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An actor–partner interdependence model of relational turbulence: Cognitions and emotions

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ABSTRACT

We extend the relational turbulence model by applying an actor–partner interdependence model to people's experiences of cognitive and emotional turbulence. In the study, 135 dating couples reported on their relationship once per week for six consecutive weeks. People's appraisals of turmoil and feelings of negative emotion were predicted by (i) their own relational uncertainty, (ii) their partner's relational uncertainty, and (iii) their own experiences of a partner's interference. When partners reported more turmoil and negative emotion in one week, actors experienced more relational uncertainty and interference from partners in the following week. The findings illuminate the interdependence between dating partners' experiences of relational turbulence over time.

KEY WORDS: dating relationships • emotion • interference from partners • relational turbulence • relational uncertainty

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The *relational turbulence model* is an emerging theoretical framework that seeks to explain people's intense reactions to changing relationship circumstances (Knobloch, 2007; Solomon & Knobloch, 2001; Solomon & Theiss, 2008). The model defines *relational turbulence* as people's tendency to be cognitively, emotionally, and behaviorally reactive to dyadic situations. It also advances two explanations for why turbulence occurs. The *relational uncertainty explanation* argues that turbulence emerges when partners question the status of their relationship. The *interference from partners explanation* suggests that turbulence arises when individuals disrupt each other's ability to accomplish everyday goals. A first generation of empirical research implies that the model is useful for understanding people's experiences of turbulence (e.g., Knobloch, Miller, & Carpenter, 2007; Theiss & Solomon, 2006a, 2006b).

Our objective is to advance a second generation of the relational turbulence model by expanding it in three ways. First, whereas the initial version of the model sought to pinpoint where turbulence peaks in the trajectory of dating relationships (e.g., Solomon & Knobloch, 2001, 2004), we focus on the mechanisms underlying why turbulence occurs. Second, whereas the initial version of the model focused exclusively on individuals (e.g., Knobloch, 2007; Theiss & Solomon, 2006a), we theorize about both actor and partner experiences. We employ an actor–partner interdependence model (Cook & Kenny, 2005; Kenny, Kashy, & Cook, 2006) to address recent calls for theorizing about the interplay within dyads (Cook & Snyder, 2005; Kenny et al., 2006). Third, whereas the initial version of the model concentrated on predictors of turbulence (e.g., Knobloch, 2007; Knobloch & Donovan-Kicken, 2006; but see Theiss & Solomon, 2006a), we examine outcomes of turbulence over a six-week period.

The relational turbulence model

At its core, the relational turbulence model argues that individuals experience turbulence during times of transition (Knobloch, 2007; Solomon & Theiss, 2008). Relational turbulence is people's tendency to be cognitively, emotionally, and behaviorally reactive to relationship situations (Knobloch, 2007; Solomon & Knobloch, 2004). According to the model, *reactivity* occurs when individuals respond intensely to circumstances that otherwise would be relatively mundane (Solomon, Weber, & Steuber, 2010). For example, holding hands may be more meaningful on a first date than after several years of dating. Similarly, discovering that a partner forgot to do laundry may be more upsetting with a new baby in the house than before pregnancy. Turbulence merits study because it has pervasive effects on relationships in transition (Knobloch & Donovan-Kicken, 2006; Solomon et al., 2010; Theiss & Solomon, 2006b).

The model's characterization of transitions and turbulence can be illustrated by the metaphor of an airplane in flight (Solomon et al., 2010). When an aircraft encounters a dramatic change in weather conditions, passengers

feel turbulence as the plane is jostled, jerked, and jolted erratically. Similarly, when a dyad undergoes a period of transition that alters the climate of the relationship, partners experience turbulence as sudden intense reactions to their circumstances. Just as turbulence during a flight may make passengers rationalize their safety, fear a crash, or grip their seat, turbulence in a relationship may make partners ruminate about hurt, cry over jealousy, or scream during conflict. Both experiences of turbulence are marked by reactivity to changing conditions in the environment.

What qualifies as turbulence? The model defines turbulence as a broad umbrella construct that encompasses a constellation of cognitive appraisals, emotional reactions, and zealous behaviors (Knobloch, 2007; Knobloch & Donovan-Kicken, 2006; Solomon et al., 2010). Two of the most direct markers of turbulence are people's cognitive appraisals of turmoil (Knobloch, 2007) and their feelings of negative emotion (Knobloch, Miller, & Carpenter, 2007). Both markers of turbulence are examined in this study for the sake of comprehensiveness.

Evolution of the relational turbulence model

Although the relational turbulence model is broadly applicable across the lifespan of romantic relationships, its first version focused on the evolution from casual to serious involvement within dating relationships (Solomon & Knobloch, 2001, 2004). The model hypothesized that dating partners experience turbulence at moderate levels of intimacy as they shift from a casual, informal, short-term orientation to an exclusive, committed, long-term orientation. Notably, however, empirical findings provided limited support for a peak in turbulence at moderate levels of intimacy (Knobloch & Donovan-Kicken, 2006; Knobloch & Solomon, 2002b; Solomon & Knobloch, 2001, 2004). These mixed results led Solomon and Theiss (2008) to propose a change in the model by theorizing that dating partners experience turbulence across the trajectory of relationship development rather than exclusively during the transition from casual to serious involvement.

Our second generation of the model adopts the change advocated by Solomon and Theiss (2008). In particular, we discard the premise that moderate intimacy is the phase when dating partners encounter the most turbulence. Instead, we focus on relational uncertainty and interference from partners as more proximal predictors of turbulence (e.g., Theiss & Solomon, 2006a, 2006b). This change marks a shift from attending to *when* turbulence happens to *why* it happens. The following sections explicate the model's theorizing about why relational uncertainty and interference from partners may spark turbulence.

Relational uncertainty as a foundation of turbulence

The model identifies relational uncertainty as one mechanism that may generate tumultuous experiences. *Relational uncertainty* is the degree of confidence individuals have in their perceptions of involvement within a relationship (Knobloch & Solomon, 1999, 2002a). Relational uncertainty stems from self, partner, and relationship sources (Berger & Bradac, 1982).

Whereas *self uncertainty* refers to questions people have about their own involvement in a relationship ("How certain am I about my feelings for my partner?"), *partner uncertainty* involves questions individuals have about their partner's involvement in a relationship ("How certain am I about my partner's feelings for me?"). *Relationship uncertainty*, which exists at a higher level of abstraction than either self or partner uncertainty, encompasses questions about the nature of the relationship itself ("How certain am I about where this relationship is going?"). In sum, relational uncertainty is an overarching construct comprised of self, partner, and relationship sources of doubt.

Relational uncertainty, which by definition restricts people's ability to make sense of relationship circumstances, may leave individuals prone to reactivity. Evidence supports this claim for several indicators of turbulence. With respect to cognition, people experiencing relational uncertainty perceive their dating relationship to be more unstable (Knobloch, 2007), conversations with their partner to be more challenging (Knobloch & Solomon, 2005), irritations to be more severe (Theiss & Solomon, 2006b), unexpected events to be more threatening (Knobloch & Solomon, 2002b), and social network members to be less supportive of their dating relationship (Knobloch & Donovan-Kicken, 2006). In terms of emotion, partners report more anger, sadness, fear, and jealousy under conditions of relational uncertainty (Knobloch, Miller, & Carpenter, 2007; Knobloch, Solomon, & Cruz, 2001; Theiss & Solomon, 2006a).

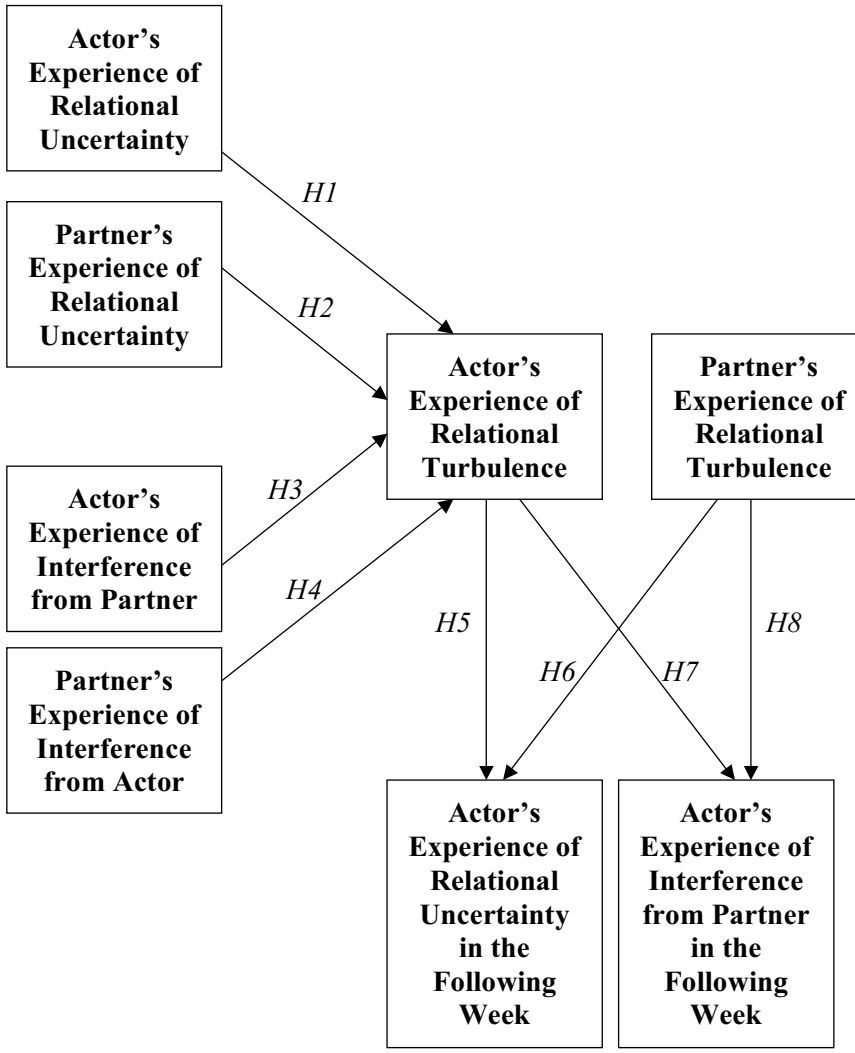
Whereas prior work has focused on how the relational uncertainty of *actors* corresponds with their own experiences of turbulence, we also propose that the relational uncertainty of *partners* contributes to actors' experiences of turbulence. To that end, we employ an actor–partner interdependence model (APIM) to conceptualize people's experiences of turbulence (see Figure 1). An APIM provides statistical tools for parsing mutual influence within dyads (Cook & Kenny, 2005).

An APIM approach to the relational turbulence model implies that partners who are entertaining doubts may behave in ways that spark turbulence for actors (see Figure 1). Relational uncertainty corresponds with more topic avoidance (Knobloch & Carpenter-Theune, 2004), less fluent communication (Knobloch, 2006), less relationship maintenance (Weger & Emmett, 2009), and greater reluctance to discuss sensitive issues such as unexpected events (Knobloch & Solomon, 2002b), irritations (Theiss & Solomon, 2006b), and jealousy (Theiss & Solomon, 2006a). Because relational uncertainty is tied to a variety of unpleasant behaviors, a partner's experience of relational uncertainty may generate turbulence for actors. Our first two hypotheses evaluate actor and partner effects of relational uncertainty:

H1: An actor's relational uncertainty is positively associated with his or her appraisals of turmoil and feelings of negative emotion.

H2: A partner's relational uncertainty is positively associated with an actor's appraisals of turmoil and feelings of negative emotion.

FIGURE 1
Hypothesized actor–partner interdependence model of relational turbulence



Interference from partners as a foundation of turbulence

The relational turbulence model extends the logic of Berscheid's (1983, 1991) Emotion-in-Relationships Model (ERM) to identify interference from partners as a second foundation of reactivity. ERM proposes that people perform their daily routines rather mindlessly by enacting habitual sequences of behavior to accomplish goals such as eating, grooming, commuting, working, exercising, and relaxing. As relationships develop, however, individuals gradually incorporate a partner into their lifestyle. By

allowing someone else to influence their goals, people become vulnerable to unexpected interruptions (see also Mandler, 1975). ERM identifies two ways that a partner can interrupt an individual's routines (Knobloch, 2008b; Knobloch & Solomon, 2004). *Interference from partners* occurs when a partner's interruptions make it harder to accomplish a goal ("If you park in the driveway, I can't get my car out." "Did you eat all of the cereal?"), and *facilitation from partners* occurs when a partner's interruptions make it easier to accomplish a goal ("I'm so glad you stopped at the drugstore." "New exercise videos? Fantastic."). In sum, ERM defines interference and facilitation from partners as interruptions that stop an individual from mindlessly executing a routine.

According to the relational turbulence model, individuals frustrated by a partner's interference are likely to be reactive. For example, people experiencing interference from their partner report that their dating relationship is more tumultuous (Knobloch, 2007), appraise irritations more negatively (Solomon & Knobloch, 2004; Theiss & Solomon, 2006b), perceive more hindrance in their dating relationship from friends and family (Knobloch & Donovan-Kicken, 2006), and feel more anger, sadness, fear, and jealousy (Knobloch, Miller, & Carpenter, 2007; Theiss & Solomon, 2006a). Hence, the hassles of repeated disruptions from a partner may foster turbulence.

Whereas actor effects for interference from partners are well documented, partner effects are less clear. Consequently, we also examine whether partners' perceptions of interference from actors predict actors' experiences of turbulence (see Figure 1). Indeed, when partners encounter barriers to their goals, they may act in ways that prompt actors to experience turbulence. Interference from partners coincides with uncoordinated conversation (Knobloch & Schmelzer, 2008), less affiliative messages (Knobloch, 2008b), and more speech errors (Knobloch & Schmelzer, 2008). Because interference from partners is tied to disfluent and destructive behaviors, individuals who impede a partner's goals may experience turbulence. *H3* and *H4* propose actor and partner effects:

> *H3:* An actor's interference from partners is positively associated with his or her appraisals of turmoil and feelings of negative emotion.
>
> *H4:* A partner's interference from actors is positively associated with an actor's appraisals of turmoil and feelings of negative emotion.

Outcomes of relational turbulence over time

The temporal element of relationship development is intriguing yet elusive (Bradbury, 1998; Werner & Baxter, 1994). For example, the relational turbulence model argues that relational uncertainty is a foundation of turbulence, but a lingering question is whether people's perceptions of turbulence spark relational uncertainty over time. If turbulence leads individuals to question the definition of their relationship (e.g., Afifi & Metts, 1998; Emmers & Canary, 1996), then actors' and partners' experiences of turbulence in one week may be positively associated with actors' relational uncertainty in the

following week (see Figure 1). In a previous study examining outcomes of turbulence, Theiss and Solomon (2006a) found that individuals who experienced cognitive jealousy in one week reported more partner and relationship uncertainty in the following week. Their results suggest that turbulence may contribute to relational uncertainty over time.

H5: An actor's appraisals of turmoil and feelings of negative emotion in one week are positively associated with an actor's relational uncertainty in the following week.

H6: A partner's appraisals of turmoil and feelings of negative emotion in one week are positively associated with an actor's relational uncertainty in the following week.

In a comparable vein, turbulence may foster subsequent perceptions of interference from partners (see Figure 1). Turbulence probably provides ample opportunities for individuals to disrupt each other's goals (e.g., Berscheid, 1983, 1991). In fact, under conditions of turbulence, people view their partner's behavior more negatively (Solomon & Knobloch, 2004; Theiss & Solomon, 2006b), perceive their dating relationship less favorably (Knobloch, 2007), and experience more anger, sadness, and fear (Knobloch, Miller, & Carpenter, 2007). These manifestations of turbulence are likely to disrupt people's everyday routines. If so, then actors' and partners' experiences of turbulence may be positively associated with actors' subsequent reports of interference from partners.

H7: An actor's appraisals of turmoil and feelings of negative emotion in one week are positively associated with an actor's interference from partners in the following week.

H8: A partner's appraisals of turmoil and feelings of negative emotion in one week are positively associated with an actor's interference from partners in the following week.

Method

To test the hypotheses depicted in Figure 1, we collected self-report data from dating couples once per week for six consecutive weeks. We chose to solicit weekly observations (rather than daily, bi-weekly, or monthly observations) for a period of six weeks (rather than a shorter or longer span) for three reasons. First, the relational turbulence model assumes that relational uncertainty and interference from partners fluctuate quite rapidly (Solomon & Theiss, 2008; Theiss & Solomon, 2006a, 2006b). Second, weekly data collection offers precision for detecting changes without being too taxing for participants (Arriaga, 2001; Arriaga, Reed, Goodfriend, & Agnew, 2006; Solomon & Theiss, 2008). Third, substantial changes occur in dating relationships across six-week periods (Baxter & Erbert, 1999; Surra & Hughes, 1997). For these reasons, we chose to collect weekly observations for six consecutive weeks.

Couples were recruited by making announcements in communication courses at large universities in the Midwestern and Northeastern United States. Individuals were eligible if (i) they had a romantic interest in someone who was willing to participate, and (ii) both people had access to a secure Internet connection. For each wave they completed, students earned a small amount of extra course credit and partners earned US$5.

Procedures

Individuals received an introductory e-mail message describing the study and asking them to respond if willing to participate. After both partners replied with their consent, each person received a second e-mail message with a web link, a unique username, and instructions for participating. People chose the day, time, and location of their participation. Each data collection wave began on a Monday morning and concluded on a Sunday evening. On Monday morning, individuals received an e-mail message containing a password to access the questionnaire for the week. Reminder e-mail messages were sent on Thursday afternoon and Saturday morning. Passwords expired at midnight on Sunday evening, and the cycle repeated on Monday morning.

Participants could complete the questionnaire in one sitting or save their data on a secure server and finish the task later. Across waves, people devoted an average of 19.15 minutes (SD = 14.25 minutes, Mdn = 17 minutes) and 2.30 sessions (SD = 1.33 sessions, Mdn = 2 sessions) to completing the questionnaires.

The questionnaire for Wave 1 solicited demographic information and relationship status, as well as people's perceptions of relational uncertainty, interference from partners, turmoil, and negative emotion. Each subsequent questionnaire began with an open-ended item asking participants to describe any relationship changes during the previous week, and then it assessed people's experiences of relational uncertainty, interference from partners, turmoil, and negative emotion during the previous week.

Participants

The sample contained 135 couples (270 individuals) who provided Wave 1 data. Of those, 13 couples did not complete the Wave 6 questionnaire (9.6% attrition). Four couples ended their relationship during the six-week period. Nine other couples were eliminated during the study when one individual did not complete three consecutive waves. Multilevel modeling was selected for the substantive analyses because it accommodates missing data.

The sample included 131 males and 139 females (131 heterosexual couples, 4 lesbian couples), who ranged in age from 18 to 38 (M = 20.68 years, SD = 2.23 years, Mdn = 20 years). Approximately two-thirds of the participants were Caucasian (65%); others were African American (13%), Hispanic (11%), Asian (9%), and other (2%). At Wave 1, participants reported being romantically involved with their partner for an average of 1.75 years (SD = 1.98 years, *range* = less than one month to more than 18 years, Mdn = 1.18 years). They characterized the *status of their relationship* as friend-

ship (4%), casually dating (14%), seriously dating (78%), or engaged to be married (4%).

This sample also provided data for investigations of people's appraisals of irritating partner behavior (Theiss & Knobloch, 2009) and hurtful episodes (Theiss, Knobloch, Checton, & Magsamen-Conrad, 2009). Relational uncertainty and interference from partners are the only variables reported in common.

Measures

Confirmatory factor analysis (CFA) was used to verify the unidimensionality of the multi-item scales measured in Wave 1 (Hunter & Gerbing, 1982). The variables were computed by averaging the responses to the unidimensional items. Table 1 reports the descriptive statistics.

Relational uncertainty. A brief version of the relational uncertainty scale measured self, partner, and relationship uncertainty (Knobloch & Solomon, 1999). Participants responded to items prefaced by the stem "How certain are you about . . . ?" (1 = *completely or almost completely uncertain*, 6 = *completely or almost completely certain*). Items were scored such that higher values represented greater relational uncertainty. *Self uncertainty* contained six items (e.g., whether or not you want the relationship to work out in the long run), *partner uncertainty* included five items (e.g., whether or not your partner is ready to commit to you), and *relationship uncertainty* involved six items (e.g., whether or not you and your partner feel the same way about each other). Despite strong positive correlations (see Table 2), the three sources of relational uncertainty did not form a single factor according to CFA results. Hence, we treated them as separate variables (following Knobloch, 2006, 2007).

Interference from partners. A brief version of Solomon and Knobloch's (2001) scale assessed interference from partners. Participants reported their agreement (1 = *strongly disagree*, 6 = *strongly agree*) with five statements describing their partner (e.g., this person interferes with whether I achieve the everyday goals I set for myself).

Appraisals of turmoil. Knobloch's (2007) measure operationalized appraisals of turmoil. Participants rated eight adjectives describing their relationship (1 = *strongly disagree*, 6 = *strongly agree*). The adjectives were prefaced by the stem "At the present time, this relationship is. . ." (e.g., turbulent, chaotic, in turmoil).

Feelings of negative emotion. Emotion scales operationalized how much anger, sadness, and fear (1 = *not at all*, 6 = *a lot*) people felt in their relationship during the previous week (Dillard, Kinney, & Cruz, 1996). Three items for each emotion were introduced by the stem "I felt . . ." (e.g., angry, mad, sad, gloomy, afraid, scared).

TABLE 1
Descriptive statistics by wave

	Wave 1 *N* = 270			Wave 2 *N* = 249			Wave 3 *N* = 236			Wave 4 *N* = 233			Wave 5 *N* = 234			Wave 6 *N* = 229		
Self uncertainty	1.89	0.84	.91	1.89	0.97	.94	1.91	1.05	.95	2.01	1.15	.96	1.96	1.13	.96	1.96	1.15	.97
Partner uncertainty	1.93	0.93	.90	2.01	0.99	.93	2.02	1.13	.95	2.03	1.17	.96	1.94	1.17	.96	1.99	1.19	.97
Relationship uncertainty	2.03	0.79	.85	2.03	0.93	.91	2.06	1.02	.92	2.09	1.10	.94	2.02	1.07	.94	2.00	1.04	.93
Interference from partners	2.46	0.94	.83	2.42	1.09	.88	2.38	1.13	.89	2.42	1.18	.92	2.46	1.19	.92	2.40	1.31	.95
Turmoil	2.45	0.90	.84	2.28	0.98	.86	2.34	1.12	.88	2.44	1.14	.87	2.36	1.14	.87	2.23	1.13	.88
Anger	2.58	1.28	.87	2.39	1.29	.88	2.21	1.25	.89	2.47	1.44	.93	2.45	1.34	.88	2.26	1.34	.90
Sadness	2.09	1.19	.86	1.91	1.11	.83	1.93	1.15	.87	1.95	1.20	.88	2.02	1.23	.88	1.92	1.28	.89
Fear	1.71	1.06	.88	1.53	0.93	.89	1.54	0.99	.92	1.53	0.96	.89	1.57	1.01	.89	1.51	1.04	.93

Note. Cell entries are means, standard deviations, and α reliability scores.

TABLE 2
Bivariate correlations among the Wave 1 variables

	V1	V2	V3	V4	V5	V6	V7	V8
V1: Actor's self uncertainty	–							
V2: Actor's partner uncertainty	.50***	–						
V3: Actor's relationship uncertainty	.72***	.67***	–					
V4: Actor's interference from partners	.17**	.12*	.16*	–				
V5: Actor's turmoil	.26***	.07	.19**	.26***	–			
V6: Actor's anger	.13*	–.02	.12	.28***	.58***	–		
V7: Actor's sadness	.16*	.09	.17**	.21**	.50***	.65***	–	
V8: Actor's fear	.11	.08	.12	.14*	.41***	.46***	.67***	–
Partner's self uncertainty	.33***	.53***	.38***	–.01	.08	.06	.04	.04
Partner's partner uncertainty	.39***	.37***	.42***	.18*	.15	.05	.01	.07
Partner's relationship uncertainty	.42***	.48***	.45***	.06	.12	.10	.02	.05
Partner's interference from actors	–.06	–.02	–.05	.29**	–.02	.06	–.01	.02
Partner's turmoil	–.08	–.05	–.05	.01	.28**	.32***	.29**	.15
Partner's anger	–.17	–.04	–.09	.01	.12	.29**	.26**	.14
Partner's sadness	–.06	–.12	–.13	.02	.17	.21*	.15	.05
Partner's fear	–.07	–.01	–.03	–.10	.06	.11	.07	.05

Note. $N = 270$ for correlations among actors; $N = 135$ for correlations within couples.
*$p < .05$; **$p < .01$; ***$p < .001$.

Results

Preliminary analyses

A first preliminary analysis examined the bivariate correlations among actors and within couples for the Wave 1 variables (see Table 2). Among actors, positive correlations were apparent among the relationship characteristics and among the markers of turbulence. Self uncertainty and relationship uncertainty were positively associated with turmoil and sadness, and self uncertainty was positively associated with anger. Interference from partners was positively associated with turmoil and the negative emotions. Within couples, scores between partners were positively associated for all of the variables except sadness and fear.

One-way ANOVAs evaluated differences in the Wave 1 variables by Wave 1 relationship status. Participants who classified their relationship as friendship (M_{su} = 2.66, SD_{su} = .81; M_{pu} = 3.07, SD_{pu} = .65; M_{ru} = 2.82, SD_{ru} = .35) or casually dating (M_{su} = 2.91, SD_{su} = .97; M_{pu} = 2.75, SD_{pu} = 1.16; M_{ru} = 2.93, SD_{ru} = .82) reported more self uncertainty, partner uncertainty, and relationship uncertainty than participants who classified their relationship as seriously dating (M_{su} = 1.69, SD_{su} = .66; M_{pu} = 1.75, SD_{pu} = .79; M_{ru} = 1.87, SD_{ru} = .67) or engaged to be married (M_{su} = 1.37, SD_{su} = .54; M_{pu} = 1.42, SD_{pu} = .51; M_{ru} = 1.50, SD_{ru} = .38), F_{su} (3, 266) = 34.45, F_{pu} (3, 266) = 22.30, F_{ru} (3, 266) = 31.63, all p <.001. Therefore, Wave 1 relationship status was covaried in the tests of the hypotheses.

A third preliminary analysis documented the intraclass correlation (ρ) for each dependent variable. An intraclass correlation indicates the proportion of total variation in a dependent variable that is attributable to within-person variance versus between-person and between-group variance. An intraclass correlation close to zero indicates that the variability in the dependent variable is mostly within-person; an intraclass correlation close to one suggests that most of the variability is between-person and between-group (Snijders & Bosker, 2003). Intraclass correlations for self uncertainty (ρ = .55), partner uncertainty (ρ = .57), relationship uncertainty (ρ = .55), and interference from partners (ρ = .53) indicated a relatively equal distribution of variance. Intraclass correlations for turmoil (ρ = .39), anger (ρ = .16), sadness (ρ = .21), and fear (ρ = .34) revealed primarily within-person variance.

Substantive analyses

Multilevel modeling (MLM) was employed to evaluate the hypotheses because it accommodates both unbalanced designs and missing data (Raudenbush & Bryk, 2002); accordingly, our analyses included all couples who provided data for Wave 1. We treated the multiple observations across waves as nested within individuals and individuals as nested within couples. We constructed three-level models using maximum likelihood estimation with repeated measures at Level 1, variables measured across individuals at Level 2, and dyadic characteristics at Level 3. Thus, the MLM analyses shed light on the structure and predictors of change while controlling for

characteristics of the individual and the relationship (Raudenbush & Bryk, 2002). All statistical significance tests were two-tailed.

For each model, we report the intercept and slopes. The covariates entered on the intercept specify the between-person effects, and the slopes document the within-person effects across waves. The slopes supply the tests of the hypotheses because they evaluate whether within-person fluctuations in the predictors across waves explain variation in the dependent variables. (Contact the first author for the results for the residuals, which denote the variability left to be explained in the intercepts and slopes.)

Model 1: Predicting turmoil and negative emotion

First hypotheses predicted that actors' and partners' relational uncertainty (*H1*, *H2*) and actors' and partners' interference from partners (*H3*, *H4*) are positively associated with actors' turmoil and negative emotion. Accordingly, the models contained actors' turmoil, anger, sadness, and fear as the dependent variables. The independent variables were examined in separate models to avoid multicollinearity. Level 1 predictors were actors' and partners' self uncertainty, partner uncertainty, relationship uncertainty, or interference from partners. These variables were group mean centered (i.e., centered around the individual's mean for the six waves). Level 2 covariates were Wave 1 relationship status and the within-person mean for the actor's independent variable were uncentered. Wave 1 relationship status was grand mean centered (i.e., centered around the population mean). The within-person mean for the actor's independent variable was uncentered. The intercepts and the slopes were estimated as random effects.

Relational uncertainty. Table 3 contains the results for the models predicting turmoil and anger; Table 4 provides the findings for the models predicting sadness and fear. A first step was to examine the covariates on the intercept to evaluate between-person effects. Wave 1 relationship status increased the value of the intercept in the analyses where relationship uncertainty predicted sadness and fear, such that people who started the study with higher relationship status reported more sadness and fear. Similarly, the within-person means for relational uncertainty increased the value of the intercept, such that individuals who reported more relational uncertainty also reported more turmoil, anger, sadness, and fear.

The slopes provide the tests of *H1* and *H2* by documenting within-person variation across waves of the study. Actors' relational uncertainty was positively associated with their own turmoil, anger, sadness, and fear. Partners' relational uncertainty was positively associated with actors' turmoil, anger, and sadness, but not fear. In other words, *H1* was fully supported and *H2* was supported with the exception of fear.

Interference from partners. Table 5 depicts the models evaluating actors' and partners' reports of interference from partners as predictors of actors' turbulence. For the intercept, Wave 1 relationship status decreased the value of the intercept in the model predicting sadness, such that people with

TABLE 3
Relational uncertainty predicting an actor's turmoil and anger

	An actor's turmoil			An actor's anger		
	Self uncertainty	**Partner uncertainty**	**Relationship uncertainty**	**Self uncertainty**	**Partner uncertainty**	**Relationship uncertainty**
Intercept	1.59***	2.05***	1.60***	1.59***	1.93***	1.39***
Relationship status	.17	.01	.17	.13	–.01	.20
Actor's relational uncertainty mean	.39***	.15*	.37***	.42***	.24***	.50***
Slopes						
Actor's relational uncertainty	.44***	.42***	.48***	.54***	.56***	.57***
Partner's relational uncertainty	.09**	.07**	.12**	.08*	.09*	.14**

Note. Cell entries in the intercept category are the between-person change in the intercept attributable to Wave 1 relationship status or the within-person mean for an actor's self uncertainty, partner uncertainty, or relationship uncertainty. Cell entries in the slopes category are the within-person slope over the course of the study. Self uncertainty, partner uncertainty, and relationship uncertainty were evaluated in separate models.
*$p < .05$; **$p < .01$; ***$p < .001$.

TABLE 4
Relational uncertainty predicting an actor's sadness and fear

	An actor's sadness			An actor's fear		
	Self uncertainty	**Partner uncertainty**	**Relationship uncertainty**	**Self uncertainty**	**Partner uncertainty**	**Relationship uncertainty**
Intercept	1.20***	1.39***	1.04***	.99***	1.24***	.93***
Relationship status	.16	.10	.24*	.14	.07	.19*
Actor's relational uncertainty mean	.40***	.29***	.46***	.29***	.17**	.31***
Slopes						
Actor's relational uncertainty	.49***	.51***	.53***	.27***	.26***	.30***
Partner's relational uncertainty	.10**	.09**	.13**	.02	.00	.02

Note. Cell entries in the intercept category are the between-person change in the intercept attributable to Wave 1 relationship status or the within-person mean for an actor's self uncertainty, partner uncertainty, or relationship uncertainty. Cell entries in the slopes category are the within-person slope over the course of the study. Self uncertainty, partner uncertainty, and relationship uncertainty were evaluated in separate models.
*$p < .05$; **$p < .01$; ***$p < .001$.

TABLE 5
Interference from partners predicting an actor's turmoil, anger, sadness, and fear

	Turmoil	Anger	Sadness	Fear
Intercept	1.60***	1.69***	1.25***	1.03***
Relationship status	–.11	–.18	–.16*	–.06
Actor's interference from partner mean	.31***	.30***	.30***	.23***
Slopes				
Actor's interference from partner	.26***	.24***	.16**	.19***
Partner's interference from actor	.01	.00	.02	.01

Note. Cell entries in the intercept category are the between-person change in the intercept attributable to Wave 1 relationship status or the within-person mean for an actor's experience of interference from a partner. Cell entries in the slopes category are the within-person slope over the course of the study.
*$p < .05$; **$p < .01$; ***$p < .001$.

higher relationship status reported less sadness. The within-person means for actors' interference from partners increased the value of the intercept, such that individuals who experienced more interference from partners reported more turmoil, anger, sadness, and fear.

The slopes were consistent with *H3* but not *H4*. Actors' perceptions of interference from partners were positively associated with their own reports of turmoil, anger, sadness, and fear. In contrast, partners' perceptions of interference from actors did not predict actors' reports of turmoil or negative emotion.

Model 2: Predicting subsequent relational uncertainty and interference from partners

Final hypotheses predicted that actors' and partners' perceptions of turmoil and feelings of negative emotion in one week are positively associated with actors' reports of relational uncertainty (*H5*, *H6*) and interference from partners (*H7*, *H8*) in the following week. The dependent variables were actors' self uncertainty, partner uncertainty, relationship uncertainty, and interference from partners in Wave t. Wave 1 relationship status was entered as a covariate on the intercept to control for its between-person effect. Because people's reports of the dependent variable are likely to be correlated with their reports of the same variable in the previous wave, the within-person effect was controlled by covarying actors' reports of the dependent variable in the previous wave (i.e., Wave t–1). Finally, actors' and partners' judgments of turmoil, anger, sadness, or fear in Wave t–1 were entered as the substantive predictors. Wave 1 relationship status and the Wave t–1 values of the predictors were uncentered. The intercepts and slopes were estimated as random effects.

Relational uncertainty. Findings for relational uncertainty are reported in Table 6 and Table 7. Across all models, Wave 1 relationship status decreased

TABLE 6
Turmoil and negative emotion predicting actors' subsequent self and partner uncertainty

	Actor's experience of self uncertainty in Wave t				Actor's experience of partner uncertainty in Wave t			
	Turmoil	**Anger**	**Sadness**	**Fear**	**Turmoil**	**Anger**	**Sadness**	**Fear**
Intercept	2.03***	2.09***	2.07***	2.02***	2.07***	2.11***	2.08***	2.06***
Relationship status	–.47*	–.46*	–.48*	–.48*	–.45*	–.44*	–.45*	–.45*
Slopes								
Dependent variable Wave t–1	.23**	.25***	.22***	.23***	.25***	.26***	.23**	.25***
Actor's turbulence Wave t–1	.05	.03	.06	.10	.01	.01	.07	.07
Partner's turbulence Wave t–1	.09**	.07*	.09**	.10***	.11***	.09**	.10**	.11***

Note. Cell entries in the intercept category are the between-person change in the intercept attributable to Wave 1 relationship status. Cell entries in the slopes category are the within-person slope for the predictor from one wave to the next. Turmoil, anger, sadness, and fear were evaluated in separate models.
*$p < .05$; **$p < .01$; ***$p < .001$.

TABLE 7
Turmoil and negative emotion predicting actors' subsequent relationship uncertainty and interference from a partner

	Actor's experience of relationship uncertainty in Wave t				Actor's experience of interference from a partner in Wave t			
	Turmoil	**Anger**	**Sadness**	**Fear**	**Turmoil**	**Anger**	**Sadness**	**Fear**
Intercept	2.10***	2.15***	2.11***	2.07***	2.10***	2.14***	1.97***	2.02***
Relationship status	–.43*	–.42*	–.44*	–.44*	–.01	–.01	.01	–.01
Slopes								
Dependent variable Wave t–1	.28***	.29***	.25***	.27***	.33***	.33***	.31**	.31***
Actor's turbulence Wave t–1	–.01	–.01	.04	.07	–.01	.00	.11*	.10
Partner's turbulence Wave t–1	.09**	.07*	.09**	.09**	.10***	.08**	.08**	.10***

Note. Cell entries in the intercept category are the between-person change in the intercept attributable to Wave 1 relationship status. Cell entries in the slopes category are the within-person slope for the predictor from one wave to the next. Turmoil, anger, sadness, and fear were evaluated in separate models.
*$p < .05$; **$p < .01$; ***$p < .001$.

the value of the intercept, such that participants who began the study with higher relationship status reported less relational uncertainty. Not surprisingly, the slopes demonstrated that actors' relational uncertainty in Wave t–1 was positively associated with their relational uncertainty in Wave t. The slopes evaluating the hypotheses indicated partner effects but not actor effects. When partners reported more turmoil, anger, sadness, and fear in Wave t–1, actors experienced more relational uncertainty in Wave t (*H6*). No actor effects were apparent (*H5*).

Interference from partners. Table 7 specifies the results for interference from partners. Of course, actors' reports of interference from partners in Wave t–1 were positively associated with their reports of interference from partners in Wave t. For the hypothesized slopes, the only actor effect was that people's sadness in Wave t–1 was positively associated with their own judgments of interference from their partner in Wave t (*H7*). Partner effects surfaced such that when partners reported more turmoil, anger, sadness, and fear in Wave t–1, actors reported more interference from partners in Wave t (*H8*).

Discussion

A commendable goal for any study is to generate findings that "contribute substantially to the enrichment and expansion of [theoretical] frameworks" (Mikulincer, 2007, p. i). This study introduced a second generation of the relational turbulence model that departs from prior theorizing in three ways. First, it jettisoned the tenet that turbulence peaks at moderate levels of intimacy and emphasized the claim that relational uncertainty and interference from partners are proximal mechanisms underlying turbulence. Second, it added an actor–partner interdependence model to highlight the interplay within couples. Third, it examined outcomes of turbulence over time. The findings of the study advance the model along these lines.

Relational uncertainty and relational turbulence

The model's premise that relational uncertainty is a foundation of turbulence was supported in two ways. Consistent with *H1*, an actor's relational uncertainty was positively associated with his or her own turmoil, anger, sadness, and fear. These findings complement previous work linking relational uncertainty with turbulence in a variety of forms (e.g., Knobloch & Donovan-Kicken, 2006; Theiss & Solomon, 2006b). Consistent with *H2*, a partner's relational uncertainty was positively associated with an actor's reports of turmoil, anger, and sadness. Although relational uncertainty remained relatively stable across waves, even small fluctuations in a partner's relational uncertainty were enough for an actor to experience turbulence.

Whereas scholarship on relational uncertainty has focused almost exclusively on actor effects (Knobloch & Satterlee, 2009), the results for *H2* underscore the importance of attending to partner effects. But how does a

partner's relational uncertainty become manifest in an actor's turbulence? Relational uncertainty corresponds with more indirect and/or avoidant communication (e.g., Afifi & Burgoon, 1998; Knobloch, 2006; Theiss & Solomon, 2006b), so perhaps an actor's turbulence stems from a partner's reticence. Unfortunately, this reasoning remains speculative in the absence of behavioral data. A direction for future research is to illuminate the behaviors that connect a partner's relational uncertainty with an actor's experience of turbulence.

A caveat is that low levels of relational uncertainty may have attenuated effect sizes. Across waves, the means for relational uncertainty ranged from 1.89 (SD = .84) to 2.09 (SD = 1.10) on a 6-point scale. On one hand, the presence of actor and partner effects suggests that relational uncertainty may be closely tied to people's experiences of turbulence. Indeed, the longitudinal findings imply that fluctuations in relational uncertainty are meaningful even when individuals are fairly certain. On the other hand, the low mean and restricted range suggest that relational uncertainty was not very salient in this sample. Consequently, subsequent studies should target couples who are experiencing more questions about their relationship.

Interference from partners and relational turbulence

The relational turbulence model argues that interference from partners also generates tumultuous experiences. Results offered only mixed support for this reasoning. Consistent with *H3*, actors' reports of interference from partners were positively associated with their own turmoil and negative emotion. Contrary to *H4*, partners' reports of interference from actors did not predict actors' turmoil and negative emotion.

Why did the findings reveal actor effects but not partner effects? One possibility is that people are more aware of how a partner hinders their own goals than how they hinder a partner's goals (e.g., Malle, Knobe, & Nelson, 2007). A second possibility is that individuals may be better at masking their annoyance over disruptions than concealing their relational uncertainty. Communication difficulties are closely tied to relational uncertainty (Afifi & Burgoon, 1998; Knobloch, Miller, Bond, & Mannone, 2007), but less is known about how people's communication behavior corresponds with interference from partners (Knobloch, 2008b). A third possibility is that the specific markers of turbulence we measured may not be sensitive to spillover from partners to actors. Perhaps individuals are more likely to experience remorse or guilt (rather than turmoil, anger, sadness, or fear) when they hamper a partner's goals (e.g., Baumeister, Stillwell, & Heatherton, 1994). These possibilities are speculative, but we offer them in the hope that they will stimulate further investigation.

At a more general level, the findings for *H3* imply that the Emotion-in-Relationships Model (ERM) has utility beyond emotion. Berscheid (1983, 1991) formulated ERM to explain why people feel emotion within relationships. Both previous work and the current study support ERM by suggesting that individuals who encounter disruptions from a partner are more likely to experience anger, sadness, and fear (Ellis & Malamuth, 2000; Fehr

& Harasymchuk, 2005). The relational turbulence model extends ERM by proposing that interference from partners also corresponds with other markers of reactivity. Results for people's appraisals of turmoil, together with recent research (Knobloch & Schmelzer, 2008; Theiss & Solomon, 2006b), advance ERM by showing that interference from partners has predictive value beyond emotion.

Outcomes of relational turbulence over time

Longitudinal data permitted us to evaluate whether actors' and partners' turmoil and negative emotion predict actors' subsequent experiences of relational uncertainty and interference from partners. When partners reported more turmoil, anger, sadness, and fear in one week, actors experienced more relational uncertainty (*H6*) and interference from partners (*H8*) in the following week. Notably, actors' *own* turmoil and negative emotion in one week were unrelated to their own relational uncertainty (*H5*) and interference from partners (*H7*) in the following week. These findings may signal differences in efficacy: If people are confident that they can resolve their own difficulties, then their perceptions of turbulence may not trouble them over time. Conversely, if people feel helpless when a partner experiences turbulence, then their concerns about dyadic well-being may amplify their perceptions of relational uncertainty and interference from partners over time. We do not have data to test this explanation, but we are struck by the implication that a *partner's* turbulence is a more proximal predictor of an actor's subsequent relational uncertainty and interference from partners than an actor's own turbulence.

More broadly, the results for *H6* and *H8* contribute to theorizing on relationship development. Most theories consider how mechanisms of change predict the climate of relationships (e.g., Altman & Taylor, 1973; Bradbury, 1998), but they tend to overlook reciprocal effects. Similarly, the relational turbulence model has been relatively silent about how turbulence may feed back into relationship dynamics (but see Theiss & Solomon, 2006a). What happens to people's confidence in their relationship and their ability to coordinate behavior when volatility escalates? One possibility is a spiral of negativity: Perhaps a partner's turbulence colors an actor's subsequent perceptions of relational uncertainty and interference from partners, which in turn, foster more turbulence. The associations for *H6* and *H8* were small, but even incremental shifts from one week to the next may amount to substantial changes in the long term.

As a whole, this study illustrates the value of attending to the multifaceted nature of relationship progression. In particular, our data shed light on three interrelated processes. The within-person means covaried on the intercept of the analyses for *H1* through *H4* document how individuals differed from one another (e.g., people who reported more relational uncertainty and interference from partners also experienced more turbulence). Second, the slopes of these models illuminated how fluctuations within individuals predicted their experiences during the same week (e.g., people experienced more turbulence during waves when they reported levels of

relational uncertainty and interference from partners that were above their personal average). Third, the slopes of the lagged models for *H5* through *H8* clarified how fluctuations within individuals predicted their experiences during the next week (e.g., actors experienced more relational uncertainty and interference from partners when partners reported more turbulence during the previous week). What is the implication for theory here? All three layers require attention to fully understand people's experiences of turbulence as relationships progress.

Limitations and directions for future research

Our longitudinal research design has at least two limitations. First, the study tracked couples for only a short time. The six-week duration was consistent with both the logic (Knobloch, 2007; Solomon & Theiss, 2008) and previous tests (Theiss & Solomon, 2006a, 2006b) of the relational turbulence model, but it may have been too brief to capture large fluctuations in relational uncertainty, interference from partners, and turbulence. Future research should examine the long-term trajectory of relationship development. Second, participants had the flexibility to complete the questionnaires at intervals shorter or longer than a calendar week. The downside of this choice is that the data do not fall precisely into weekly intervals. Alternatives would be to adopt a daily diary format, to require individuals to participate during the same restricted window each week, or to use beeper methods to mark the timing of data collection. These alternative designs would have the added benefit of ensuring that both partners report on their relationship at the same time.

Floor effects may have limited the size of the associations we observed. Indeed, participants reported relatively low levels of relational uncertainty, interference from partners, and turbulence (see Table 1). A plausible explanation is that the low mean values may reflect the dyadic design. In the only other longitudinal test of the relational turbulence model, Theiss and Solomon (2006a, 2006b) reported somewhat higher means for relational uncertainty and interference from partners. Both their project and our project recruited college students to report on a dating relationship online once per week for six consecutive weeks; the noteworthy difference is that they sampled individuals and we sampled couples. Perhaps people experiencing substantial upheaval in their relationship were less likely to volunteer for our study due to the difficulties of persuading a partner to participate.

Finally, future research should investigate other dyadic contexts. Relationships between parents and children (Afifi & Schrodt, 2003) and between siblings (Bevan, Stetzenbach, Batson, & Bullo, 2006) can spark relational uncertainty, and family relationships are almost certainly ripe for goal interference as well (e.g., Berscheid, 1983). Similarly, spouses encounter both relational uncertainty and interference from partners (e.g., Knobloch, 2008a, 2008b; Steuber & Solomon, 2008). Extending the relational turbulence model beyond dating relationships would be useful for pinpointing the breadth of the model, generating data beyond samples of college students, and investigating dyads who may experience more dramatic fluctuations

over time. Pragmatically, it also would help formulate practical advice for how individuals should navigate relational turbulence.

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