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Identifying and measuring network-based relational uncertainty: Looking outside of the dyadic bubble

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Abstract

Previous research has explored both relational uncertainty and the importance of partners' social networks in the development of close relationships. Combining these concepts would better facilitate our understanding of relational development. Accordingly, this four-study identifies and creates a novel measure for social network-based relational uncertainty experienced by individuals in romantic relationships. Studies 1 and 2 reveal eight distinct categories of network uncertainty via open coding. Studies 3 and 4 use these categories to create a network uncertainty measure (NUM) and compare it to several scales from relational turbulence theory. Exploratory and confirmatory factor analysis revealed five subscales, which derived from the original eight categories. Tests of convergent and divergent validity validate the NUM as a viable measure to be used in theory expansion as well as studies of network-dyad interaction. Regression analyses first compared the NUM to measures of self, partner, and relationship uncertainty. Results demonstrated strong empirical relationships between these variables, reaffirming conceptual similarities. Moreover, measures of relationship satisfaction intimacy were regressed on the NUM, controlling for relational uncertainty measures. Results demonstrated that the NUM contributes to these outcomes above and beyond self, partner, and relationship uncertainty. Findings are discussed in terms of empirical and conceptual value to the study of romantic relationships.

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For over four decades, uncertainty has been a foundational construct in relational development (Berger & Calabrese, 1975; Sunnafrank, 1986) and maintenance research (Solomon, Knobloch, Theiss, & McLaren, 2016). Globally, uncertainty represents the inability to predict and/or explain another person's behavior (Berger & Calabrese, 1975). Uncertainty can be positively or negatively valenced (Gudykunst & Hammer, 1988) and promote an array of behaviors from information seeking (Berger & Bradac, 1982) to information avoidance (Planap & Honeycutt, 1985).

Over time, uncertainty scholarship has focused beyond individuals to include relationships themselves (i.e., relational uncertainty; Knobloch & Solomon, 1999). Relational uncertainty is typically represented as a negative experience that, if unresolved, will harm close relationships (Solomon, Weber, & Steuber, 2010). Theorists have only considered the self, the partner, and the relationship as sources of relational uncertainty. This manuscript attempts to expand relational uncertainty by focusing on its genesis in either partners' social networks or shared, duocentric, social network (Coromina, Guia, Coenders, & Ferligoj, 2008). Such expansion is important because social networks can influence relationship development in many ways (e.g., Parks, Stan, & Eggert, 1983; Sprecher, 2011), including influencing relational uncertainty (Parks & Adelman, 1983). Therefore, our primary goals in this manuscript are to conceptualize, develop, and test a measure of *network-based relational uncertainty*. This endeavor is important because network-based relational uncertainty may represent a fourth element of relational uncertainty.

Relational uncertainty in close relationships

Knobloch and Solomon (1999) defined relational uncertainty as "the degree of confidence people have in their perceptions of involvement within an interpersonal relationship" (p. 797). Relational uncertainty represents an umbrella term that encompasses three subtypes: self (e.g., how committed am *I* to my partner?), partner (e.g., how committed is *my partner* to me?), and relationship (e.g., are we just friends or something more?; Knobloch & Solomon, 1999).

Relational uncertainty functions as one of two generative mechanisms in relational turbulence theory (RTT; Solomon et al., 2016). Adverse outcomes of relational uncertainty include negative emotions (i.e., anger, sadness, and fear; Knobloch, Miller, & Carpenter, 2007), negatively biased cognitions (Theiss & Nagy, 2013), and withholding direct communication about irritations (Theiss & Solomon, 2006). Heightened relational uncertainty also correlates with perceptions that the social network is actively hindering relational development (Knobloch & Donovan-Kicken, 2006).

Research typically focuses on dyadic sources of relational uncertainty (Berger & Bradac, 1982; Knobloch & Solomon, 1999) and neglects external factors, such as partners' social networks. Considerable evidence suggests that social networks generate

relational uncertainty through their involvement in meaningful relational milestones (i.e., turning points; Baxter & Bullis, 1986) or simply because people are apprehensive about meeting network members (Parks & Adelman, 1983). Knobloch (2010), for example, noted that, "spouses usually grapple with relational uncertainty about external forces that may affect their marriage, including questions about children, finances, extended family, household chores, and career trajectories" (p. 75). Network members, however, are often turned to for support following marital conflict (Lepore, 1992). As such, social networks (and their members) may potentially generate, exacerbate, or even assuage relational uncertainty.

The influence of the social network on relational outcomes

Although definitions of social networks vary (Hill & Dunbar, 2003), two key factors include intended future interaction and a positive affinity (Shinn, Lehman, & Wong, 1984). People commonly refer to friends when identifying social network members (Sprecher, 2011), although they might also include friends, family members, coworkers, and neighbors (Hill & Dunbar, 2003). Social networks influence the success of fledgling dyads (Surra, 1988), established romantic relationships (Felmlee, 2001; Milardo, Johnson, & Houston, 1983), and couples experiencing relational transitions (Sprecher & Felmlee, 1992, 2000). Often, network members are aware of their impact on relational outcomes and sometimes intentionally attempt to exert their influence (Sprecher, 2011). Social networks actively facilitate preferred relationships (Knobloch & Donovan-Kicken, 2006) and celebrate the termination of dispreferred relationships (Sprecher & Felmlee, 2000).

Two factors—approval and liking—facilitate network influence on relational outcomes. Network approval of a relationship is longitudinally associated with greater relationship quality, commitment, and satisfaction (Lewis, 1973; Sprecher & Felmlee, 1992). Network approval positively relates to relational stability and intimacy when controlling for dyadic closeness (Felmlee, 2001). Liking of a partner's network facilitates relational success (Parks & Adelman, 1983). Network overlap (i.e., number of common friends) and liking a partner's network facilitate relationship involvement (Eggert & Parks, 1987; Parks et al., 1983). Moreover, a partner's network's level of liking positively relates to intimacy and closeness (Sprecher & Felmlee, 2000). Put simply, network liking and approval can facilitate relational success.

In summary, research demonstrates that social networks influence relational success and/or failure. One mechanism for such influence is through generating relational uncertainty. Moreover, there may be distinct sources of relational uncertainty that arise specifically from social networks. Thus, it appears prudent to consider how (if at all) social networks provoke relational uncertainty.

Defining and probing network-based relational uncertainty

Social networks' influence over close relationship outcomes (Eggert & Parks, 1987; Lewis, 1973; Sprecher, 2011) suggests that they may generate relational uncertainty (Knobloch & Donovan-Kicken, 2006). Thus, *network-based relational uncertainty* is

defined as relational partners' degree of confidence in their networks' acceptance and support of their relationship's development. As relationships develop, partners make appraisals about network involvement in their relationship trajectory (Sprecher & Felmlee, 2000). Network-based relational uncertainty is the confidence that partners have in those assessments. Although most relevant to blossoming couples, network-based relational uncertainty may influence established relationships as well, especially if such relationships share a duocentric network (Kennedy, Jackson, Green, Bradbury, & Karney, 2015).

Network-based relational uncertainty is typically a negative experience that can damage relationships. Additionally, it is a *perception* (i.e., a lack of confidence) concerning the network's acceptance and support—regardless of what might actually be true. Given conceptual similarities to relational uncertainty, network-based relational uncertainty may generate negative cognitions or emotions within relationships (as suggested by RTT; Solomon et al., 2016).

Network-based relational uncertainty can stem from many sources. Network disapproval of a partner (Sprecher & Felmlee, 2000), disliking the partner's network (Eggert & Parks, 1987), and network criticism (Knobloch & Donovan-Kicken, 2006) may lead individuals to question their relationships. Thus, a couple's network(s) are potential sources of relational uncertainty. On the contrary, network acceptance and approval may reduce relational uncertainty through facilitating positive conversations and cognitions.

Following the style of Knobloch and Solomon (1999), this four-study identifies (Studies 1 and 2) and measures (Studies 3 and 4) sources of network-based relational uncertainty. These tasks can generate a more complete understanding of how relationships work. For example, the present measures allow scholars to determine whether network-based relational uncertainty represents a fourth element of relational uncertainty (along with self, partner, and relationship) or acts independently upon relational outcomes.

Study 1: Identifying sources of network-based relational uncertainty

Berger and Calabrese (1975) initially placed uncertainty within initial interactions between strangers. Following their lead, Study 1 attempted to identify sources of network-based relational uncertainty concerning initial interactions. We expected network-based relational uncertainty to be pronounced when minimal network interaction has occurred (Berger & Bradac, 1982) and, thus, when limited knowledge of network members exists. Two research questions drive Study 1.

RQ1: What uncertainties arise from initial interactions with a partners' social network?

RQ2: What uncertainties arise from a partner initially interacting with the participant's social network?

Method

Participants and procedures

Participants included 214 undergraduates (111 females, 103 males) at a large Northeastern U.S. university ($M_{age} = 20.70$; $SD = 2.46$; range 18–33) who were currently in a heterosexual romantic/sexual relationship ($M_{length} = 15.3$ months; $SD = 4.56$). Participants were predominantly Caucasian ($n = 122$), Hispanic/Latino ($n = 46$), and African American ($n = 20$). Relationships included serious dating ($n = 126$), friends with romantic interest ($n = 52$), casual dating ($n = 27$), married or civil union ($n = 5$), engaged ($n = 2$), and other ($n = 2$). Participants received extra credit for completing the survey.

In a larger online survey, two open-ended questions asked participants to identify a member of their social network whom their partner had not met. Respondents were asked, "When you think about your partner meeting this person, what uncertainties, fears, or doubts do you have, if any?" Participants were then asked to identify a member of their partner's social network whom they had not met and asked, "When you think about meeting this person, what uncertainties, fears, or doubts do you have, if any?"

Responses to all questions were coded thematically using open coding (Strauss & Corbin, 1990). Two graduate students (including the principal investigator) unitized and coded responses ($n = 262$). Kappa coefficients for both questions were acceptable (.83 and .87, respectively). Responses were reviewed twice more to ensure that categories were mutually exclusive and exhaustive.[1]

Results

Most respondents (65.40%) described at least one experience of network-based relational uncertainty in anticipated initial interactions. Categories included participant interaction with the partners' network (i.e., network-to-self uncertainties; $n = 35$), introducing the partner to his/her own network (network-to-partner uncertainties; $n = 31$), and uncertainties that appeared across both contexts (i.e., overlapping uncertainties; $n = 196$). Table 1 provides labels, frequencies, and examples of network-based relational uncertainty sources.

Network-to-self uncertainties

Two sources of uncertainty were exclusive to meeting the partner's network. First, respondents indicated that their partners' network may *negatively judge* them about their insecurities ($n = 17$). Second, participants questioned whether their partners' network could directly threaten their relationship (i.e., *third-party threat*; $n = 18$). These responses described the harmful nature of their partner's relationship with, or disparaged the character of, network members.

Network-to-partner uncertainties

Participants were concerned that introducing their partners and networks would beget jealously regarding the relationship that they have with a network member (i.e., *partner jealousy*; $n = 31$). This jealousy was frequently described as irrational and unfounded.

Table 1. Study 1 network-based relational uncertainty sources.

Uncertainty experienced	Network-to-self	*n*	Network-to-partner	*n*	Total
Network approval	Uncertain that their partner's network will accept them as the "significant other"	49	Uncertain that their network will not accept their partner as their "significant other"	45	94
Network liking	Uncertain if their partner's network will invite them into their social circle	61	Uncertain if their network will invite their partner into their social circle	41	102
Negative judgment	Uncertain of how their partner's network will interpret their personal characteristics	17	N/A		17
Third-party threat	Uncertain of a relationship between their partner and their partner's network member	18	N/A		18
Partner jealousy	N/A		Uncertain if their partner will experience jealousy regarding network member(s)	31	31
Total		145		117	262

Overlapping uncertainties

Two sources of uncertainty, representing four distinct sources, appeared in both interaction contexts. First, *network approval* referred to participants' concerns about feeling accepted in the role of significant other by a network ($n = 49$ for network-to-self and $n = 45$ for network-to-partner*)*. Second, uncertainties about not being *liked* also appeared across both contexts ($n = 61$ for network-to-self and $n = 41$ for network-to-partner). Concerns about liking extended beyond approval and focused on the ingratiation of the self (or partner) into the respective social network.

Discussion

Both social networks (Parks et al., 1983; Sprecher & Felmlee, 1992, 2000) and relational uncertainty (Knobloch & Solomon, 1999) strongly influence relationship processes and outcomes. However, no research has combined these notions. Study 1 investigated social networks as relational uncertainty sources. Results indicate that uncertainties arise from anticipated initial interactions with network members.

Although participants reported several categories, most responses (over 70%) focused on (dis)approval and (dis)liking. These categories are consistent with network research (e.g., Parks & Adelman, 1983; Sprecher, 2011; Sprecher & Felmlee, 2000) and our definition of network-based relational uncertainty. Network approval and liking facilitate relational escalation (Bringle & Buunk, 1986; Knobloch & Donovan-Kicken, 2006), whereas their absence stunts relational development (Parks et al., 1983;

Sprecher, 2011). Thus, uncertainties about approval and liking from network may influence relationship (re)evaluations.

Descriptions of some sources differ depending on the network in question. Third-party threat represented a respondent's (apparently justified) concern that partner–network interactions might threaten their relationship. Conversely, partner jealousy (i.e., the partner's suspicion of one's own network members) was typically described as irrational. The source of uncertainty (i.e., a third party) is the same, but its experience (justified concern vs. unjustified jealousy) differed. Thus, trust may play a role in sources of network uncertainties.

Data from Study 1 clearly describe the existence of a finite number of network-based relational uncertainty sources. Study 1, however, focused only on initial interactions. Study 2 replicated Study 1 but considered continued interaction with social networks.

Study 2: Identifying continued experiences of network-based relational uncertainty

Although initial interactions are a staple of relationship research (e.g., Berger & Calabrese, 1975; Horan & Houser, 2012), close relationships forge meaning throughout their life span (Berger, 1979; Checton & Greene, 2012). Thus, sources and experiences of network-based relational uncertainty may change over time. Study 2 was designed to probe network-based relational uncertainty beyond initial interactions. Two research questions address this notion.

RQ1: What specific uncertainties arise from continued interactions with a partner's social network?

RQ2: What specific uncertainties arise from a partner's continued interactions with a participant's social network?

Method

Participants and procedure

Participants included 280 undergraduates (132 men, 147 women, 1 no report; mean age = 20.13, *SD* = 2.31) at a large Southwestern U.S. university. Participants mostly identified as Caucasian ($n = 167$), Asian ($n = 41$), African American ($n = 25$), and Hispanic ($n = 19$). Average relationship length was 11.46 months ($SD = 5.51$). Participants' heterosexual relationships included seriously dating ($n = 138$), casually dating ($n = 90$), friends with benefits ($n = 31$), married/formally united ($n = 13$), and engaged ($n = 3$). Participants were provided extra credit for survey completion.

As part of a larger survey, participants were asked to indicate "What uncertainties, if any, do you experience when you think about your partner and social network members interacting?" Respondents were also asked to describe "What uncertainties, if any, do you experience when you think about interacting with your partner's social network members?" Responses were thematically categorized using open coding (Strauss & Corbin, 1990). Study 1 categories (approval, liking, judging, third-party threat, and

jealousy) were provided as a guide prior to the coding process. Coders were instructed to utilize said categories and identify responses that did not fit.

Two graduate students (including the principal investigator) coded network-to-self (interacting with their partner's network; $\kappa = .81$) and network-to-partner uncertainties (i.e., partner interacting with their own network; $\kappa = .76$).[2] Some participants ($n = 73$) provided responses that described either (a) uncertainties generated by *social media* (e.g., a partner's online profile) or (b) reflected self, partner, or relationship uncertainty. These responses were considered *miscellaneous*, as they did not reflect experiences of network-based relational uncertainty.

Results

After removing miscellaneous responses, most participants (74.86%) described at least one form of network-based relational uncertainty. In all, 188 network-to-self sources and 173 network-to-partner sources were coded. When describing network-to-self uncertainties, participants described approval ($n = 21$), liking ($n = 23$), judgment ($n = 43$), and third-party threats ($n = 101$). When describing network-to-partner uncertainties, respondents described approval ($n = 24$), liking ($n = 35$), and their partners' irrational jealousy ($n = 38$). One new category described uncertainties about balancing time between the relationship and the network (i.e., *time split*, $n = 76$). See Table 2 for sources and frequencies.

Discussion

Study 2 refined our understanding of network uncertainties. Results are largely consistent with Study 1 and suggest that sources of network-based relational uncertainty are similar across initial and subsequent interactions. Differences in frequencies across studies are particularly interesting. Most importantly, liking and approval accounted for over 75% of responses in Study 1, but only 29% of those in Study 2. This finding qualifies previous network-dyad research by suggesting that liking/approval from network members is predominant concerns for budding partnerships (e.g., Parks et al., 1983; Sprecher & Felmlee, 1992, 2000), but appears to fade as relationships develop.

Third-party threat uncertainties were more pronounced in Study 2 (28%) than Study 1 (7%), suggesting that as individuals know their partner's network better, they may become increasingly worried about the influence of those network members. Not all interaction reduces uncertainty (e.g., Baxter & Bullis, 1986; Sunnafrank, 1986). Uncertainty about a third party is another means through which continued interaction can increase both uncertainty and negative appraisals.

The only source unique to Study 2 was time split (i.e., balancing dyad and network activities). As relationships develop, time spent with the partner replaces time spent with the network (Berscheid, 1983; Felmlee, 2001). Thus, partners become more concerned with satisfying demands from multiple relationships, ultimately producing salient concerns (Felmlee, 2001). If partners expand their duocentric network, time split uncertainties may fade, potentially bolstering relational development.

Studies 1 and 2 uncovered network-based relational uncertainty sources. These sources must be measured to empirically determine their intensity and influence.

Table 2. Study 2 network-based relational uncertainty sources.

Uncertainty experienced	Network-to-self	*n*	Network-to-partner	*n*	Total
Network approval	Uncertain that their partner's network will accept them as the "significant other"	21	Uncertain that their network will accept their partner as their "significant other"	24	45
Network liking	Uncertain if their partner's network will invite them into their social circle	23	Uncertain if their network will invite their partner into their social circle	35	58
Negative judgment	Uncertain of how their partner's network will interpret their personal characteristics	43	N/A		43
Third-party threat	Uncertain of a relationship between their partner and their partner's network member	101	N/A		101
Partner jealousy	N/A		Uncertain if their partner will experience jealousy regarding network member(s)	38	38
Time split	N/A		Uncertain of their ability to evenly disperse free time between their partner and network members	76	76
Total		188		173	361

Ultimately, this may lead to a discussion concerning the relevance of network-based variables in relational theories. Therefore, Study 3 describes the development of a network uncertainty measure (NUM).

Study 3: Measuring network-based relational uncertainty

Although multiple sources of network-based relational uncertainty have been identified, they need to be measured to determine whether and how they influence relational outcomes. Thus, the goal of Study 3 is to develop the NUM using the sources uncovered in Studies 1 and 2.

RQ1: Can the identified sources of network-based relational uncertainty be measured?

Method

Participants and procedure

Participants included 282 undergraduates (145 women and 137 men; $M_{age} = 20.08$; $SD = 2.22$) enrolled in a large Southwestern US university and concurrently involved in a heterosexual romantic/sexual relationship. Respondents identified primarily as

Caucasian ($n = 171$), Asian ($n = 37$), African American ($n = 27$), mixed race ($n = 22$), and Hispanic/Latino ($n = 17$). Relationships were described as seriously dating ($n = 151$), casually dating ($n = 83$), friends with benefits ($n = 27$), or married ($n = 19$).[3] Average relationship length was 13.15 months ($SD = 8.31$). Participants were offered course extra credit for their participation.

Measurement

Five Likert-style items were developed for each source of the NUM: liking (of the self and partner), approval (of the self and partner), judgment, third-party threat, partner jealously, and time split. Item wording was drawn verbatim from participant responses when possible. Each item asked how certain participants were regarding network-based prompts and was accompanied by a seven-interval scale, (1 = *completely uncertain*; 7 = *completely certain*). Items were coded such that higher scores reflected increased uncertainty.

Results

To answer RQ1, NUM items were subjected to exploratory factor analysis (EFA) using SPSS 23, with maximum likelihood extraction and oblique (i.e., direct oblimin) rotation as we expected correlated factors. Given the exploratory nature of this study, we chose a lenient method of dimension reduction (the Kaiser–Guttman criterion), where factors with eigenvalues greater than 1.0 are considered meaningful. We used the .50–.30 decision rule to assign items to factors (i.e., primary factor loadings must be at least .50 and no other loading can be greater than .30).

Five factors with eigenvalues above 1.0, containing a total of 18 items, explained 68.04% of shared variance in responses. Eleven items failed to meet inclusion criteria. Through four subsequent rounds of EFA, 11 additional items were removed, as they did not add or subtract variation from the factor structure (either in % of variance explained or eigenvalues). Interfactor correlations were all significant ($p < .001$) and ranged from .32 to .51. Table 3 provides item content and factor loadings.[4] Table 4 provides inter-factor correlations for Study 3.

Three factors contained items initially designed to measure multiple uncertainty sources. First, 4 items tapped the extent to which participants worried about being liked and approved of by their partners' network (*acceptance of self*, $\alpha = .88$, $M = 2.89$, $SD = 1.49$). A second factor contained 4 items that focused on participants' concerns that their network would approve of and like their partner (*acceptance of partner*, $\alpha = .96$, $M = 2.72$, $SD = 1.33$). Finally, 4 items captured participants' uncertainty about their partners' jealousy and juggling network/partner time (i.e., *jealousy/time split*; $\alpha = .86$, $M = 2.96$, $SD = 1.53$). Thus, EFA results combined six network-based relational uncertainty sources from Study 1 and 2 into three dimensions.

The remaining two factors closely matched network-based relational uncertainty sources from Studies 1 and 2. Three items measured *judging* by the partner's network ($\alpha = .94$, $M = 3.51$, $SD = 1.54$). Finally, 3 items measuring *third-party threat* factored together ($\alpha = .89$, $M = 2.75$, $SD = 1.57$).

Table 3. Means, standard deviations, reliabilities, eigenvalues, factor loadings, and descriptions of the 18 items that compose the NUM.

Prompt	Factor 1 ($M = 2.89$; $SD = 1.49$; eigenvalue = 15.95) $\alpha = .88$	Factor 2 ($M = 2.72$; $SD = 1.33$; eigenvalue = 1.88) $\alpha = .96$	Factor 3 ($M = 2.96$; $SD = 1.53$; eigenvalue = 2.42) $\alpha = .86$	Factor 4 ($M = 3.51$; $SD = 1.54$; eigenvalue = 1.97) $\alpha = .94$	Factor 5 ($M = 2.75$; $SD = 1.57$; eigenvalue = 1.42) $\alpha = .89$
1. Your partner's social network accepts you as their friend/family member's significant other	.80	.17	.05	.01	.14
2. Your partner's social network approves of the fact that you and your partner are together	.82	.14	.03	.06	.15
3. You partner's social network acts in a way that displays acceptance of you being in your partner's life	.91	.07	.08	.03	.04
6. Your partner's social network likes you	.78	.24	.26	.07	.17
11. Your partner's social network does not make negative judgments about who you are as a person	.13	.65	.10	.28	.04
13. Your partner's social network does not talk about your behind your back	.09	.77	.02	.06	.06
14. Your partner's social network does not constantly evaluate you	.08	.71	.11	.23	.09
16. Your partner does not have a romantic connection with any of their social network members	.05	.04	.89	.05	.16
17. Your partner does not have a physical relationship with any of their social network members	.11	.14	.81	.25	.18
18. Your partner's social network members do not encourage them to cheat on you	.08	.11	.76	.14	.09
24. Your social network purposefully interferes with your relationship	.05	.09	.18	.67	.12
25. Your social network thinks that your partner is "good enough" for you	.03	.13	.20	.72	.04
27. Your social network enjoys spending time with your partner	.09	.08	.02	.89	.02
28. Your social network has welcomed your partner into your social circle	.06	.08	.04	.89	.02
34. Your partner does not feel threatened by any of your network members	.03	.01	.05	.01	.76
35. Your partner does not get angry when you spend time with your social network members	.04	.02	.16	.12	.79
38. You never have to "choose" between your partner or your network members	.10	.06	.04	.04	.77
39. The amount of time that you spend with your social network member(s) does not influence the relationship that you have with your partner	.06	.02	.10	.04	.81

Note. NUM = network uncertainty measure.

Table 4. Correlations for NUM subscales in Study 3.

Measures	1	2	3	4	5
1. Network-to-self acceptance	—	.51*	.48*	.51*	.42*
2. Judging		—	.32*	.38*	.37*
3.Third-party threat			—	.37*	.46*
4.Network-to-partner acceptance				—	.49*
5. Time split/jealousy					—

Note. NUM = network uncertainty measure.
*$p < .001$ in all cases.

Discussion

Study 3 developed the NUM using results from Studies 1 and 2 as a guide. EFAs reduced the NUM to 18 items (originally 40) that tapped five distinct factors (originally eight sources). First, items designed to separately tap network approval and liking combined into a single dimension for both network-to-self and network-to-partner uncertainties. Perceptions of approval and liking are closely related (Felmlee, 2001), but have primarily been studied as separate entities (Eggert & Parks, 1987; Sprecher & Felmlee, 1992). Our results suggest that uncertainties about liking and approval represent a single phenomenon.

Similarly, items designed to measure uncertainties about jealousy and time split factored together. Felmlee (2001) explained that people often worry about juggling time between their partners and networks because they fear jealousy from either party. What is more, jealousy surrounding network members and the inability to balance schedules are associated with network interdependence characteristics (Surra, 1988). Thus, it is not surprising that such items combined during EFA.

Study 3 revealed five subscales of the NUM—three pertaining to the partner's network and two to the participant's network. What is missing is a test of these subscales' external and construct validity. Moreover, the inflated eigenvalue for factor 1 in Study 3 suggests that the five subscales of the NUM may function more parsimoniously as one composite measure. A final study addressed these issues through confirmatory factor analysis (CFA), convergent/divergent validity tests, and concurrent validity tests.

Study 4

Validating the NUM

Study 4 sought to confirm the NUM's factor structure through CFA (Hunter & Gerbing, 1982), correlation tests, and regression analyses. These analyses allow the testing of an a priori factor structure. Given that our ultimate goal is to include the NUM into relational theories, CFA is an important follow-up to EFA (Hurley et al., 1997). In CFA, latent variables are created to capture covariation among measured items. In other words, items measuring acceptance of self (and each of the other factors) should intercorrelate *because* they comprise a single latent variable.

One important note for our measure concerns the subscales of the NUM. It may be that the five factors uncovered in Study 3 are each distinct subscales. It may also be that network-self subscales factor together, as do network–partner subscales, forming two second-order variables. Last, all 18 items may factor into a third-order, unidimensional variable. A research question addresses the possibility of each of these outcomes.

RQ1: What is the a priori factor structure of the NUM?

A second important scale validation step involves assessing convergent and discriminant validity (Worthington & Whittaker, 2006). Given the strong conceptual connection between network-based relational uncertainty and relational uncertainty, convergent validity tests focus upon RTT variables. This strong conceptual connection demands a strong correlation between network-based and relational uncertainty.

H1: Subscales of the NUM will correlate positively with relational uncertainty dimensions.

The conceptual similarities between relational uncertainty and network-based relational uncertainty suggest that RTT variables are an appropriate starting point to observe the viability of the NUM. For example, self-uncertainty negatively relates to relationship satisfaction (Theiss & Nagy, 2013). Moreover, self, partner, and relationship uncertainty share a negative bivariate correlation with intimacy (Knobloch & Donovan-Kicken, 2006). Given the strong conceptual (and assuming strong empirical) relationships, NUM subscales should mirror these previously researched relationships.

H2: Subscales of the NUM will negatively correlate with intimacy.
H3: Subscales of the NUM will negatively correlate with relationship satisfaction.

Finally, according to RTT, there is no direct link between uncertainty and communication (Solomon et al., 2016). Because no axioms link relational uncertainty to the amount of valence of communication episodes, it is reasonable to propose a similar null relationship for the NUM. Said differently, the final two hypotheses test the discriminant validity of the NUM.

H4: Subscales of the NUM will not significantly correlate with enacted communication.
H5: Subscales of the NUM will not significantly correlate with valence of communication.

Our final probe of the NUM was related to concurrent validity. Using multiple regressions, the percentage of explained variance by (a) each of the five subscales of the NUM, (b) composite variables for network-self subscales and network-partner subscales, and (c) a single copositive variable can be assessed. This would reveal if the NUM functions like relational uncertainty (with self, partner, and relationship measures considered separately; Knobloch & Solomon, 1999), or if it is best used as two, or one,

copositive variable(s). The associations are posed as research questions, as we did not know which structure of the NUM would explain the most variance in outcome variables. We first consider the role of the NUM as relating to self, partner, and relationship uncertainty.

RQ2: Which factor structure of the NUM explains the most variation in self, partner, and relationship uncertainty?

Related, it is important to see how, if at all, the NUM relates to biased cognitions above and beyond relational uncertainty. Regressing relationship satisfaction and intimacy on both the NUM and relational uncertainty will potentially uncover which factor structure is the most appropriate for future research. Moreover, this final test would reveal whether the NUM adds additional variance to outcome variables in RTT above and beyond relational uncertainty.

RQ3a: Is the NUM related to biased cognitions above and beyond relational uncertainty?
RQ3b: Which factor structure (if any) of the NUM explains the most variation in biased cognitions when controlling for relational uncertainty?

Method

Participants and procedure

Participants included 367 undergraduate students at a large, Southwestern U.S. university (158 men, 209 women; $M_{age} = 20.26$, $SD = 2.11$) who identified as currently being in a heterosexual romantic or sexual relationship. Respondents primarily identified as Caucasian ($n = 196$), Asian ($n = 56$), Hispanic/Latino ($n = 53$), mixed race ($n = 24$), and African American ($n = 19$). Participants described their relationship as seriously dating ($n = 184$), casually dating ($n = 106$), friends with benefits ($n = 42$), engaged/married ($n = 19$), and other ($n = 14$).[5] Average relationship length was 18.59 months ($SD = 20.81$). Participants received extra credit in their courses for completing the survey.

Measurement

The NUM. The 18-item NUM developed in Study 3 included Likert-style items (1 = *completely uncertain*, 7 = *completely certain*) paired with the prompt "how certain are you . . . " about network acceptance, judgment, third-party threat, and jealousy/time split. High scores reflected greater uncertainty. Table 5 provides scale reliabilities, means, and standard deviations.

Turbulence variables. Relational uncertainty was measured with Knobloch and Solomon's (1999) self ($\alpha = .90$), partner ($\alpha = .95$), and relationship uncertainty (7 items; $\alpha = .92$) scales. Rubin's (1970) love scale assessed intimacy ($\alpha = .92$). Rusbult, Martz, and Agnew' (1998) scale measured relationship satisfaction ($\alpha = .91$). Knobloch and Theiss'

Table 5. Study 4 tests of convergent and divergent validity for the NUM.

Measures	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Acceptance of self ($\alpha = .95$)	—	.54**	.42**	.49**	.43**	.49**	.55**	.54**	−.23*	−.32**	−.16	−.24*
2. Judging ($\alpha = .92$)	—	—	.29**	.42**	.42**	.26**	.38**	.37**	−.24**	−.21*	−.19	−.16
3. Third-party threat ($\alpha = .95$)	—	—	—	.31**	.50**	.46**	.55**	.54**	−.34**	−.41**	−.13	−.22*
4. Acceptance of partner ($\alpha = .95$)	—	—	—	—	.48**	.59**	.33**	.59**	−.41**	−.36**	−.24*	−.27*
5. Jealous/time split ($\alpha = .90$)	—	—	—	—	—	.42**	.44**	.40**	−.43**	−.35**	−.16	−.28*
6. Self-uncertainty	—	—	—	—	—	—	.60**	.75**	−.39**	−.48**	−.20*	−.13
7. Partner uncertainty	—	—	—	—	—	—	—	.76**	−.33**	−.39**	−.21*	−.22*
8. Relationship uncertainty	—	—	—	—	—	—	—	—	−.41**	−.44**	−.18	−.15
9. Perceived intimacy	—	—	—	—	—	—	—	—	—	.29**	.24*	.31**
10. Relationship satisfaction	—	—	—	—	—	—	—	—	—	—	.28*	.32**
11. Enactment of relational talk	—	—	—	—	—	—	—	—	—	—	—	.37**
12. Valence of relational talk	—	—	—	—	—	—	—	—	—	—	—	—
M	3.00	3.27	2.44	2.68	2.83	2.43	2.66	2.72	5.01	4.21	4.23	5.41
SD	1.54	1.65	1.73	1.51	1.56	1.45	1.64	1.49	1.32	1.43	1.36	1.31

Note. NUM = network uncertainty measure.
*$p < .01$; **$p < .001$.

(2011) measure of relational talk was used to assess enactment ($\alpha = .87$) and valence ($\alpha = .89$) of communication.

Results

Factor structure

Three CFA analyses were performed with Amos, using maximum likelihood estimation, to confirm the NUM factor structure (RQ1). The first model featured five distinct, but intercorrelated, latent variables. The second model included these same five variables, with network-self acceptance, judging, and third-party threat comprising a second-order factor, and network-partner acceptance and jealousy/time split comprising a different second-order factor. A third model replicated the second, but the two second-order variables were part of a third-order unidimensional variable (Rijmen, Jeon, von Davier, & Rabe-Hesketh, 2014).

Multiple indices evaluated model fit. These indices included χ^2/df (Schumacker & Lomax, 2004; values < 3.0 indicating excellent fit); confirmatory fit index (CFI) (Hu & Bentler, 1999; values >.95 indicating excellent fit); root mean square error of approximation (RMSEA; Browne & Cudek, 1993; Hu & Bentler, 1999; values < .06 indicating excellent fit); and the standardized root mean square residual (SRMR; Hu & Bentler, 1999; values < .08 indicating excellent fit).

Fit for the first measurement model was excellent, $\chi^2/df = 2.93$; CFI = .96; RMSEA = .053 (90% CI: .044–.063); and SRMR = .049.[6] Factor intercorrelations ranged from .44 to .67 ($p < .001$). The second factor structure, featuring two second-order latent variables, also demonstrated excellent fit, $\chi^2/df = 2.06$; CFI = .98; RMSEA = .054 (90% CI: .045–.063); and SRMR = .047.[7] The third model, featuring a single, third-order unidimensional factor, displayed excellent fit, $\chi^2/df = 2.05$; CFI = .98; RMSEA = .054 (90% CI: .044–.063); and SRMR = .040.[8] Fit indicators for the three models are similar, though slightly better for the final model (see Figure 1). These results appropriately answer RQ1.

Testing convergent and divergent validity

Hypothesis 1 predicted positive correlations between NUM and relational uncertainty subscales. Consistent with H1, all 15 correlations between relational uncertainty and NUM dimensions were positive and significant (see Table 5). Second, the NUM was also hypothesized to correlate negatively with intimacy (H2) and relationship satisfaction (H3). Consistent with these hypotheses, all 10 correlations were significant and negative (see Table 5). Lastly, the NUM was predicted to share no relationship with the enactment (H4) and valence (H5) of relationship talk. Although 5 of the 10 correlations were significant, they were small (i.e., $r < .08$). Thus, H4 and H5 received partial support.

Testing concurrent validity

The final two research questions required more robust tests. First, three hierarchical tests regressed self, partner, and relationship uncertainty on the five NUM subscales, the two

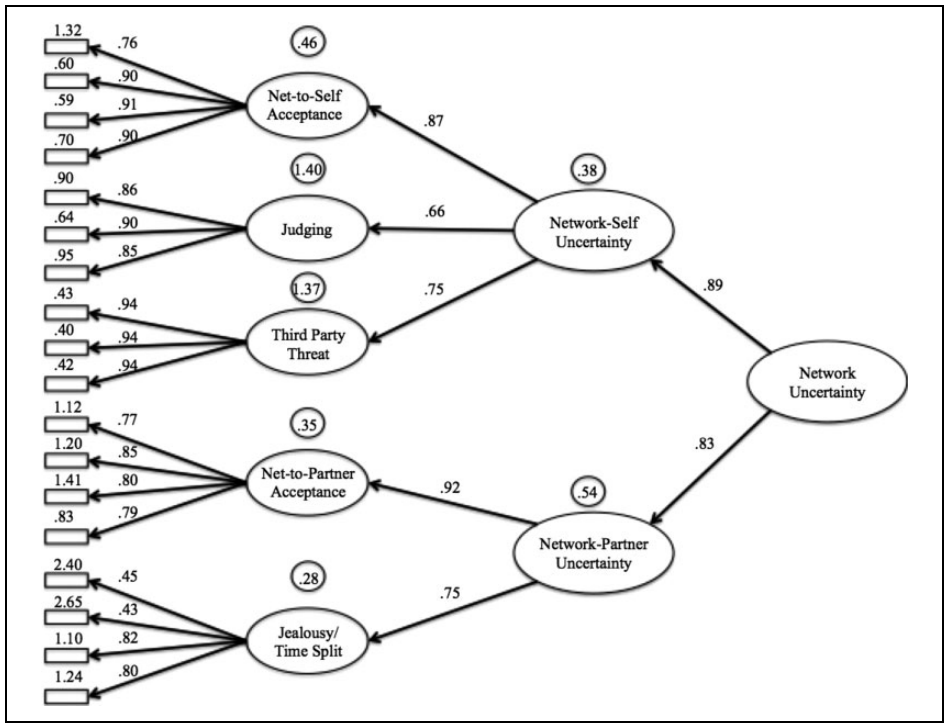

Figure 1. Third-order factor model for the NUM. For this model, $\chi^2 = (125) = 256.16$, $\chi^2/df = 2.05$; CFI = .98; RMSEA = .054; and SRMR = .040. All correlations are standardized and were significant at the critical α of .001. Values above boxes and latent variables represent error values. NUM = network uncertainty measure; CFI = confirmatory fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

composite variables, and the single composite variable (RQ2). Second, intimacy and relationship satisfaction were regressed on these same factor structures (RQ3) while controlling for self, partner, and relationship uncertainty. Table 6 displays the full results of these 15 regressions. In short, results showed that the five-factor structure explained the most variation in self, partner, and relationship uncertainty; however, the single composite variable featured the strongest β weights. For both intimacy and relationship satisfaction, the single composite variable featured the largest percentage of variance explained, as well as the strongest β weights.

Discussion

Study 4 provides initial validation of the NUM by investigating factor structure and exploring convergent, divergent, and concurrent validity. Specifically, factor analyses compared a five-factor structure with second-order (self vs. partner network) and third-order (both networks combined) models. The three measurement models generated exhibited excellent fit, although the single third-order unidimensional model (see

Table 6. Regressions parsing the mechanisms of the NUM.

Independent variable	Outcome variable									
	Self-uncertainty		Partner uncertainty		Relationship uncertainty		Intimacy		Relationship satisfaction	
	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β
	.36***		.41***		.43***		.02**		.03*	
Net-self acceptance		.17**		.27***		.21***		−.04		−.07
Judging		−.05		.06		.03		−.03		.02
Third-party threat		.14**		.28**		.24***		.04		−.06
Net-partner acceptance		.34***		.16**		.24***		.03		−.13*
Jealousy/time split		.10*		−.01		.07		−.15*		−.12*
	.34***		.39***		.40***		.01		.02*	
Net-self uncertainty		.29***		.51***		.41***		−.08		−.04
Net-partner uncertainty		.40***		.15**		.29***		−.10		−.17**
	.32***		.38***		.40***		.03*		.04*	
Network uncertainty		.57***		.61***		.64***		−.14**		−.18**

Note. NUM = network uncertainty measure. $N = 367$. Results display 15 distinct regressions. First, the five subscales of the NUM were regressed on five outcome values. When intimacy and relationship satisfaction were regressed on the NUM (in all forms), self, partner, and relationship uncertainty were controlled for.
*$p < .05$; **$p < .01$; ***$p < .001$.

Figure 1) fit marginally better. This implies that the NUM's structure can be adapted depending on the question at hand.

Convergent validity analyses revealed that the NUM correlated strongly with relational uncertainty (H1), intimacy (H2), and relationship satisfaction (H3) measures. Evidence of the NUM's divergent validity comes from small and/or null relationships with enactment (H4) and valence (H5) of relational talk. Together, these analyses are important because a scale's construct validity depends, in part, upon its placement within a nomological network (Cronbach & Meehl, 1955; Worthington & Whittaker, 2006).

Study 4 validity analyses also attempted to determine which NUM factor structure explained the greatest variation in relational uncertainty and outcome variables. All three factor models explain considerable (i.e., between 36% and 42%) of the variation in self, partner, and relationship uncertainty. The five-factor structure explained slightly more variation, however, the single composite variable generated the largest β weights. The single composite variable also explained the greatest variation in, and demonstrated the strongest betas for, intimacy and relationship satisfaction. Researchers should feel comfortable using any of the five NUM subscales, or either the two-factor or one-factor

models, as needed based on their specific research questions. Well-constructed third-order unidimensional measures are quite strong and parsimonious (Rijmen et al., 2014), but lack the specificity of the five- or two-factor models.

When intimacy and satisfaction were regressed on the NUM, results appear modest. It is important to note that in these analyses, the influence of self, partner, and relationship uncertainty were entered (i.e., controlled for) before entering NUM dimension(s). Thus, NUM dimension(s) explain a significant amount of variation in intimacy and satisfaction *above and beyond* that explained by relational uncertainty dimensions. This implies that the NUM is a scale that can be used in conjunction with or independent of relational uncertainty measures.

Although the convergent and divergent validity analyses partially focused on RTT variables (Solomon et al., 2016), Study 4 was not designed as a theory test or addition. Instead, RTT was utilized as an example of one framework where network variables might contribute to understandings of relational processes. Further validation work should utilize the NUM with other relationship-oriented theories, such as the investment model (Rusbult, Martz, & Agnew, 1998) or attachment (Shaver & Hazan, 1993). Study 4 goes a long way to validate the NUM; however, future research must explore its theoretical utility.

General discussion

This manuscript introduced social networks as source(s) of relational uncertainty by blending two research streams. First, work on relational uncertainty presupposes that the dyad serves as the only source(s) of uncertainty (i.e., the self, partner, or relationship). Second, decades of work indicate that social networks influence relational judgments (Parks et al., 1983; Sprecher & Felmlee, 2000) and outcomes (Parks & Adelman, 1983; Sprecher, 2011). Thus, we proposed that a couple's social networks may represent a unique source of relational uncertainty.

Four studies focused on the presence, measurement, and correlates of network-based relational uncertainty. Initially, we identified concerns that partners have about network members, both in initial (Study 1) and ongoing interactions (Study 2). Based on those results, we measured sources of uncertainty with 18 items that comprise five distinct subscales (Study 3). Those subscales were tested for their a priori factor structure and subjected to convergent, divergent, and concurrent validity tests (Study 4). Together, these studies provide considerable evidence that the NUM is a valid measure of network-based relational uncertainty that can potentially contribute to a bevy of theoretical frameworks.

An important finding in these studies focused on the NUM's dimensionality. Studies 1 and 2 revealed as many as eight sources of network-based relational uncertainty, while Study 3 compressed them into five subscales. Study 4 demonstrated that the NUM can be utilized as a single third-order unidimensional measure. Scholars might choose one factor structure over another based on their desire for parsimony (single factor) or detail (five factors). It is presumptuous to claim that one scale structure is more effective than the other, but our results are an initial step toward considering the NUM as a global scale.

The NUM's dimensionality raises important questions regarding the relationship between network-based uncertainty and relational uncertainty. Three relationships between these constructs appear possible. First, given the close conceptual and empirical ties with self, partner, and relationship uncertainty, network-based relational uncertainty may represent a fourth component of relational uncertainty. Second, it is possible that network-based relational uncertainty acts as an antecedent to self, partner, and/or relationship uncertainty (Parks et al., 1983). A final possibility is that network uncertainty is distinct from relational uncertainty and independently influences outcome variables. Longitudinal data would be required to differentiate these three possibilities.

Study 4 used RTT as an example of how the NUM relates to theory-grounded constructs. It is necessary to explore now the NUM relates to other well-established measures, such as commitment (Rusbult et al., 1998), perceived partner responsiveness (Theiss & Knobloch, 2014), and levels of self-disclosure (Petronio, 2010). These tests would carry the NUM's design from a valid scale to a measure that aids in theory development. Our results provide initial evidence that network-based uncertainty may contribute to dyadic perceptions/interactions. The next step is to begin using the NUM in interpersonal and relational theory explorations.

In summary, network-based relational uncertainty can be measured should be used to investigate relationship processes and outcomes in network-dyad interaction studies. The sources of network-based relational uncertainty uncovered in Studies 1 and 2 consistently influence relational outcomes. For example, approval and liking (both of, and from, network members) impact relational perceptions (Parks et al., 1983; Sprecher, 2011) even after controlling for dyadic factors (Felmlee, 2001). Moreover, both jealousy (Surra, 1988) and time split (Felmlee, 2001) are salient for romantic relationships partners. In short, relationships do not occur in a vacuum. This study is the first step toward developing relational theories that combat this assumption.

Limitations and future directions

Despite a number of important conceptual and theoretical implications, our findings come with a number of limitations. First, the four samples are demographically homogeneous (e.g., age, cultural background, and sexual orientation). It is necessary to explore the NUM's utility in multiple contexts (e.g., collectivist cultures, older age groups, and other relationship types). For example, it is possible that different cultures (e.g., individualist and collectivist) experience different sources of, and react differently to, network-based relational uncertainty (e.g., Gudykunst & Hammer, 1988). For example, American and Chinese cultures differ in how personal and professional ties are formed (Chiu, Wu, Zhuang, & Hsu, 2009). Thus, the creation of, and reaction to, social network structures likely differ across cultures.

A second limitation is the present studies use RTT as a point of reference, hinting that perhaps this theory (and others) would benefit from the inclusion of network-based variables. Our results lay the groundwork for this research, but do not call for theory modification or addition. The NUM should also be tested outside of interpersonal approaches using methods such as duocentric network analyses (Kennedy et al., 2015) and hierarchical mapping techniques (Rowe & Carnelley, 2005).

A final limitation is that social networks were considered as homogeneous in this study. Some network members (e.g., parents or best friends) may influence relational outcomes more than others. The importance of such network members may be, in part, determined culturally. Thus, there are theoretical, methodological, and demographic questions that must be answered to better parse the mechanisms of the NUM.

Conclusion

Relationship theories have consistently assumed that only the self and the partner can influence relationship outcomes, despite compelling evidence that network members alter relational perceptions and behaviors (Felmlee, 2001; Sprecher, 2011). Results of these studies do not stake theoretical claims but do point to a tool that might be used to modify relationship theories in the future. The NUM development is the first of many steps necessary to craft an argument for network-based variables in theory inclusion. We offered an initial conceptual justification for such theoretical tests to unfold.

Authors' note

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Open research statement

As part of IARR's encouragement of open research practices, the author(s) have provided the following information: This research was not pre-registered. The data used in the research are not available in accordance with IRB agreements. Questions about the data can be addressed to jbstein1@asu.edu. The materials used in the research are available. The materials can be obtained by emailing jbstein1@asu.edu.

Supplemental material

Supplemental material for this article is available online.

Notes

1. Contact the corresponding author for coding procedures and codebooks.
2. Contact the corresponding author for coding procedures and codebooks.

3. A one-way analysis of variance revealed no differences between relationship types for network uncertainty measure (NUM) subscales.
4. Table 3 contains only the retained 18. Tables also containing the remaining 22 items and their loadings are available upon request.
5. A one-way analysis of variance revealed no differences between relationship types for NUM subscales.
6. After consultation of modification indices, two covariations were drawn between error values for items 13/14 and items 16/18. A figure depicting these relationships is available upon request.
7. After consultation of modification indices, covariations were drawn between items 11/12, 15/16, and 16/18. A figure depicting these relationships is available upon request.
8. After consultation of modification indices, covariations were drawn between items 11/12, 13/14, 15/16, and 16/18.

References

Baxter, L. A., & Bullis, C. (1986). Turning points in developing romantic relationships. *Human Communication Research*, *12*, 469–493. doi:10.1111/j.1468-2958.1986.tb00088.x

Berger, C. R. (1979). Beyond initial interaction: Uncertainty, understanding, and the development of interpersonal relationships. In H. Giles & R. N. St Clair (Eds.), *Language and social psychology* (pp. 122–144). Oxford, UK: Blackwell.

Berger, C. R., & Bradac, J. J. (1982). *Language and social knowledge: Uncertainty in interpersonal relationships*. London, UK: Arnold.

Berger, C. R., & Calabrese, R. J. (1975). Some explorations in initial interaction and beyond: Toward a developmental theory of interpersonal communication. *Human Communication Research*, *2*, 99–112. doi:10.1111/j.1468-2958.1975.tb00258.x

Berscheid, E. (1983). Emotion. In H. H. Kelley, E. Berscheid, A. Christensen, J. Harvey, T. L. Huston, G. Levinger, E. McClintock, L. A. Peplau, & D. R. Peterson (Eds.), *Close relationships* (pp. 110–168). San Francisco, CA: Freeman.

Bringle, R. G., & Buunk, B. P. (1986). Examining the causes and consequences of jealousy: Some recent findings and issues. In R. Gilmour & S. Duck (Eds.), *The emerging field of personal relationships* (pp. 225–240). Hillsdale, NJ: Erlbaum.

Browne, M. W., & Cudek, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park, CA: Sage.

Checton, M. G., & Greene, K. (2012). Beyond initial disclosure: The role of prognosis and symptom uncertainty in patterns of disclosure in relationships. *Health Communication*, *27*, 145–157. doi:10.1080/10410236.2011.571755

Chiu, Y. P., Wu, M., Zhuang, W. L., & Hsu, Y. Y. (2009). Influences on expatriate social networks in China. *The International Journal of Human Resource Management*, *20*, 790–809. doi:10.1080/09585190902770703

Coromina, L., Guia, J., Coenders, G., & Ferligoj, A. (2008). Duocentered networks. *Social Networks*, *30*, 49–59. doi:10.1016/j.socnet.2007.07.001

Cronbach, L., & Meehl, P. (1955). Construct validity in psychological tests. *Psychological Bulletin*, *52*, 281–302. doi:10.1037/h0040957

Eggert, L. L., & Parks, M. R. (1987). Communication network involvement in adolescents' friendship and romantic relationships. In M. L. McLaughlin (Ed.), *Communication yearbook* (Vol. 10, pp. 283–322). Newbury Park, CA: Sage.

Felmlee, D. H. (2001). No couple is an island: A social network perspective on dyadic stability. *Social Forces*, *79*, 1259–1287. doi:10.1353/sof.2001.0039

Gudykunst, W. B., & Hammer, M. R. (1988). Strangers and hosts: An uncertainty reduction based theory of intercultural adaptation. In Y. Y. Kim & W. B. Gudykunst (Eds.), *Cross-cultural adaptation: Current approaches* (pp. 106–139). Newbury Park, CA: Sage.

Hill, R. A., & Dunbar, R. I. (2003). Social network size in humans. *Human Nature*, *14*, 53–72. doi:10.1007/s12110-003-1016-y

Horan, S. M., & Houser, M. L. (2012). Understanding the communicative implications of initial impressions: A longitudinal test of predicted outcome value theory. *Communication Education*, *61*, 234–252. doi:10.1080/03634523.2012.671950

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1–55. doi:10.1080/10705519909540118

Hunter, J. E., & Gerbing, D. W. (1982). Unidimensional measurement, second order factor analysis, and causal models. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (Vol. 4, pp. 267–320). Greenwich, CT: JAI Press.

Hurley, A. E., Scandura, T. A., Schriesheim, C. A., Brannick, M. T., Seers, A., Vandenberg, R. J., & Williams, L. J. (1997). Exploratory and confirmatory factor analysis: Guidelines, issues, and alternatives. *Journal of Organizational Behavior*, *18*, 667–683. doi:10.1002/28SICI291099-1379

Kennedy, D. P., Jackson, G. L., Green, H. D., Bradbury, T. N., & Karney, B. R. (2015). The analysis of duocentric social networks: A primer. *Journal of Marriage and Family*, *77*, 295–311. doi:10.1111/jomf.12151

Knobloch, L. K. (2010). Relational uncertainty and interpersonal communication. In S. W. Smith & S. R. Wilson (Eds.), *New directions in interpersonal communication research* (pp. 69–93). Thousand Oaks, CA: Sage.

Knobloch, L. K., & Donovan-Kicken, E. (2006). Perceived involvement of network members in courtships: A test of the relational turbulence model. *Personal Relationships*, *13*, 281–302. doi:10.1111/j.1475-6811.2006.00118.x

Knobloch, L. K., Miller, L. E., & Carpenter, K. E. (2007). Using the relational turbulence model to understand negative emotion within courtship. *Personal Relationships*, *14*, 91–112. doi:10.1111/j.1475-6811.2006.00143.x

Knobloch, L. K., & Solomon, D. H. (1999). Measuring the sources and content of relational uncertainty. *Communication Studies*, *50*, 261–278. doi:10.1080/10510979909388499

Knobloch, L. K., & Theiss, J. A. (2011). Relational uncertainty and relationship talk within courtship: A longitudinal actor–partner interdependence model. *Communication Monographs*, *78*, 3–26. doi:10.1080/03637751.2010.542471

Lepore, S. J. (1992). Social conflict, social support, and psychological distress: Evidence of cross-domain buffering effects. *Journal of Personality and Social Psychology*, *63*, 857–867. doi:10.1037/0022-3514.63.5.857

Lewis, R. (1973). Social reaction and the formation of dyads: An interactionist approach to mate selection. *Sociometry*, *36*, 409–418. doi:10.2307/2786342

Milardo, R. M., Johnson, M. P., & Huston, T. L. (1983). Developing close relationships: Changing patterns of interaction between pair members and social networks. *Journal of Personality and Social Psychology*, *44*, 964–976. doi:10.1037/0022-3514.44.5.964

Parks, M. R., & Adelman, M. B. (1983). Communication networks and the development of romantic relationships: An expansion of uncertainty reduction theory. *Human Communication Research*, *10*, 55–79. doi:10.1111/j.1468-2958.1983.tb00004.x

Parks, M. R., Stan, C. M., & Eggert, L. L. (1983). Romanic involvement and social network involvement. *Social Psychology Quarterly*, *46*, 116–131. doi:10.2307/3033848

Petronio, S. (2010). Communication privacy management theory: What do we know about family privacy regulation? *Journal of Family Theory & Review*, *2*, 175–196. doi:10.1111/j.1756-2589.2010.00052.x

Planap, S., & Honeycutt, J. M. (1985). Events that increase uncertainty in personal relationships. *Human Communication Research*, *11*, 593–604. doi:10.1111/j.1468-2958.1985.tb00062.x

Rijmen, F., Jeon, M., von Davier, M., & Rabe-Hesketh, S. (2014). A third-order item response theory model for modeling the effects of domains and subdomains in large-scale educational assessment surveys. *Journal of Educational and Behavioral Statistics*, *39*(4), 235–256. doi:10.3102/1076998614531045

Rowe, A. C., & Carnelley, K. B. (2005). Preliminary support for the use of a hierarchical mapping technique to examine attachment networks. *Personal Relationships*, *12*, 499–519. doi:10.1111/j.1475-6811.2005.00128.x

Rubin, Z. (1970). Measurement of romantic love. *Journal of Personality and Social Psychology*, *16*, 265–273. doi:10.1037/h0029841

Rusbult, C. E., Martz, J. M., & Agnew, C. R. (1998). The investment model scale: Measuring commitment level, satisfaction level, quality of alternatives, and investment size. *Personal Relationships*, *5*, 357–387. doi:10.1111/j.1475-6811.1998.tb00177

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Shaver, P. R., & Hazan, C. (1993). Adult romantic attachment: Theory and evidence. *Advances in Personal Relationships*, *4*, 29–70. doi:10.1037//1089-2680.4.2.132

Shinn, M., Lehmann, S., & Wong, N. W. (1984). Social interaction and social support. *Journal of Social Issues*, *40*, 55–76. doi:10.1111/j.1540-4560.1984.tb01107.x

Solomon, D. H., Knobloch, L. K., Theiss, J. A., & McLaren, R. M. (2016). Relational turbulence theory: Explaining variation in subjective experiences and communication within romantic relationships. *Human Communication Research*, *42*, 507–532. doi:10.1111/hcre.12091

Solomon, D. H., Weber, K., & Steuber, K. (2010). Turbulence in relational transitions. In S. W. Smith & R. W. Wilson (Eds.), *New directions in interpersonal communication* (pp. 115–134). Thousand Oaks, CA: Sage.

Sprecher, S. (2011). The influence of social networks on romantic relationships: Through the lens of the social network. *Personal Relationships*, *18*, 630–644. doi:10.1111/j.1475-6811.2010.01330.x

Sprecher, S., & Felmlee, D. (1992). The influence of parents and friends on the quality and stability of romantic relationships: A three-wave longitudinal investigation. *Journal of Marriage and the Family*, *54*, 888–900. doi:10.2307/353170

Sprecher, S., & Felmlee, D. (2000). Romantic partners' perceptions of social network attributes with the passage of time and relationship transitions. *Personal Relationships*, *7*(4), 325–340. doi:10.1111/j.1475-6811.2000.tb00020.x

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage.

Sunnafrank, M. (1986). Predicted outcome value during initial interactions: A reformulation of uncertainty reduction theory. *Human Communication Research*, *13*, 3–33. doi:10.1111/j.1468-2958.1986.tb00092.x

Surra, C. A. (1988). The influence of the interactive network on developing relationships. In R. M. Milardo's (Ed.), *Families and social networks* (pp. 48–82). Newbury Park, CA: Sage.

Theiss, J. A., & Knobloch, L. K. (2014). Relational turbulence and the post-deployment transition: Self, partner, and relationship focused turbulence. *Communication Research*, *41*, 27–51. doi:10.1177/0093650211429285

Theiss, J. A., & Nagy, M. E. (2013). A relational turbulence model of partner responsiveness and relationship talk across cultures. *Western Journal of Communication*, *77*, 186–209. doi:10.1080/10570314.2012.720746

Theiss, J. A., & Solomon, D. H. (2006). A relational turbulence model of communication about irritations in romantic relationships. *Communication Research*, *33*, 391–418. doi:10.1177/0093650206291482

Worthington, R. L., & Whittaker, T. A. (2006). Scale development research: A content analysis and recommendations for best practices. *The Counseling Psychologist*, *34*, 806–838. doi:10.1177/0011000006288127