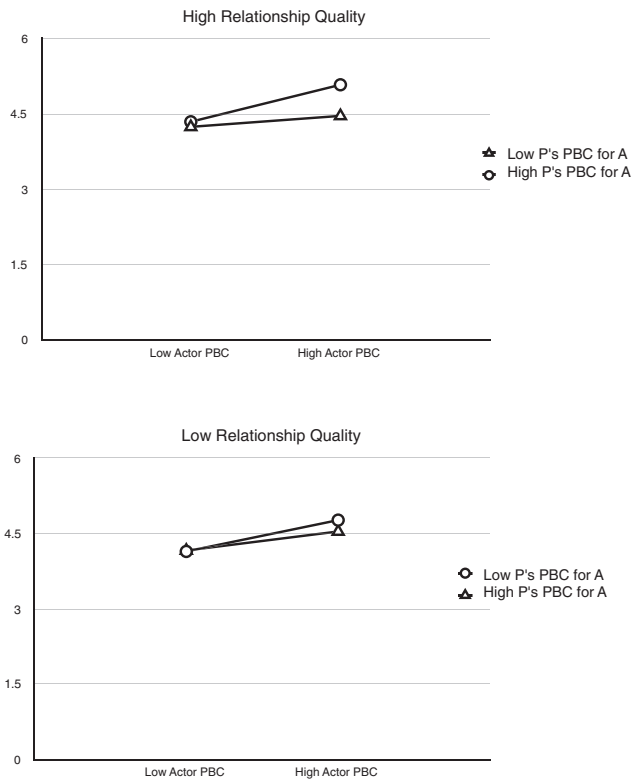

Figure 4. Three-way interaction between actor perceived behavioral control (PBC), partner's PBC for the actor, and relationship quality predicting exercise intentions. High/low designations reflect values one *SD* above/below the mean.

thoughts, feelings, and behaviors of close others, rendering them *interpersonal* phenomena (see also Coan & Sbarra, 2015). When one adds an interpersonal focus to well-tested and well-supported theoretically based models of behavior such as the TPB, the model's predictive and explanatory power may increase considerably. Given the strength, frequency, diversity, and duration of influence that close relationship partners exert on each other almost every day (Berscheid, Snyder, & Omoto, 1989) and their relatively simple structure (only two individuals), couples offer a particularly rich social context in which to study and model a myriad of health behaviors and outcomes.

In this initial dyadic demonstration, we limited tests of actor-partner interactions to a simple set of parallel items (e.g., actor's attitudes and partner's attitudes). Future research should examine whether and how partners influence actors on other TPB components (e.g., how Sally's attitudes impact Harry's PBC). Additionally, this approach can be applied to other intrapersonal models of health-behavior (e.g., Social Cognitive Theory; Bandura, 1998) or to other health domains, such as smoking, dental hygiene, use of sunscreen, and so on. For example, in a recent study of diabetes patients and their partners, it was *partners'* perceptions of their involvement in the patients' dietary adherence (not patients' perceptions of that involvement) that predicted patient adherence to medical recommendations (Stephens, Rook, Franks, Khan, & Iida, 2010). Dyadic influences may also emerge in other types of relationships, such as between friends, coworkers, or family members. Individuals' eating behavior, for example, can be influenced by eating norms that exist in friendship groups (Howland, Hunger, & Mann, 2012).

Researchers have examined some nuances of relational influence in the health behavior domain, such as the relative influence of friends versus romantic partners (e.g., Salvy, Jarrin, Paluch, Irfan, & Pliner, 2007). They have also applied theories from relationship science to health behavior–relevant outcomes, such as the desire to quit smoking (e.g., Ranby, Lewis, Toll, Rohrbaugh, & Lipkus, 2013; Lipkus, Ranby, Lewis, & Toll, 2013). Nevertheless, a fully dyadic theoretical framework is needed to elucidate when and how relationship partners influence one another across various health domains.

The dyadic approach we have outlined in this paper also provides a framework within which to test the effects of other important relationship constructs. We focused on relationship satisfaction, which has been found to be an influential feature of relationships in predicting some health outcomes (e.g., Kiecolt-Glaser & Newton, 2001). We found that greater relationship quality intensified the associations between partner perceptions and individuals' behavioral intentions, but other relationship-relevant measures may be just as important, such as each partner's attachment orientation (Pietromonaco et al., 2013) or relational power (VanderDrift, Agnew, Harvey, & Warren, 2013). These variables and others may be key when designing health behavior interventions for couples that are aimed at changing each partner's attitudes, subjective norms, and/or perceptions of behavioral control.

This is one of the first studies to test for dyadic effects on a health-relevant behavioral intention and the first one to formally operationalize a dyadic version of a traditional intrapersonal model of health behavior. The sample in the current study ($N = 200$ couples) is relatively large, increasing both our statistical power and the stability of our estimates. However, the sample is also largely White and because many participants were recruited on a university campus, it is restricted in socioeconomic status. Thus, caution should be taken in generalizing these results to other samples.

In this study, we focused on the predictors of behavioral intentions specified by the TPB. Given that meta-analyses of correlational (Armitage & Conner, 2001; Albarracin, Johnson, Fishbein, & Muellerleile, 2001) and experimental (Webb & Sheeran, 2006) studies have consistently revealed strong positive relations between behavioral intentions and behavior, specifying the determinants of behavioral intentions within a dyadic framework has theoretical and empirical value. However, it will be important to extend assessment of the proposed dyadic framework to predictions of behavior. In doing so, it's possible that we may find that partner effects play a larger role in predicting intentions than in directly predicting behavior; however, predicting behavior will also allow additional partner paths to be tested. For example, because of the self-expansion phenomenon described above (Aron et al., 1991) there is reason to expect direct associations between partner intentions and actor behavior or that partner beliefs may moderate the actor's own intentions-behavior path.

Another limitation of this study is that it is cross-sectional, which further limits our ability to make any causal inferences. To resolve this issue, future research should adopt a longitudinal approach examining couples' beliefs and behaviors over time. Investigators should also pursue opportunities to employ experi-

mental or quasi-experimental methods to test the effects specified in the dyadic model. For example, researchers have found behavioral and health differences within-couple during or following conflict versus support conversations (e.g., Kiecolt-Glaser et al., 2005)—this technique could be used to explore how higher or lower quality moments within a relationship may result in different degrees of partner influence on health behaviors. Additionally, researchers have directly compared the behaviors of individuals in stranger versus couple dyads in the lab (e.g., Salvy et al., 2007), which would allow for the comparison of the types or strength of the associations found here in different dyadic contexts.

In addition, the relative value of the different components of the TPB and the TPB as a whole are under some debate (see Conner, 2015; Sniehotta, Presseau, & Araujo-Soares, 2014). Although the literature may be replete with many basic demonstrations of the TPB, by placing the TPB within a dyadic context the current study examined the TPB from a novel perspective. Moreover, we aimed to demonstrate an approach that can be applied well-beyond the TPB.

Finally, even though our TPB items were derived from standard TPB materials (Ajzen, 2015), our subjective norms index had low reliability, which may explain why we found few effects for this construct.

Despite these limitations, the findings and approach presented here demonstrate the potential value of placing intrapersonal models of health behavior within a broader interpersonal context. Documenting the associations that exist between partner variables and individual behavioral intentions lays the groundwork for future research, both longitudinal and experimental, that can confirm and expand on the results presented in this paper.

In conclusion, this research and these findings highlight the many benefits of adopting a dyadic perspective toward health outcomes. By expanding traditional models to the level of the dyad, one can better predict and understand not only health-relevant outcomes, but also the interpersonal processes that lead *both* relationship partners to make better or worse health-relevant choices in their daily lives.

References

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action-control: From cognition to behavior* (pp. 11–39). Heidelberg, Germany: Springer. http://dx.doi.org/10.1007/978-3-642-69746-3_2

Ajzen, I. (2015). *Constructing a theory of planned behavior questionnaire*. Retrieved from http://people.umass.edu/aizen/pdf/tpb.measurement.pdf

Albarracín, D., Johnson, B. T., Fishbein, M., & Muellerleile, P. A. (2001). Theories of reasoned action and planned behavior as models of condom use: A meta-analysis. *Psychological Bulletin, 127,* 142–161. http://dx.doi.org/10.1037/0033-2909.127.1.142

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40,* 471–499. http://dx.doi.org/10.1348/014466601164939

Aron, A., Aron, E. N., Tudor, M., & Nelson, G. (1991). Close relationships as including other in the self. *Journal of Personality and Social Psychology, 60,* 241–253. http://dx.doi.org/10.1037/0022-3514.60.2.241

Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology & Health, 13,* 623–649. http://dx.doi.org/10.1080/08870449808407422

Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. *Social Science & Medicine, 51,* 843–857. http://dx.doi.org/10.1016/S0277-9536(00)00065-4

Berscheid, E., Snyder, M., & Omoto, A. M. (1989). The Relationship Closeness Inventory: Assessing the closeness of interpersonal relationships. *Journal of Personality and Social Psychology, 57,* 792–807. http://dx.doi.org/10.1037/0022-3514.57.5.792

Centers for Disease Control. (February 6, 2015). *Leading causes of death*. Retrieved from www.cdc.gov/nchs/fastats/leading-causes-of-death.htm

Coan, J. A., & Sbarra, D. A. (2015). Social Baseline Theory: The social regulation of risk and effort. *Current Opinion in Psychology, 1,* 87–91. http://dx.doi.org/10.1016/j.copsyc.2014.12.021

Cobb, L. K., Godino, J. G., Selvin, E., Kucharska-Newton, A., Coresh, J., & Koton, S. (2015). Physical activity among married couples in the Atherosclerosis Risk in Communities Study. *Circulation, 131,* P275.

Conner, M. (2015). Extending not retiring the theory of planned behaviour: A commentary on Sniehotta, Presseau and Araújo-Soares. *Health Psychology Review, 9,* 141–145. http://dx.doi.org/10.1080/17437199.2014.899060

Conner, M., & McMillan, B. (1999). Interaction effects in the theory of planned behaviour: Studying cannabis use. *British Journal of Social Psychology, 38,* 195–222. http://dx.doi.org/10.1348/014466699164121

de Castro, J. M. (1991). Social facilitation of the spontaneous meal size of humans occurs on both weekdays and weekends. *Physiology & Behavior, 49,* 1289–1291. http://dx.doi.org/10.1016/0031-9384(91)90365-U

Feng, J., Glass, T. A., Curriero, F. C., Stewart, W. F., & Schwartz, B. S. (2010). The built environment and obesity: A systematic review of the epidemiologic evidence. *Health & Place, 16,* 175–190. http://dx.doi.org/10.1016/j.healthplace.2009.09.008

Fitzsimons, G. M., Finkel, E. J., & vanDellen, M. R. (2015). Transactive goal dynamics. *Psychological Review, 122,* 648–673. http://dx.doi.org/10.1037/a0039654

Fletcher, G. J. O., Simpson, J. A., & Thomas, G. (2000). The measurement of perceived relationship quality components: A confirmatory factor-analytic approach. *Personality and Social Psychology Bulletin, 26,* 340–354. http://dx.doi.org/10.1177/0146167200265007

Godin, G., & Kok, G. (1996). The theory of planned behavior: A review of its applications to health-related behaviors. *American Journal of Health Promotion, 11,* 87–98. http://dx.doi.org/10.4278/0890-1171-11.2.87

Howland, M., Hunger, J. M., & Mann, T. (2012). Friends don't let friends eat cookies: Effects of restrictive eating norms on consumption among friends. *Appetite, 59,* 505–509. http://dx.doi.org/10.1016/j.appet.2012.06.020

Karney, B. R., Hops, H., Redding, C. A., Reis, H. T., Rothman, A. J., & Simpson, J. A. (2010). A framework for incorporating dyads in models of HIV-prevention. *AIDS and Behavior, 14*(Suppl 2), 189–203. http://dx.doi.org/10.1007/s10461-010-9802-0

Kashy, D. A., & Kenny, D. A. (2000). The analysis of data from dyads and groups. In H. T. Reis & C. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 451–477). New York, NY: Cambridge University Press.

Kenny, D. A., Kashy, D. A., & Cook, W. L. (2006). *Dyadic data analysis*. New York, NY: Guilford Press.

Kiecolt-Glaser, J. K., Loving, T. J., Stowell, J. R., Malarkey, W. B., Lemeshow, S., Dickinson, S. L., & Glaser, R. (2005). Hostile marital interactions, proinflammatory cytokine production, and wound healing. *Archives of General Psychiatry, 62,* 1377–1384. http://dx.doi.org/10.1001/archpsyc.62.12.1377

Kiecolt-Glaser, J. K., & Newton, T. L. (2001). Marriage and health: His and hers. *Psychological Bulletin, 127,* 472–503. http://dx.doi.org/10.1037/0033-2909.127.4.472

Lawton, R., Conner, M., & McEachan, R. (2009). Desire or reason: Predicting health behaviors from affective and cognitive attitudes. *Health Psychology, 28,* 56–65. http://dx.doi.org/10.1037/a0013424

Lipkus, I. M., Ranby, K. W., Lewis, M. A., & Toll, B. (2013). Reactions to framing of cessation messages: Insights from dual-smoker couples. *Nicotine & Tobacco Research, 15,* 2022–2028. http://dx.doi.org/10.1093/ntr/ntt091

Mann, T., de Ridder, D., & Fujita, K. (2013). Self-regulation of health behavior: Social psychological approaches to goal setting and goal striving. *Health Psychology, 32,* 487–498. http://dx.doi.org/10.1037/a0028533

Meyler, D., Stimpson, J. P., & Peek, M. K. (2007). Health concordance within couples: A systematic review. *Social Science & Medicine, 64,* 2297–2310. http://dx.doi.org/10.1016/j.socscimed.2007.02.007

Pietromonaco, P. R., Uchino, B., & Dunkel Schetter, C. (2013). Close relationship processes and health: Implications of attachment theory for health and disease. *Health Psychology, 32,* 499–513. http://dx.doi.org/10.1037/a0029349

Ranby, K. W., Lewis, M. A., Toll, B. A., Rohrbaugh, M. J., & Lipkus, I. M. (2013). Perceptions of smoking-related risk and worry among dual-smoker couples. *Nicotine & Tobacco Research, 15,* 734–738. http://dx.doi.org/10.1093/ntr/nts210

Raynor, D. A., & Levine, H. (2009). Associations between the five-factor model of personality and health behaviors among college students. *Journal of American College Health, 58,* 73–82. http://dx.doi.org/10.3200/JACH.58.1.73-82

Robles, T. F., Slatcher, R. B., Trombello, J. M., & McGinn, M. M. (2014). Marital quality and health: A meta-analytic review. *Psychological Bulletin, 140,* 140–187. http://dx.doi.org/10.1037/a0031859

Rosenstock, I. M. (1974). The health belief model and preventive health behavior. *Health Education Monographs, 2,* 354–386. http://dx.doi.org/10.1177/109019817400200405

Salvy, S. J., Jarrin, D., Paluch, R., Irfan, N., & Pliner, P. (2007). Effects of social influence on eating in couples, friends and strangers. *Appetite, 49,* 92–99. http://dx.doi.org/10.1016/j.appet.2006.12.004

Sniehotta, F. F., Presseau, J., & Araújo-Soares, V. (2014). Time to retire the theory of planned behaviour. *Health Psychology Review, 8,* 1–7. http://dx.doi.org/10.1080/17437199.2013.869710

Stadler, G., Snyder, K. A., Horn, A. B., Shrout, P. E., & Bolger, N. P. (2012). Close relationships and health in daily life: A review and empirical data on intimacy and somatic symptoms. *Psychosomatic Medicine, 74,* 398–409. http://dx.doi.org/10.1097/PSY.0b013e31825473b8

Stephens, M. A. P., Rook, K. S., Franks, M. M., Khan, C., & Iida, M. (2010). Spouses use of social control to improve diabetic patients' dietary adherence. *Families, Systems, & Health, 28,* 199–208. http://dx.doi.org/10.1037/a0020513

Troxel, W. M. (2010). It's more than sex: Exploring the dyadic nature of sleep and implications for health. *Psychosomatic Medicine, 72,* 578–586. http://dx.doi.org/10.1097/PSY.0b013e3181de7ff8

VanderDrift, L. E., Agnew, C. R., Harvey, S. M., & Warren, J. T. (2013). Whose intentions predict? Power over condom use within heterosexual dyads. *Health Psychology, 32,* 1038–1046. http://dx.doi.org/10.1037/a0030021

Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin, 132,* 249–268.

Wegner, D. M. (1987). Transactive memory: A contemporary analysis of the group mind. In B. Mullen & G. R. Goethals (Eds.), *Theories of group behavior* (pp. 185–208). New York, NY: Springer. http://dx.doi.org/10.1007/978-1-4612-4634-3_9

Received June 23, 2015
Revision received September 21, 2015
Accepted November 15, 2015 ■