Cognitive Interdependence: Commitment and the Mental Representation of Close Relationships

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On the basis of an interdependence analysis, it is proposed that commitment to a close relationship is associated with *cognitive interdependence*—a mental state characterized by a pluralistic, collective representation of the self-in-relationship. A cross-sectional survey study and a 2-wave longitudinal study revealed that strong commitment to a romantic relationship is associated with greater spontaneous plural pronoun usage, greater perceived unity of self and partner, and greater reported relationship centrality. Commitment and cognitive interdependence operate in a cycle of mutual influence, such that earlier commitment predicts change over time in cognitive interdependence, and earlier cognitive interdependence predicts change over time in commitment. Links between commitment and cognitive interdependence were weak or nonsignificant for relationships among best friends, suggesting that this phenomenon may be unique to romantic relationships.

Involvement in a close relationship can change individuals in fundamental ways. For example, close involvement can produce changes in everyday activity preferences, arising from attempts to coordinate activities with those of a significant other (cf. Berscheid, Snyder, & Omoto, 1989; Van Lange et al., 1997). Close involvement can also change the ways in which we communicate; for instance, increasing commitment is associated with enhanced tendencies to accommodate, or to diminish negative reciprocity during the course of interaction (cf. Gottman, 1979; Rusbult, Verette, Whitney, Slovik, & Lipkus, 1991). Does close involvement modify mental representations of the self or change the manner in which we think about ourselves in relation to our partners? The present work asserts that increasing relationship commitment is accompanied by a restructuring of self-in-relationship mental representations, including tendencies to perceive ourselves less as individuals and more as part of a

pluralistic self-and-partner collective. We refer to these collective mental representations of the self-in-relationship as *cognitive interdependence*.[1]

Several theoretical orientations provide broad frameworks in which to understand the effects of closeness on mental representations of the self-in-relationship. For example, to understand such issues, attachment theory proponents might turn to the concept of working models, focusing on the childhood origins of relationship-relevant cognition and affect (cf. Bowlby, 1969; Hazan & Shaver, 1994). Proponents of an evolutionary–biological orientation might address such issues by highlighting the potential adaptive value of blending one's identity with that of a close partner (cf. Kenrick & Trost, 1997). In contrast, social–cognitive theorists might explore the internal structure of the self-concept (cf. Baldwin, 1992; Fletcher & Fincham, 1991). In the present work, we use interdependence theory constructs (cf. Kelley, 1979; Kelley & Thibaut, 1978) to understand self-in-relationship mental representations, examining this phenomenon by focusing on an outgrowth of interdependence theory, the investment model of commitment processes (Rusbult, 1980a, 1983).

Interdependence Theory and the Investment Model

Interdependence theory describes the ways in which the structure of outcome interdependence shapes motivation and behavior in dyads (Kelley, 1979; Kelley & Thibaut, 1978). The concept of dependence is a key component of the theory. *Dependence*

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[1] This term previously has been used by other authors to refer to assorted relationship phenomena. Most notably, Wegner and his colleagues have used the term in reference to the interdependent cognitions that characterize the transactive memories of relationship partners (Wegner, Giuliano, & Hertel, 1985; Wegner, Erber, & Raymond, 1991).

level describes the degree to which each of two interacting individuals needs their relationship, or the extent to which each individual's personal well-being rests on involvement in the relationship. According to interdependence theory, dependence is greater to the degree that a relationship provides good outcomes and to the degree that the outcomes available in alternative relationships are poor. For example, John's dependence on Mary is greater to the extent that he relies uniquely on Mary for the fulfillment of his most important needs; John's dependence is reduced to the extent that his needs could be gratified elsewhere.

The *investment model* extends interdependence propositions in two respects (Rusbult, 1983). First, the model identifies three bases of dependence. Like interdependence theory, the investment model suggests that dependence increases to the degree that (a) satisfaction level is high, or the relationship gratifies the individual's most important needs (e.g., the needs for intimacy, sexuality, or companionship), and (b) quality of alternatives is poor, or the individual's most important needs could not be gratified independent of the relationship (e.g., by other romantic partners, friends or family members, or on one's own). The investment model further suggests that dependence increases to the degree that investment size is high, or numerous important resources become directly or indirectly linked to the relationship (e.g., time and effort, joint possessions, shared friendship network). John becomes increasingly dependent—that is, he comes to need his relationship—to the extent that he wants to be in his relationship with Mary (feels satisfied), is bound to the relationship (has high investments), and has little choice but to be in the relationship (has poor alternatives).

The investment model also extends interdependence propositions in a second respect, suggesting that dependence produces the psychological experience of *commitment*. Commitment includes conative, cognitive, and affective components. The conative component of commitment is *intent to persist*—John feels intrinsically motivated to continue his relationship with Mary. The cognitive component is *long-term orientation*—John envisions himself as involved in the relationship for the foreseeable future and considers the implications of current actions for future outcomes. The affective component is *psychological attachment*—John experiences life in dyadic terms, such that his emotional well-being is influenced by Mary and their relationship. The three components of commitment are theoretically and empirically discriminable but tend to cooccur, and collectively are distinct from the three bases of dependence (Arriaga, Agnew, & Rusbult, 1997; Rusbult, Martz, & Agnew, in press).

The empirical literature reveals good support for investment model predictions. Numerous studies have demonstrated that (a) commitment level is significantly associated with the bases of dependence, being positively associated with satisfaction level, negatively associated with quality of alternatives, and positively associated with investment size; (b) the three bases of dependence collectively account for 40% to 80% of the variance in commitment (e.g., Rusbult, 1983; Rusbult, Johnson, & Morrow, 1986; Simpson, 1987); and (c) each of the three bases of dependence accounts for unique variance in commitment (e.g., Cox, Wexler, Rusbult, & Gaines, 1997; Rusbult, 1983; Rusbult et al., in press). At the same time, the three bases of dependence do not necessarily exhibit associations with commitment that are equivalent in magnitude. For example, satisfaction is some-

times an especially powerful correlate of commitment (e.g., in short-term or new involvements, where sentiment override is potent; cf. Weiss, 1980), and satisfaction is sometimes largely irrelevant to commitment (e.g., in abusive relationships; cf. Rusbult & Martz, 1995).

How does commitment differ from dependence? First, dependence is a structural property whereas commitment is a subjective experience. Dependence is a *structural state* describing the degree to which an individual needs a relationship. Individuals may or may not be aware of their dependence. At critical moments, John may actively contemplate his dependence on Mary, consciously reviewing the extent of his satisfaction, alternatives, and investments. At other times, however, John's dependence may remain largely implicit—he may not consciously consider the extent of his need. In contrast, commitment is the *subjective state* that dependent individuals experience on a daily basis. In this sense, commitment can usefully be construed as the subjective sense of allegiance that is established with regard to the source of one's structural dependence. Because John is dependent on his relationship, he develops intentions to persist with Mary, he foresees long-term involvement with Mary, and he feels affectively linked to Mary and their relationship. It is the psychological experience of commitment, rather than the structural state of dependence, that is argued to influence everyday behavior in relationships.

Commitment also differs from dependence in a second respect. Commitment is an emergent property of dependence, representing more than the sum of the structural elements from which it arises. Although commitment develops as a result of high satisfaction, poor alternatives, and high investments, commitment is more than a simple numerical summary of dependence. The structural state of dependence does not necessarily have direct implications for conative, cognitive, and affective experiences such as intent to persist, long-term orientation, or psychological attachment; the subjective experience of commitment embodies these psychological elements. Thus, the components of commitment extend beyond that which is predictable based on the degree to which John wants to be in a relationship (satisfaction), is bound to the relationship (investments), and has no choice but to be in the relationship (alternatives). Indeed, the empirical literature suggests that (a) commitment is the direct mediator of persistence and other prorelationship behaviors, and (b) commitment accounts for unique variance in prorelationship behavior beyond the variance accounted for by satisfaction, alternatives, and investments (e.g., Johnson & Rusbult, 1989; Rusbult, 1983; Van Lange et al., 1997).

Commitment, Relationship Maintenance Acts, and Cognitive Interdependence

Strong commitment to a relationship is reliably associated with voluntary continuance in the relationship (e.g., Bui, Peplau, & Hill, 1996; Drigotas & Rusbult, 1992; Rusbult, 1983; Rusbult et al., in press). Moreover, commitment is associated with a variety of so-called relationship maintenance acts, including (a) disparagement of alternatives, or tendencies to drive away or derogate tempting alternative partners (Johnson & Rusbult, 1989; Simpson, Gangestad, & Lerma, 1990); (b) willingness to sacrifice, or tendencies to forego desired behavioral

options for the good of a relationship (Van Lange et al., 1997); and (c) accommodative behavior, or tendencies to accommodate rather than retaliate when a partner behaves poorly (Rusbult et al., 1991). In short, committed individuals frequently are willing to exert significant effort or endure great cost toward the goal of maintaining their relationships.

How is it that committed individuals come to enact such prorelationship behaviors? The interdependence theory distinction between the given situation and the effective situation provides a framework for understanding this process. The *given situation* refers to each partner's immediate, personal well-being in a specific situation, describing each person's "gut level," self-centered preferences. Clearly, people do not always pursue their given preferences. Frequently, behavior is shaped by broader concerns, including strategic considerations, long-term goals, or desire to promote both one's own and a partner's well-being. Movement away from given preferences results from *transformation of motivation,* a process that leads individuals to relinquish their immediate self-interest and act on the basis of broader considerations. The *effective situation* refers to the modified preferences resulting from the transformation process; effective preferences directly guide behavior.

Transformation of motivation describes departures from given-situation preferences, or movement away from desire to maximize one's own immediate self-interest (referred to in interdependence terminology as "MaxOwn"). Sometimes the transformation process yields prorelationship motivational shifts; for example, John may wish to maximize his partner's outcomes ("MaxOther"), or he may wish to maximize his own and Mary's joint outcomes ("MaxJoint"). Sometimes the transformation process yields antirelationship shifts; for example, John may wish to maximize the difference between his own and Mary's outcomes ("MaxRel"). Interdependence theory assumes that the character of the transformation process typically is shaped by the internal processes accompanying an interpersonal event, for example, by the cognitive and affective concomitants of commitment (cf. Kelley, 1984; Rusbult & Van Lange, 1996). Unfortunately, however, few studies have explicated the role of internal events in the process of adaptation to interdependence structure, and knowledge of the mental concomitants of commitment is very limited. The present work seeks to identify an important internal concomitant of commitment—cognitive interdependence.

We suggest that as individuals become increasingly committed to a relationship, they come to think of their partners as part of the self and come to regard themselves as part of a collective unit that includes the partner. Over time in a developing relationship, John becomes increasingly committed to continuing his involvement with Mary, foreseeing an extended future during which his well-being will rest on Mary and their relationship. Accordingly, increased commitment is likely to instigate more frequent relationship-relevant cognitive activity, along with a shift in the nature of personal identity and self-representation. In keeping with the emergence of MaxOther and MaxJoint motivations, the individual is likely to develop a relatively couple-oriented identity and a relatively pluralistic representation of the self-in-relationship. John no longer thinks of himself simply as John but comes to regard himself as part of a collective John–

Mary unit. This pluralistic, collective mental representation of the self-in-relationship is termed *cognitive interdependence.*

It is useful to construe cognitive interdependence as a habit of thinking that supports prorelationship motivation and behavior by increasing the accessibility of the partner and relationship. That is, partner-oriented and relationship-oriented thoughts, or thoughts relevant to MaxOther and MaxJoint motives, become increasingly available bases for transformation of motivation. Cognitive interdependence may be thought of as operating in conjunction with commitment, in that commitment involves various components of the self-in-relationship: self intending to persist in the relationship (conative self-in-relationship), self oriented toward the long-term future of the relationship (future self-in-relationship), and self feeling psychologically attached to the relationship (emotional self-in-relationship).

The existing literature provides indirect support for the assertion that cognitive interdependence characterizes committed relationships. For example, actor–observer differences in attribution are attenuated for close partners in comparison with strangers, such attenuation presumably occurring because the distinction between self and partner becomes blurred (Sande, Goethals, & Radloff, 1988). Similarly, individuals tend to reflect others' successes when the other is close, but not when the other is a stranger (Tesser, 1988). The concept of transactive memory is also relevant to our cognitive interdependence construct. Transactive memory is "a shared system for encoding, storing, and retrieving information"—a system whereby close partners make use of one another's memories as repositories for information (Wegner, Erber, & Raymond, 1991, p. 923; see also Wegner, 1986). The existence of interdependent memory systems, reflected experiences of success, and parallel patterns of self–partner attribution is compatible with the notion that commitment results in cognitive restructuring, including incorporation of a close partner into the sense of self.

Our interdependence analysis of cognitive interdependence is also compatible with the self-expansion model concept of inclusion of other in the self (Aron & Aron, 1997). Indeed, the Arons proposed that a close relationship is defined by the degree of self–other merger, arguing that closeness exists to the extent that individuals think and behave as though the partner is a component of the self (e.g., Aron & Aron, 1986; Aron, Aron, & Smollan, 1992; Aron, Aron, Tudor, & Nelson, 1991). More generally, self-expansion theory and interdependence theory are parallel in many respects. Both theories suggest that evaluations of a relationship rest on the gratification resulting from everyday interaction, both theories emphasize the ways in which partners become psychologically linked over the course of extended involvement, and both theories argue that important human needs may be fulfilled in the course of interaction with a close partner. Self-expansion theory stresses one need in particular—the need for self-expansion—whereas interdependence theory proposes that a variety of needs may be gratified by close partners (e.g., security needs, sexuality needs, emotional involvement needs). Both self-expansion theory and the present work propose that the process of increasing interdependence yields a pluralistic, collective representation of the self-in-relationship. The present work seeks to extend the literature on other-in-the-self inclusion by explicitly linking the concept of cognitive interdependence to the broader interdependence framework.

Acitelli's broad concept of relationship awareness also shares certain features with cognitive interdependence (Acitelli, 1988, 1992, 1993). Acitelli defined relationship awareness as "a person's thinking about interaction patterns, comparisons, or contrasts between oneself and one's partner in a relationship. Included are thoughts about the couple or relationship as an entity" (Acitelli, 1993, p. 151). As "the process of thinking in relational terms" (Acitelli, 1992, p. 102), relationship awareness involves "thinking about how two persons relate to each other" (p. 103). Past research on relationship awareness in marital relationships has shown that satisfaction is positively associated with relationship talk (a behavioral manifestation of relationship awareness; Acitelli, 1992). Consistent with the process of relational thinking, cognitive interdependence represents a state in which couple members regard themselves as part of a collective unit that includes the partner. Being cognitively interdependent, or possessing a pluralistic, collective mental representation of the self-in-relationship, can be regarded as one important manifestation of relationship awareness.

Hypotheses Guiding the Present Research

We conducted two studies, a cross-sectional survey study and a two-wave longitudinal study, to determine whether strong commitment is associated with a relatively pluralistic, other-inclusive cognitive representation of the self-in-relationship. To address this question, it was necessary to identify valid methods of measuring cognitive interdependence. Our work used three operational definitions of this construct: (a) a linguistic analysis of plural pronoun use in relationship-relevant cognitions, (b) the Inclusion of Other in the Self (IOS) Scale (Aron et al., 1992), and (c) a measure of reported centrality of relationship. These measures were selected because they are psychometrically diverse: The language measure provides a covert means of tapping relationship-relevant thought structures, the IOS Scale is a graphical measure that assesses how an individual mentally perceives a relationship, and the centrality of relationship measure is a pencil-and-paper self-report of the degree to which a relationship is an essential, highly central element of life. Cognitive interdependence is operationally defined as possessing relatively pluralistic relationship cognitions, perceiving other-in-the-self inclusion, and regarding a relationship as particularly central to the self. Collectively, these measures should psychometrically triangulate on mental representations of the self-in-relationship.

Linguistic Analysis of Relationship-Relevant Cognitions

Several researchers have attempted to link language use with interpersonal processes. For example, the number of first-, second-, and third-person singular and plural pronouns occurring during natural interaction has been found to be associated with empathic accuracy (Ickes, Stinson, Bissonnette, & Garcia, 1990). In addition, the types of verbs used in open-ended descriptions of self and others have been used to test the assertion that individuals hold privileged information about the self (McGuire & McGuire, 1986). Similarly, language use has been analyzed in studies of attributional bias in relationships (Fiedler, Semin, & Koppetsch, 1991), and researchers inter-

ested in prejudice and stereotyping have used linguistic measures to gain insight into the cognitive representation of outgroups; for example, the words *they* and *we* have been used to activate category-based affect (Dovidio & Gaertner, 1993; see also Hamilton, Gibbons, Stroessner, & Sherman, 1992; Maass & Arcuri, 1992). Researchers have also made use of spontaneous verbalization procedures to investigate self-verification processes, on the assumption that spontaneous verbalization stands as "one means of laying bare the complex processes that mediate people's choice of interaction partners" (Swann, Stein-Seroussi, & Giesler, 1992, p. 399). In parallel fashion, our work examines language use in order to open a "window to the mind," providing a covert and unobtrusive sampling of mental structure. We reasoned that to the extent that a partner is regarded as part of the self, the individual should describe the relationship in more pluralistic terms (i.e., exhibit greater use of first-person plural personal and possessive pronouns such as *we, us, our,* or *ours*). Accordingly, we hypothesized that individuals who are more strongly committed will exhibit greater plural pronoun use in spontaneous verbalizations about their relationships (Hypothesis 1).

Inclusion of Other in the Self

The Inclusion of Other in the Self (IOS) Scale was developed on the assumption that closeness can be conceptualized as overlapping selves, and that the IOS Scale taps the individual's "sense of being interconnected with another" (Aron et al., 1992, p. 598). The IOS Scale is a graphical representation of the self in relation to the partner, consisting of a series of Venn diagrams with varying degrees of overlap. We propose that this sense of interconnectedness—the tendency literally to perceive the self as overlapping with the partner—provides evidence of the state of cognitive interdependence. Accordingly, we hypothesized that individuals who are more strongly committed to their relationships will perceive the partner as more integral to the self (Hypothesis 2).

Centrality of Relationship

Individuals lead multifaceted lives. Close relationships compete for time and energy with professional activities, with other friendships and family relationships, with valued pastimes (e.g., following one's favorite sports team), and with the more mundane events of everyday life (e.g., exercising). To the degree that a relationship is an integral component of the self, the relationship should be regarded as central to the overall scope of life and as integral to what makes life important and meaningful. Thus, the tendency to describe one's relationship as central can be regarded as yet another manifestation of cognitive interdependence (cf. Lin & Rusbult, 1995; Rusbult et al., 1991). In addition to the covert language measure and the graphical IOS measure, we believed it was important to include an overt self-report measure to capture the more conscious and accessible manifestations of cognitive interdependence. Accordingly, we predicted that individuals who are more committed to their relationships will report greater centrality of relationship (Hypothesis 3).

Mediational Role of Commitment

Given that cognitive interdependence is represented as a concomitant of commitment—and given that commitment is assumed to emerge as a consequence of increasing satisfaction, declining alternatives, and increasing investments—we anticipated that commitment level will partially or wholly mediate any associations of satisfaction, alternatives, and investments with cognitive interdependence. That is, although satisfaction, alternatives, and investments may exhibit simple links with cognitive interdependence, when the association with commitment is taken into consideration, simple links with the three bases of dependence will be reduced or eliminated (Hypothesis 4).

Study 1

Study 1 is a cross-sectional survey study that was designed to examine the plausibility of our claim that commitment level is positively associated with three indexes of cognitive interdependence: plural pronoun usage, perceived unity of self and partner, and reported centrality of relationship (Hypotheses 1, 2, and 3). Furthermore, this study sought to assess the mediational role of commitment in the associations of the bases of dependence with cognitive interdependence (Hypothesis 4). In addition, Study 1 included a measure of social desirability, to determine whether our findings were influenced by tendencies toward socially desirable responding.

Method

Participants. Two hundred individuals (123 women, 77 men) involved in a romantic relationship participated in the study in partial fulfillment of the requirements for introductory psychology classes at the University of North Carolina at Chapel Hill. Participants were 20 years old on average; 89% were Caucasian, 9% were African American, and 2% were Asian American or Native American. The median duration of their relationships was 11 months.

Procedure. To maximize the odds of obtaining a diverse sample of ongoing relationships (i.e., relationships of diverse duration and commitment levels), study recruitment sheets included a nebulous title and listed no requirements for participation (i.e., involvement in a romantic relationship was not required). Participants took part in the study in groups of 15 to 35 persons. They were asked to complete a questionnaire concerning a current close relationship. The questionnaire tapped all constructs described below, along with several additional personal dispositions and features of relationships. If participants were currently involved in a romantic relationship, they were instructed to answer study questions with respect to the current romantic partner; if they were not currently involved, participants were instructed to answer the questions in relation to their current best friend. The data from participants describing romantic relationships were included in the analyses reported below ($n = 200$); the data from participants describing best friends ($n = 142$) were not analyzed.[2] After completing the questionnaire, participants were fully debriefed and thanked for their assistance.

Instruments. Using an open-ended, spontaneous thought-listing procedure (cf. Brock, 1967; Greenwald, 1968), we asked participants to record their thoughts about their current relationship. The directions for the thought-listing task asked participants to "share some of your thoughts concerning your relationship." Participants were asked to record "any thoughts you have. . . . They can be positive or negative. . . . For each thought, we ask that you write a complete sentence. Please use one line per thought. . . . You can write as many or as few

thoughts as you'd care to. Keep in mind that there are no right or wrong answers. . . ." To help participants understand the task, four examples were provided—two positive examples and two negative examples, of which two included only plural pronouns (e.g., "We were made for one another") and two included only singular pronouns (e.g., "Sometimes I feel the need for more space"). The examples were counterbalanced in two set orders: one order in which the first example was singular and the last example was plural, and the other in which the first example was plural and the last was singular. In order to maximize the odds that each thought listed by participants would include a subject, and hence, possibly a pronoun, participants were asked to write complete sentences. The instructions were followed by 14 numbered spaces (two lines per space) on which participants were to record their thoughts. After listing their thoughts, participants were asked to rate the positivity versus negativity of each thought (-3 = *extremely negative*, 0 = *neutral*, 3 = *extremely positive*). The questionnaire was self-paced, so participants could spend as much time as they wished recording their thoughts (in fact, participants spent no more than 15 min on this measure). No information was provided about why these verbalizations were requested; participants were not told that their thoughts would be coded for plural pronoun usage. Each thought was later coded by two trained judges. Thoughts were coded as including only plural pronouns (we, us, our), only singular pronouns (I, me, mine), both plural and singular pronouns (e.g., "I think our relationship is good"), or no personal or possessive pronouns (e.g., "The relationship is good"). Interrater reliability was good ($\kappa = .95$). Coding disagreements were discussed and correct codes were determined. Number of plural thoughts (i.e., the number of thoughts that contained only plural pronouns) was used as an indicator of cognitive interdependence.

The IOS Scale was also used to assess cognitive fusion of partner with the self (Aron et al., 1992). The IOS Scale presents seven Venn diagrams representing varying degrees of overlap; one circle is labeled as representing the self, the other circle is labeled as representing the other (or relationship partner). The respondent is asked to select the diagram which "best describes" the relationship. Diagram choices range from completely separate, nonoverlapping circles (1) to nearly complete overlap (7). The IOS Scale was used as a second indicator of cognitive interdependence.

Centrality of relationship was measured with four self-report items: (a) "In comparison to other parts of your life (e.g., work, family, friends, religion), how central is your relationship with your partner?"; (b) "How much time do you spend thinking about your relationship with your partner?"; (c) "Among the things that give your life meaning, how important is your relationship with your partner?"; and (d) "Compared to other aspects of your life, to what degree do events in your

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[2] We did not perform parallel analyses of this best friend sample for two reasons. First, the best friends sample suffers a selection bias in that this group of participants was asked to describe the best friendship solely because they were not currently involved in a romantic relationship. Thus, this group of participants may be qualitatively different from our romantic relationships sample. Second, and more important, many questionnaire items were not well-suited for measuring key constructs in nonromantic relationships, thus limiting direct comparisons of the two types of relationships. For example, in measuring the investment model constructs, all respondents were asked "How likely is it that you will date someone other than your partner within the next year?" Similarly, all respondents were asked "How much do you love your partner?" Clearly these items make little sense for people who are responding about a best friend (in fact, most of the best friend respondents left these items unanswered or replied with a question mark). The method used in Study 2 resolves the problems concerning sampling and question wording and allows for an examination of cognitive interdependence in friendships.

relationship affect your overall feelings of life satisfaction?'' Each item was answered on a 9-point response scale (0 = *other things are of some importance*, 8 = *nothing else is of any importance*). Interitem reliability for the four items was good (α = .82), so an averaged measure of centrality of relationship was computed as a third indicator of cognitive interdependence.

Participants also answered questions concerning commitment level and the three bases of dependence: satisfaction level, quality of alternatives, and investment size. These items were drawn from previous research concerning the investment model (Rusbult, 1983; Rusbult et al., 1991). After conducting initial factor analyses to isolate items that exhibited minimal construct overlap, we selected three items to measure each investment model construct (all measured on a 9-point scale; 0 = *not at all committed*, 8 = *completely committed*). For commitment level, we used the following three items: (a) "For how much longer do you want your relationship to last?"; (b) "Do you feel committed to maintaining your relationship with your partner?"; and (c) "Do you feel attached to your relationship with your partner (like you're "linked" to your partner, whether or not you're happy with the relationship)?" (α = .80). To measure satisfaction level, we used the following items: (a) "All things considered, to what degree do you feel satisfied with your relationship?"; (b) "Taking into account all of the qualities that are most important to you, how does your relationship compare to other people's?"; and (c) "All things considered, how does your relationship compare to your ideal?" (α = .87). For quality of alternatives, we used the following three items: (a) "All things considered, how attractive are the people other than your partner with whom you could become involved?"; (b) "If you weren't dating your current partner, would you do okay—would you find another appealing person to date?"; and (c) "How do your alternatives (dating another, spending time alone, etc.) compare to your relationship with your partner?" (α = .64). Finally, to measure investment size, we used the following items: (a) "Have you put things into your relationship that you would in some sense lose if the relationship were to end (e.g., time spent together, secrets disclosed to one another)?"; (b) "Are there special activities associated with your relationship that you would in some sense lose (or they'd be more difficult) if the relationship were to end (e.g., shared friends, childrearing, recreational activities, job)"; and (c) "How much have you got invested in your relationship—things that you've put into it, things that are tied to it, activities that are connected to it, etc.?" (α = .75). Given that these sets of items exhibited acceptable interitem reliability, an averaged measure of each construct was computed for each participant.

To determine whether any constructs were influenced by the tendency to respond in a socially desirable manner, we also included in the questionnaire a 12-item version of the Marlowe–Crowne Social Desirability Scale (Crowne & Marlowe, 1960; α = .51). The reliability of this instrument was lower than would be ideal but was judged to be acceptable given that this instrument has frequently been used in previous research. Moreover, the present version of the instrument has been shown to exhibit good test–retest reliability (Van Lange et al., 1997).

Results and Discussion

Descriptive statistics. In the relationship-relevant thought-listing task, participants generated between seven and eight thoughts on average (M = 7.52). Plural thoughts represented slightly more than one third of all verbalizations (Ms = 2.62 plural, 4.08 singular, 0.57 both plural and singular, 0.22 no pronoun). An analysis of variance (ANOVA) was performed to determine whether the order of the examples provided for the thought-listing task exerted any impact on the obtained data; this analysis revealed that order did not influence number of plural thoughts, $F(1, 197)$ = 0.93, *ns*. A principal-components

analysis of the three indexes of cognitive interdependence—number of plural thoughts, inclusion of other in the self, and centrality of relationship—revealed a single factor underlying these measures (eigenvalue = 1.71), accounting for 57% of the total variance. Accordingly, we used the derived factor score to develop a single measure from the three separate indexes. This measure is termed total cognitive interdependence (Gorsuch, 1983).[3]

Correlational analyses. Table 1 presents simple correlations among the measures of cognitive interdependence and commitment level. In further support of the assertion that number of plural thoughts, inclusion of other in the self, and centrality of relationship tap a single latent construct, number of plural thoughts was positively correlated with both inclusion of other in the self and centrality of relationship; in addition, inclusion of other in the self was positively correlated with centrality of relationship. Of primary relevance to the present investigation, commitment level was significantly and positively correlated with total cognitive interdependence and with all three indexes of cognitive interdependence.[4] No variables were significantly correlated with the measure of socially desirable response tendencies.[5]

Commitment as mediator of concurrent cognitive interdependence. Given that cognitive interdependence is assumed to be a concomitant of commitment—and given that commitment is

[3] From the relationship-relevant thought-listing task, we also created measures of proportion of positive thoughts and proportion of negative thoughts. In support of the construct validity of our measures of cognitive interdependence, number of plural thoughts, inclusion of other in the self, and centrality of relationship were positively correlated with proportion of positive thoughts (rs = .27, .36, and .36, all ps < .01) and were negatively correlated with proportion of negative thoughts (rs = -.23, -.30, and -.34, all ps < .01). Also, commitment level was positively correlated with proportion of positive thoughts (r = .39) and was negatively correlated with proportion of negative thoughts (r = -.40, all ps < .01).

[4] In addition to analyses on number of plural thoughts, we also performed analyses using a measure of proportion of plural thoughts (number of plural thoughts/number of total thoughts) and obtained similar correlational results: .15 association with commitment level, .25 with IOS, and .15 with relationship centrality (all ps < .05). In addition, commitment was positively correlated with the total number of thoughts listed (r = .15, p < .05) and was negatively correlated with the number of no-pronoun thoughts (r = -.23, p < .05).

[5] We also performed analyses of variance to determine whether mean levels of the Table 1 variables differed for women and men. Three significant sex differences were observed: In comparison with men, women exhibited greater number of plural thoughts (Ms = 2.14 vs. 1.91), $F(1, 198)$ = 4.95, p < .05; centrality of relationship (Ms = 4.93 vs. 5.34), $F(1, 199)$ = 4.13, p < .05; and commitment level (Ms = 5.43 vs. 6.42), $F(1, 196)$ = 13.20, p < .01. It is important to note that the correlational analyses displayed in Table 1 were calculated separately for women and men. Comparisons of the strength of these paired correlations revealed that no correlations differed significantly as a function of participant sex. Thus, sex of participant does not appear to have exerted substantively meaningful effects on the obtained findings. In addition, the correlational analyses were calculated separately for the two order conditions in the relationship-relevant thought-listing task. No correlations differed significantly as a function of order (one pair differed marginally). Thus, order of examples does not appear to have exerted substantively meaningful effects on the findings.

Table 1

Means, Standard Deviations, and Correlations Among the Cognitive Interdependence Measures and Commitment Level: Study 1

Variable	M	SD	Variable				
			1	2	3	4	5
1. Total cognitive interdependence	0.00	1.00	—				
2. Number plural thoughts	2.62	2.40	.50**	—			
3. Inclusion of Other in the Self	4.72	1.64	.86**	.22**	—		
4. Centrality of relationship	5.18	1.36	.85**	.20**	.59**	—	
5. Commitment level	6.04	1.91	.66**	.16*	.56**	.65**	—

$*p < .05.$ $**p < .01.$

assumed to emerge as a consequence of increasing satisfaction, declining alternatives, and increasing investments—Hypothesis 4 predicted that commitment level would partially or wholly mediate any associations of satisfaction, alternatives, and investments with cognitive interdependence. That is, we anticipated that although satisfaction, alternatives, and investments might exhibit simple links with cognitive interdependence, when the association with commitment is taken into consideration, links with the three bases of dependence should be reduced or eliminated. To test Hypothesis 4, we performed mediational analyses (cf. Baron & Kenny, 1986), along with accompanying model comparison tests (Cramer, 1972).

To test for mediation, we proceeded in four steps. First, the presumed distal causes (i.e., the three bases of dependence: satisfaction, alternatives, and investments) were found to be significantly associated with the presumed mediator, commitment ($R^2 = .45$, $p < .01$). Second, the presumed mediator, commitment, was found to be significantly associated with the criterion, total cognitive interdependence ($R^2 = .43$, $p < .01$) and with all three indexes of cognitive interdependence (see Table 1 and Table 2, Model 1). Third, we tested an unmediated multiple regression model in which total cognitive interdependence was regressed simultaneously onto the three bases of

Table 2

Regression Analyses Predicting Concurrent Cognitive Interdependence: Study 1

Total cognitive interdependence	Coefficients	Overall regression model		
	β	R^2	F	df
Model 1		.43	143.69**	1, 190
Commitment level	.66**			
Model 2		.45	50.66**	3, 188
Satisfaction level	.43**			
Quality of alternatives	−.05			
Investment size	.34**			
Model 3		.51	49.15**	4, 187
Commitment level	.37**			
Satisfaction level	.26**			
Quality of alternatives	.01			
Investment size	.22**			

Note. β = standardized regression coefficient.
$**p < .01.$

dependence. The total variance accounted for by this three-variable unmediated model was substantial ($R^2 = .45$, $p < .01$; see Model 2 in Table 2). Finally, we tested a mediated multiple regression model in which total cognitive interdependence was regressed simultaneously onto the three bases of dependence plus commitment ($R^2 = .51$, $p < .01$; see Model 3 in Table 2). Results from these analyses indicate that the total amount of variance in total cognitive interdependence accounted for by the three bases of dependence was markedly reduced, but not eliminated, in the presence of commitment (partial R^2 for the bases of dependence = .08), $F_{\text{diff}}(3, 187) = 10.40$, $p < .01$.

Parallel analyses and model comparisons were performed for the three individual indexes of cognitive interdependence. These analyses revealed similar findings. Comparisons of unmediated three-variable with mediated four-variable models revealed that the total amount of variance accounted for by the three bases of dependence was markedly reduced but not eliminated in predicting number of plural thoughts (partial $R^2 = .05$ for the bases of dependence), $F_{\text{diff}}(3, 191) = 3.84$, $p < .01$, inclusion of other in the self (partial $R^2 = .08$), $F_{\text{diff}}(3, 191) = 8.05$, $p < .01$, and centrality of relationship (partial $R^2 = .05$), $F_{\text{diff}}(3, 191) = 5.17$, $p < .01$. Thus, in predicting concurrent cognitive interdependence, satisfaction, alternatives, and investments contribute significant unique variance beyond the variance accounted for by commitment. Commitment only partially mediated the associations of the bases of dependence with cognitive interdependence.

Overall, the results of Study 1 demonstrate that commitment to a romantic relationship is associated with several indexes of cognitive interdependence. The stronger the individual's reported experience of commitment, the greater is the tendency to think about the relationship in a pluralistic, other-inclusive manner, as reflected in the spontaneous use of plural pronouns to describe the relationship (Hypothesis 1). In addition, greater commitment was associated with greater overlap in mental representations of the self and the partner (Hypothesis 2). This finding is consistent with research reported by Aron et al. (1992), in which commitment was found to correlate strongly with the IOS ($r = .54$ for wives and .51 for husbands). Commitment level was also associated with tendencies to regard the relationship as a relatively central component of that which is important in life (Hypothesis 3). These findings do not appear to have been influenced by individuals' tendencies to describe

themselves in a socially desirable manner; no study variables were associated with tendencies toward socially desirable responding. Finally, we found that commitment partially, but not fully, mediated the association of the bases of dependence with cognitive interdependence (partially confirming Hypothesis 4).

Study 2

Study 2 was conducted to examine the robustness and generalizability of the Study 1 findings. Studies 1 and 2 differed in two primary respects. First, half of the participants in Study 2 were randomly assigned to a condition that involved asking them to describe a romantic relationship, and half were asked to describe a best friendship. The friendship data were obtained to ascertain whether cognitive interdependence is a concomitant of both romantic commitment and friendship commitment. Previous research has demonstrated that the associations of the bases of dependence with commitment generally are significant for both romantic relationships and friendships, although these effects tend to be stronger in romantic relationships (e.g., Rusbult, 1980b; Lin & Rusbult, 1995). Moreover, given that romantic relationships tend to be closer and more exclusive than friendships, it seems plausible that the association of commitment with cognitive interdependence might be stronger in romantic relationships than in friendships. However, we did not advance a priori predictions in this regard—the analyses of best friend relationships were performed for exploratory purposes.

Second, in Study 2, we obtained data at two points in time in order to demonstrate that the cross-sectional findings observed in Study 1 were not merely the product of transitory mood states or self-report bias (e.g., self-presentation concerns or desire to appear consistent). Longitudinal designs make it less plausible that mood state accounts for links between Time 1 and Time 2 variables, particularly if one makes the reasonable assumption that there is considerable day-to-day variation in mood. Whereas in cross-sectional designs it is possible that mood states account for some links (e.g., a positive mood might increase overall relationship-enhancing judgments), this type of spurious association becomes less likely with a longitudinal design. We anticipated that the associations among variables predicted in Hypotheses 1, 2, and 3 would be evident not only in concurrent analyses, but also in lagged analyses.

The design of Study 2 also allowed us to examine possible reciprocal associations among variables. Previously we suggested that as individuals become increasingly dependent on their relationships, the psychological experience of commitment is strengthened. At the same time, individuals develop couple-oriented identity and pluralistic representations of the self-in-relationship, coming to regard themselves as part of a collective unit that includes the partner. This mental concomitant of commitment is assumed to play a role in the transformation of motivation, instigating prorelationship motives and behavior by increasing the accessibility of the partner and the relationship. Given that key processes in ongoing relationships unfold over extended periods of time, prorelationship acts are likely to exert reciprocal effects on commitment and the bases of dependence. For example, earlier investments may increase commitment, which is accompanied by enhanced cognitive interdependence, which in turn induces prorelationship acts such as willingness

to sacrifice, which in turn may affect perceived investment, which in turn strengthens commitment, and so on, in a congenial pattern of cyclical mutual growth. Given that cognitive interdependence is represented as a concomitant of commitment, and in light of our assumption that these variables operate in a pattern of cyclical mutual growth, we hypothesized that (a) earlier commitment level will be associated with change over time in level of cognitive interdependence and (b) earlier cognitive interdependence will be associated with change over time in level of commitment (Hypotheses 1a, 2a, and 3a).

The longitudinal nature of Study 2 also allowed us to examine the mediating role of commitment in predicting change over time in cognitive interdependence. Hypothesis 4 predicted that commitment level would partially or wholly mediate any associations of satisfaction, alternatives, and investments with cognitive interdependence. Study 2 allowed us to examine this hypothesis over time, to determine whether the links that the bases of dependence might have with cognitive interdependence are reduced or eliminated when the association with commitment is taken into consideration and when earlier cognitive interdependence is controlled (Hypothesis 4a).

Method

Participants and procedure. Seventy-six individuals participated in the study as part of a psychology class exercise at Purdue University (54 women, 22 men). Participants were 21 years old on average; 90% were Caucasian, 4% were Asian American, 3% were African American, and 3% were Hispanic. Participants completed questionnaires during class time; if a participant needed additional time to complete the questionnaire, he or she was allowed to take the questionnaire home and return it at the next class meeting.

Participants were randomly assigned to either the romantic relationships condition or the best friends condition. In the romantic relationships condition, participants were asked to complete a questionnaire concerning a current romantic relationship; if they were not currently involved they were asked to describe their most recent romantic relationship (data from this latter group were not analyzed due to obvious qualitative differences between current versus former romantic involvements). In the best friends condition, participants were asked to complete a parallel questionnaire concerning the best friend, defined as "someone other than your current romantic relationship partner, even though you may consider your boyfriend or girlfriend to be your best friend."

Romantic relationship data were obtained from 37 participants (excluding those who were not currently involved), and best friendship data were obtained from 39 participants. The median duration of the romantic relationships was 18 months, and the median duration of the best friend relationships was 36 months. About 6 weeks after completing Time 1 questionnaires, participants completed Time 2 questionnaires with respect to the same relationship described at Time 1 (again, these data were obtained during class time). After completing the Time 2 questionnaire, participants were fully debriefed and thanked for their assistance.

Instruments. Our measures of cognitive interdependence largely paralleled those obtained in Study 1. The open-ended thought-listing procedure from Study 1 was again used in Study 2 to covertly assess the number of plural thoughts. Given that no order effects were observed for the Study 1 data, the examples provided in the Study 2 instructions were presented in a standard order. As in Study 1, after listing their thoughts, participants were asked to rate the relative positivity or negativity of each thought. Each thought was later coded by two trained undergraduate research assistants. Thoughts were coded

as including only plural pronouns, only singular pronouns, both plural and singular pronouns, or no personal or possessive pronouns. Interrater reliability was good (κ = .98). Coding disagreements were discussed and correct codes were determined. As in Study 1, the IOS Scale was used to assess cognitive fusion of partner with the self. Centrality of relationship was measured with four self-report items, worded as appropriate for the romantic relationship and best friend conditions (e.g., "I spend a lot of time thinking about my relationship with my partner [friend]"; 0 = *do not agree at all*, 8 = *agree completely*). Interitem reliability for the four items was good (for romantic relationships, Times 1 and 2, α = .88 and .92, respectively; for best friends, Times 1 and 2, α = .75 and .87, respectively), so an averaged measure of centrality of relationship was computed for both types of relationships for both Time 1 and Time 2.

Participants also answered questions concerning commitment and the three bases of dependence. In keeping with one of the goals of this study, special efforts were made to construct friendship-specific investment model measures (see Footnote 2). To that end, all of the items described below substituted the word *friend* for *partner* and the word *friendship* for *relationship*, in addition to other minor word changes in order to make each item sensible in the context of friendships. Following initial item analyses conducted to ensure maximum construct differentiation, three to four items were selected to measure each construct (all measured on a 9-point scale, with 0 = *do not agree at all*, 8 = *agree completely*). Commitment level was measured with the following three items: (a) "I want our relationship to last for a very long time," (b) "I am committed to maintaining my relationship with my partner," and (c) "I feel very attached to our relationship—very strongly linked to my partner." For romantic relationships, Times 1 and 2, α = .97 and .95, respectively; for best friends, Times 1 and 2, α = .79 and .84, respectively. Satisfaction level was also measured with three items: (a) "I feel satisfied with our relationship," (b) "My relationship is much better than others' relationships," and (c) "My relationship is close to ideal." For romantic relationships, Times 1 and 2, α = .87 and .91, respectively; for best friends, Times 1 and 2, α = .84 and .86, respectively. Quality of alternatives was measured with four items: (a) "If I weren't dating my partner, I would do fine—I would find another appealing person to date," (b) "The people other than my partner with whom I might become involved are very appealing," (c) "My alternatives to our relationship are close to ideal (dating another person, spending time with friends or on my own, etc.)," and (d) "My alternatives are attractive to me (dating another person, spending time with friends or on my own, etc.). For romantic relationships, Times 1 and 2, α = .80 and .84, respectively; for best friends, Times 1 and 2, α = .88 and .65, respectively. Investment size was also measured with four items: (a) "I have put a great deal into my relationship that I would lose if the relationship were to end," (b) "Many aspects of my life have become linked to my partner (recreational activities, etc.) and I would lose all of this if we were to break up," (c) "My relationship with friends and family members would be complicated if my partner and I were to break up (e.g., partner is friends with people I care about)," and (d) "Compared to other people I know, I have invested a great deal in my relationship with my partner." For romantic relationships, Times 1 and 2, α = .74 and .81, respectively; for best friends, Times 1 and 2, α = .53 and .71, respectively. In general, each set of items exhibited acceptable interitem reliability, so an averaged measure of each variable was computed for Time 1 and Time 2.[6] In light of the low reliability for the Time 1 investment size items in the best friends condition, an averaged measure of this construct was not computed; instead, we used a single item judged to best assess the construct (i.e., investment item "a" listed above). Because of the absence of associations with socially desirable response tendencies in Study 1, in Study 2 we did not administer an instrument to measure this construct.

Results and Discussion

Descriptive statistics. In the romantic relationships thought-listing task, participants generated 8.46 thoughts on average at Time 1 and 6.62 thoughts at Time 2. Plural thoughts represented 46% of all Time 1 verbalizations (*M*s = 3.86 plural, 3.41 singular, 0.84 both plural and singular, 0.35 no pronoun) and represented 42% of all Time 2 verbalizations (*M*s = 2.78 plural, 3.05 singular, 0.57 both plural and singular, 0.22 no pronoun). In the best friends thought-listing task, participants generated 7.13 thoughts on average at Time 1 and 5.79 thoughts at Time 2. Plural thoughts represented 56% of all Time 1 verbalizations (*M*s = 3.97 plural, 2.46 singular, 0.36 both plural and singular, 0.33 no pronoun), and represented 57% of all Time 2 verbalizations (*M*s = 3.28 plural, 1.95 singular, 0.36 both plural and singular, 0.21 no pronoun). A principal-components analysis of the Time 1 indexes of cognitive interdependence—number of plural thoughts, inclusion of other in the self, and centrality of relationship—revealed a single factor underlying these measures for the romantic relationships sample (eigenvalue = 2.27), accounting for 76% of the total variance. Similarly, analysis of the Time 2 indexes revealed a single factor underlying the measures (eigenvalue = 1.96), accounting for 65% of the variance. In contrast, a single reliable factor could not be derived for the friendship sample at either time period (i.e., the three items did not all load highly on a single factor). Accordingly, we used the derived factor scores to develop Time 1 and Time 2 measures of total cognitive interdependence for the romantic relationships sample only.[7]

Concurrent correlational analyses. Table 3 presents synchronous correlations among measures for both romantic relationships and friendships. For romantic relationships at Time 1 and Time 2, number of plural thoughts was positively correlated

Table 3
Means, Standard Deviations, and Correlations Among Measures Analyzed Separately for Romantic Relationships and Friendships at Time 1 and Time 2: Study 2

| | Time 1 | | Variable | | | | |
Variable	M	SD	1	2	3	4	5
			Romantic relationships sample				
Time 2 M			0.00	2.78	4.03	5.34	6.20
Time 2 SD			1.00	2.17	1.64	1.99	2.25
1. Total cognitive interdependence	0.00	1.00	—	.62**	.90**	.86**	.85**
2. Number plural thoughts	3.86	2.93	.79**	—	.38*	.30†	.38*
3. Inclusion of Other in Self	4.03	1.57	.91**	.55**	—	.71**	.75**
4. Centrality of relationship	5.26	1.96	.91**	.55**	.78**	—	.87**
5. Commitment level	6.18	2.39	.75**	.40**	.68**	.85**	—
			Best friends sample				
Time 2 M				3.28	4.16	4.43	6.92
Time 2 SD				2.53	1.52	1.51	1.04
2. Number plural thoughts	3.97	3.09		—	.07	.10	.22
3. Inclusion of Other in Self	4.13	1.40		.09	—	.72**	.59**
4. Centrality of relationship	4.04	1.30		.03	.32*	—	.54**
5. Commitment level	7.16	0.84		−.02	.39**	.12	—

Note. Time 1 correlations are displayed below the diagonal; Time 2 correlations are above the diagonal.
† *p* < .10 (marginally significant). * *p* < .05. ** *p* < .01.

with inclusion of other in the self and centrality of relationship, and inclusion of other in the self was positively correlated with centrality of relationship (one effect was marginal at Time 2). Consistent with Hypotheses 1, 2, and 3, at Time 1 and Time 2, commitment level was significantly positively correlated with all three indexes of cognitive interdependence.[8]

Table 3 also presents synchronous correlations among all measures for the best friends sample: As anticipated, at Time 1 and Time 2, inclusion of other in the self was positively correlated with centrality of relationship; however, number of plural thoughts was not significantly correlated with either inclusion of other in the self or centrality of relationship. Commitment was significantly correlated with inclusion of other in the self at Time 1 and Time 2 and was significantly correlated with centrality of relationship at Time 2; however, the remaining three correlations of cognitive interdependence indexes with commitment were nonsignificant.

Lagged correlational analyses. We also calculated lagged correlations among all measures for both romantic relationships and friendships. These data provide good support for the test–retest reliability of our measures: For both romantic relationships and friendships, the Time 1 measure of each construct was significantly correlated with the Time 2 measure of that construct—for number of plural thoughts (*r*s = .51 and .57), inclusion of other in the self (.77 and .54), centrality of relationship (.85 and .47), commitment level (.90 and .45), satisfaction level (.81 and .43), quality of alternatives (.80 and .52), and investment size (.78 and .58; all *p*s < .01). In addition, for romantic relationships, the Time 1 and Time 2 measures of total cognitive interdependence were strongly correlated (*r* = .86, *p* < .01).

The lagged correlational analyses also revealed that in romantic relationships, Time 1 commitment was significantly corre-

lated with Time 2 measures of number of plural thoughts, inclusion of other in the self, and centrality of relationship (*r*s = .40, .78, and .80); also, the Time 1 measures of cognitive interdependence were significantly correlated with Time 2 commitment level (*r*s = .53, .72, and .86; all *p*s < .05). However, parallel lagged associations were nonsignificant in friendships (*r*s ranged from .02 to .19, all *ns*).

Thus, synchronous and lagged correlational findings for romantic relationships generally were congruent with expectations, but findings for best friend relationships did not conform to the same pattern: (a) the three indexes of cognitive interdependence consistently were correlated with one another in romantic relationships (12 of 12 effects significant or marginal) but not in friendships (2 of 12 effects significant); (b) the three indexes of cognitive interdependence were consistently correlated with commitment in romantic relationships (12 of 12 effects significant) but not in friendships (3 of 12 effects significant); and (c) the three indexes of cognitive interdependence were consistently correlated with satisfaction, alternatives, and investments in romantic relationships (36 of 36 effects significant or marginal) but not in friendships (10 of 36 effects

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[8] In addition to analyses on number of plural thoughts, we also performed analyses using a measure of proportion of plural thoughts (number of plural thoughts/number of total thoughts) and obtained similar correlational results: At Time 1, .34 association with commitment level, .32 with IOS, and .33 with relationship centrality (all *p*s < .05); At Time 2, .35 association with commitment level (*p* < .05), .30 with IOS (*p* < .05), and .29 with relationship centrality (*p* < .10). In addition, commitment was found to be positively correlated with the total number of thoughts listed (*r* = .33 at Time 1 and .32 at Time 2, both *p*s < .05) and was negatively correlated with the number of no-pronoun thoughts (*r* = −.39 at Time 1 and −.31 at Time 2, both *p*s < .05).

significant or marginal). Comparisons of the strength of the synchronous and lagged correlations (excluding the test–retest correlations) revealed that 45 of 84 correlations were significantly stronger in romantic relationships than in best friend relationships.[9]

The correlational results of Study 2 demonstrate that commitment to a romantic relationship is associated with several indexes of cognitive interdependence, in both concurrent and lagged analyses. The stronger the individual's reported experience of commitment to his or her romantic relationship, the greater is the tendency to think about the relationship in a pluralistic manner, as reflected in the spontaneous use of plural pronouns to describe the relationship (Hypothesis 1). In addition, greater romantic commitment was associated with greater overlap in mental representations of the self and the partner (Hypothesis 2). Moreover, romantic commitment was associated with tendencies to regard the relationship as a relatively central component of that which is important in life (Hypothesis 3). Such effects were weak or nonsignificant for best friend relationships. These findings suggest that the cognitive manifestations of commitment characterizing romantic relationships by and large are not evident (or are only weakly evident) in mental representations of best friend relationships. Accordingly, the remaining Study 2 hypothesis tests were performed only for the romantic relationship sample.

Predicting change over time in commitment and cognitive interdependence. Given that cognitive interdependence is assumed to be a concomitant of commitment—and in light of our assumption that these variables operate in a pattern of reciprocal influence—Hypotheses 1a, 2a, and 3a predicted that (a) Time 1 commitment level would be associated with change over time in cognitive interdependence and (b) Time 1 cognitive interdependence would be associated with change over time in commitment. To test these predictions, we first regressed Time 2 total cognitive interdependence onto Time 1 commitment and the Time 1 measure of total cognitive interdependence (cf. Finkel, 1995; Plewis, 1985). This type of analysis examines change over time in cognitive interdependence, predicting Time 2 levels of the criterion while controlling for Time 1 levels of the criterion.

The results of analyses predicting change in total cognitive interdependence are summarized in Table 4 (see Model 1). Not surprisingly, Time 2 total cognitive interdependence was significantly predicted by Time 1 total cognitive interdependence. However, above and beyond that which would be expected on the basis of Time 1 total cognitive interdependence, Time 1 commitment was significantly predictive of Time 2 total cognitive interdependence; that is, earlier feelings of commitment predicted change over time in degree of cognitive interdependence. In addition to performing this analysis for total cognitive interdependence, we performed parallel analyses for each of the three indexes of cognitive interdependence. Parallel findings were observed for the three individual indexes: Time 1 commitment predicted significant change over time in inclusion of other in the self ($\beta = .40, p < .01$) and in centrality of relationship ($\beta = .31, p < .05$), and predicted marginally significant change over time in number of plural thoughts ($\beta = .24, p < .11$). These findings provide good support for the claim that earlier

Table 4

Regression Analyses Predicting Change Over Time in Cognitive Interdependence: Study 2 Romantic Relationships

Time 2 total cognitive interdependence	Coefficients	Overall regression model		
	β	R^2	F	df
Model 1		.80	66.47**	2, 34
Time 1 cognitive interdependence	.46**			
Time 1 commitment level	.49**			
Model 2		.77	26.31**	4, 32
Time 1 cognitive interdependence	.39*			
Time 1 satisfaction level	.38*			
Time 1 quality of alternatives	−.05			
Time 1 investment size	.14			
Model 3		.81	26.47**	5, 31
Time 1 total cognitive interdependence	.41**			
Time 1 commitment level	.52**			
Time 1 satisfaction level	.00			
Time 1 quality of alternatives	.10			
Time 1 investment size	.16			

Note. β = standardized regression coefficient.
* $p < .05$. ** $p < .01$.

feelings of commitment are associated with change over time in degree of cognitive interdependence.

To examine the possibility of reciprocal associations, we regressed Time 2 commitment level onto Time 1 total cognitive interdependence, controlling for Time 1 commitment level. Not surprisingly, Time 2 commitment level was significantly predicted by Time 1 commitment level ($\beta = .68, p < .01$). However, above and beyond that which would be expected on the basis of Time 1 commitment, Time 1 total cognitive interdependence was significantly predictive of Time 2 commitment level ($\beta = .29, p < .01$), that is, earlier cognitive interdependence predicted change over time in the psychological experience of commitment. Parallel findings were observed for the three individual indexes of cognitive interdependence: Change over time in commitment was significantly predicted by Time 1 number of plural thoughts and by Time 1 centrality of relationship (βs = .20 and .31, both ps < .03) and was marginally predicted by Time 1 inclusion of other in the self ($\beta = .17, p < .09$). These findings demonstrate not only that (a) earlier commitment is associated with change over time in level of cognitive interde-

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[9] We also performed analyses of variance to determine whether mean levels of commitment or the cognitive interdependence variables within either time period differed for romantic relationships and best friend relationships. We observed two significant differences and one marginal difference as a function of relationship type: In comparison to descriptions of best friend relationships, descriptions of romantic relationships exhibited greater centrality of relationship at both Time 1 ($Ms = 4.04$ vs. 5.26), $F(1, 73) = 10.07, p < .01$, and Time 2 ($Ms = 4.43$ vs. 5.34), $F(1, 73) = 5.01, p < .05$, and marginally lower commitment level at Time 2 ($Ms = 6.92$ vs. 6.20), $F(1, 74) = 3.58, p < .10$.

pendence but also that (b) earlier cognitive interdependence is associated with change over time in strength of commitment (Hypotheses 1a, 2a, and 3a).

Commitment as mediator of change over time in cognitive interdependence. Given that cognitive interdependence is assumed to be a concomitant of commitment—and given that commitment is assumed to emerge as a psychological consequence of increasing satisfaction, declining alternatives, and increasing investments—Hypothesis 4a predicted that commitment level would partially or wholly mediate any associations of satisfaction, alternatives, and investments with cognitive interdependence, after taking into consideration earlier cognitive interdependence. That is, we anticipated that although satisfaction, alternatives, and investments might exhibit simple links with cognitive interdependence, when the association with commitment and earlier cognitive interdependence are taken into consideration, links with the three bases of dependence should be reduced or eliminated. To test Hypothesis 4a, we performed mediation analyses of change, along with accompanying model comparison tests.

As in Study 1, to test for mediation, we proceeded in four steps. First, the presumed distal causes (i.e., the three bases of dependence: Time 1 satisfaction, Time 1 alternatives, and Time 1 investments) were found to be significantly associated with the presumed mediator, Time 1 commitment ($R^2 = .84$, $p < .01$). Second, the presumed mediator, Time 1 commitment, was found to be significantly associated with the criterion, Time 2 total cognitive interdependence, controlling for Time 1 cognitive interdependence (partial $R^2 = .09$, $p < .01$; see Model 1 in Table 4) and with all three Time 2 indexes of cognitive interdependence (for number of plural thoughts, partial $R^2 = .16$, $p < .01$; for inclusion of other in the self, partial $R^2 = .12$, $p < .01$; for centrality of relationships, partial $R^2 = .10$, $p < .01$). We then tested an unmediated multiple regression model in which Time 2 total cognitive interdependence was regressed simultaneously onto Time 1 total cognitive interdependence (so as to examine change over time in the criterion), along with the three Time 1 bases of dependence. The total variance accounted for by this four-variable unmediated model was substantial (see Model 2 in Table 4). Finally, we tested a mediated multiple regression model in which Time 2 total cognitive interdependence was regressed simultaneously onto Time 1 total cognitive interdependence, the three Time 1 bases of dependence and Time 1 commitment (see Model 3 in Table 4). Results from these analyses indicated that the three Time 1 bases of dependence accounted for virtually no variance in Time 2 total cognitive interdependence in the presence of Time 1 commitment; partial R^2 for the bases of dependence $= .01$, $F_{diff}(3, 31) = 0.65$, *ns.* Thus, in predicting change in cognitive interdependence, the bases of dependence (satisfaction, alternatives, and investments) did not contribute significant unique variance beyond the variance accounted for by commitment.

Parallel change analyses and model comparisons were performed for the three individual indexes of cognitive interdependence. These analyses revealed similar findings. Comparisons of unmediated four-variable to mediated five-variable models revealed that the three Time 1 bases of dependence did not contribute a significant amount of variance when Time 1 commitment was included in the model: for number of plural

thoughts, partial $R^2 = .06$ for the bases of dependence, $F_{diff}(3, 31) = 0.98$, *ns;* for inclusion of other in the self, partial $R^2 = .05$, $F_{diff}(3, 31) = 2.07$, *ns;* and for centrality of relationship, partial $R^2 = .02$, $F_{diff}(3, 31) = 0.90$, *ns.* Across these three analyses, the coefficients for satisfaction, alternatives, and investments typically were nonsignificant: Only one of nine coefficients was significant (in predicting inclusion of other in the self, satisfaction $\beta = .26$, $p < .05$; all others *ns*). Thus, in predicting change in cognitive interdependence, the three bases of dependence did not contribute significant unique variance beyond the variance accounted for by commitment. These findings provide good support for Hypothesis 4a, which predicted that commitment would mediate the associations of satisfaction, alternatives, and investments with cognitive interdependence.

In light of the assumed reciprocal associations of commitment with cognitive interdependence, it is also reasonable to test whether cognitive interdependence mediates the associations of the bases of dependence with commitment. Accordingly, we performed analyses paralleling those reported above, regressing Time 2 commitment onto Time 1 commitment, along with the Time 1 measures of total cognitive interdependence, satisfaction, alternatives, and investments. The results of these analyses generally were parallel to those reported above. In predicting Time 2 commitment, a model containing Time 1 commitment, the three Time 1 bases of dependence, and Time 1 cognitive interdependence did not account for significant variance beyond a model containing only Time 1 commitment and Time 1 cognitive interdependence: respective $R^2 = .843$ vs. $.841$; partial $R^2 = .002$, for the bases of dependence, $F_{diff}(3, 31) = 0.12$, *ns.* Consistent findings were obtained for the three indexes of cognitive interdependence. Model comparison procedures to determine whether Time 1 satisfaction, alternatives, and investments contributed unique variance above and beyond the various Time 1 cognitive interdependence indexes in predicting Time 2 commitment clearly indicated that earlier satisfaction, alternatives, and investments did not contribute significant unique variance beyond the variance accounted for by earlier cognitive interdependence.[10]

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[10] We performed additional analyses to determine whether commitment mediated the associations of the three bases of dependence with cognitive interdependence within Time 1 and within Time 2 (cross-sectional mediational analyses), as well as in simple lagged analyses (i.e., lagged mediational analyses, not controlling for the level of the criterion at Time 1). Analyses for total cognitive interdependence and the three separate indexes revealed parallel findings for both the Time 1 and Time 2 cross-sectional analyses: (a) the three bases of dependence accounted for significant variation in commitment; (b) commitment was significantly associated with cognitive interdependence; (c) in simultaneous, unmediated multiple regression models, the three bases of dependence account for significant variation in cognitive interdependence; and (d) in simultaneous, mediated multiple regression models (i.e., including commitment), the three bases continued to account for significant variation in cognitive interdependence. Model comparison tests indicated that the total amount of variance in cognitive interdependence accounted for by the bases of dependence was markedly reduced but not eliminated in the presence of commitment. Combined with the results from Study 1, these findings suggest that commitment only partially mediates the associations of the bases of dependence with cognitive interdependence in concurrent analyses.

In contrast, results from the lagged mediational analyses (i.e., not

General Discussion

Two studies—a cross-sectional survey study and a two-wave longitudinal study—yielded results that are congruent with an interdependence analysis of commitment processes. For romantic involvements, cognitive interdependence appears to increase hand-in-hand with increases in commitment level. The more romantically committed individuals become, the greater is the tendency to think about the relationship in a pluralistic, other-inclusive manner, as reflected in the spontaneous use of plural pronouns to describe oneself and one's relationship (Hypothesis 1). In addition, the more romantically committed individuals become, the more they come to regard themselves as blended with the partner, as revealed in perceived overlap in mental representations of self and partner (Hypothesis 2). Furthermore, romantically committed individuals tend to regard their relationships as relatively central to who they are and what their lives are about, as an essential component of that which is important and meaningful in life (Hypothesis 3).

It is important to note that the results of Study 2 demonstrate that in romantic relationships, the effects of commitment and cognitive interdependence are reciprocal: Earlier commitment is significantly associated with increases over time in levels of cognitive interdependence, and earlier cognitive interdependence is significantly associated with increases over time in commitment level (Hypotheses 1a, 2a, and 3a). We anticipated such reciprocal causal associations, in that key processes in ongoing involvements unfold over extended periods of time. For example, earlier investments may increase commitment, which is accompanied by enhanced cognitive interdependence, which in turn induces prorelationship acts such as willingness to sacrifice, which in turn may affect perceived investment, which in turn strengthens commitment, and so on. Such cyclical patterns could have considerable adaptive value in the context of a generally healthy ongoing involvement. Although the field of social psychology has tended to emphasize models of unidirectional cause and effect, we believe that models of mutual cyclical influence may be a more suitable means of understanding causal processes in ongoing relationships.

In contrast to our findings for romantic relationships, for best friend relationships, the link between cognitive interdependence and commitment appears to be weak and inconsistent. These divergent findings may have emerged for the reasons outlined in

our earlier speculation regarding differences between romantic involvements and friendships: It is possible that romantic relationships tend to be closer than friendships and that because of the lower base rate of closeness in friendships, the emergence of cognitive interdependence is rare or unreliable. Alternatively, it is possible that cognitive interdependence plays a role (presumably, largely an unconscious role) in sustaining exclusivity. That is, a pluralistic, collective representation of the self-in-relationship may help committed individuals block or drive away challenging alternatives who otherwise might threaten the stability of a relationship. Given that exclusivity tends to be less essential in friendships—even in "best friendships"—the functional need for an exclusivity-sustaining mechanism may be considerably lower in friendships than in romantic relationships (cf. Fehr, 1996). Finally, the reliable emergence of cognitive interdependence in romantic relationships may result from the prominence of sexuality in such involvements. It would not be surprising if mental images of "we-ness," merging, and union were more accessible in relationships wherein sexuality plays a prominent role. These possible reasons for the differences found between romantic relationships and friendships are speculative and await examination in future research.

Beyond the above-noted findings, romantic commitment was shown to be associated with several additional measures derived from the spontaneous thought-listing data (see Footnotes 3, 4, 7, and 8): More committed individuals hold a greater proportion of positive thoughts and fewer negative thoughts regarding their relationships. These results presumably reflect tendencies toward perceived superiority, or positive illusion (cf. Van Lange & Rusbult, 1995; Martz et al., in press), a tendency that frequently is measured using a thought-listing procedure comparing the frequencies of positive and negative thoughts regarding one's own and others' relationships. The present results complement and extend prior findings, in that even in the absence of instructions to list positive and negative thoughts about relationships, our open-ended measurement technique revealed that individuals with strong commitment are prone to view their relationships in a rosy, relationship-enhancing manner.

Romantic commitment was also positively correlated with total number of relationship-relevant thoughts, and was negatively correlated with number of no-pronoun thoughts. These findings suggest that low levels of commitment may be accompanied by cognitive representations that are rather minimal and impersonal. That is, on a continuum representing variations from low to high cognitive interdependence, low interdependence may be cognitively represented not so much in terms of low collectivism and low other–self fusion, but rather in terms of no representation whatsoever. Low-commitment individuals may simply not think about their relationships (i.e., they exhibit few relationship-relevant thoughts), and when they do think about their relationships, they may do so in an impersonal manner that is relatively divorced from both the self and the partner (i.e., they exhibit numerous no-pronoun thoughts).

Although commitment level was significantly predictive of all three indexes of cognitive interdependence, links with commitment were weaker for plural pronoun usage than for inclusion of other in the self and for centrality of relationship. We believe that these less robust effects may be a function of the subtle, covert measurement approach used to assess partici-

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controlling for the level of the criterion at Time 1) revealed that Time 1 commitment mediated the association of the three Time 1 bases of dependence with the various indexes of Time 2 cognitive interdependence. In these analyses (a) the three Time 1 bases of dependence accounted for significant variation in Time 1 commitment; (b) Time 1 commitment was significantly associated with Time 2 cognitive interdependence; (c) in simultaneous, unmediated multiple regression models, the three Time 1 bases of dependence account for significant variation in Time 2 cognitive interdependence; and (d) in simultaneous, mediated multiple regression models (i.e., including commitment), the three Time 1 bases did not account for significant variation in Time 2 cognitive interdependence. These results, together with the Study 2 analyses reported in the present article, suggest that commitment largely mediates the associations of the bases of dependence with later cognitive interdependence when the variables are assessed over time.

pants' relationship-relevant cognitions. The instructions for this indirect measure purposely do not lead participants to respond in any particular manner or direction. Participants were not told how their listed thoughts would be analyzed, and, importantly, were not informed that their pronoun use would serve as a central focus of our research. For these reasons, we would not expect the statistical association with commitment to be as robust as that observed for the more direct measures of inclusion of other in the self and centrality of relationship. In many respects, it is remarkable—yet consistent with our theoretical framework—that in two separate samples of romantic relationships, this covert measure managed to significantly tap collective cognitive representation of the self-in-relationship.

A series of multiple-regression analyses revealed that commitment level at least partially mediates the relation of variations in satisfaction, alternatives, and investments on cognitive interdependence (Hypotheses 4 and 4a): In the Study 2 mediation analyses examining lagged associations and change in cognitive interdependence, such mediation was rather complete; in the concurrent mediation analyses performed in Studies 1 and 2, such mediation was partial (see Footnote 10). For the time being, it seems most prudent to take these findings at face value, concluding that the impact of the three bases of dependence— satisfaction, alternatives, and investments—may not be entirely subsumed by subjective commitment (particularly in concurrent analyses). Although the experience of commitment appears to exert rather broad effects on the course of developing relationships, substantially mediating associations with the bases of dependence, the actual structure of dependence may well exert some direct impact on mental representations above and beyond commitment per se. The existence of partial mediation in concurrent analyses but not in lagged analyses or analyses of change may reflect the process of cyclical mutual growth described earlier. Precisely when and why direct effects emerge remains to be specified in future work.

It is appropriate to comment on some of the broader implications of the current work. Our model represents internal events such as emotions, cognitive interpretations, and mental representations as part of the process of adaptation to existing structural circumstances of interdependence. Specifically, we suggested that cognitive interdependence may stand as a "habit of thinking" that helps to sustain relationships by facilitating acts of relationship maintenance. How might this occur? First, the existence of cognitive interdependence among well-functioning couples may partially account for the tendency of nondistressed couples (in comparison with distressed couples) to develop benign interpretations of one another's actions, for example, to regard couple problems as jointly rather than unilaterally caused or to share responsibility for resolving dissatisfying incidents (cf. Bradbury & Fincham, 1990). Moreover, cognitive interdependence may enhance the capacity for resolving problems of noncorrespondence in an affable manner, to yield long-term joint benefit (cf. Thibaut & Kelley, 1959). That is, partner-oriented and relationship-oriented thoughts, or thoughts relevant to Max-Other and MaxJoint motives, become increasingly available bases for transformation of motivation. Such an outcome would parallel findings from the literature on social dilemmas, which has demonstrated that collective, group identity promotes cooperation (cf. Brewer & Kramer, 1986). Moreover, as noted earlier,

partners may intentionally or inadvertently communicate cognitive interdependence to others—for example, through the frequent use of "we" in everyday language—thereby protecting the relationship from threat by discouraging approach by alternative partners. Thus, there are a variety of indirect means by which cognitive interdependence might serve to protect and sustain ongoing relationships. One possible practical implication of this work would involve the development of *cognitive interdependence enhancement* techniques for use in marital therapy (e.g., "think in terms of *we* rather than *I*").

Strengths and Limitations

Before closing, several limitations of the present research should be noted. First, this work examined the dating relationships and best friend relationships of college students. It is notable that even in these relatively young relationships, variations in degree of cognitive interdependence were sufficiently pronounced to reveal reliable links with romantic commitment. However, future work should examine parallel effects in more longstanding relationships. In addition, the present research did not differentiate between same-sex and cross-sex best friendships. In light of the absence of systematic associations among the cognitive interdependence measures for the best friends sample in Study 2, it would be useful to determine whether cognitive interdependence functions differentially in these two potentially distinctive types of friendship.

It will also be important to determine whether cognitive interdependence in fact is associated directly with prorelationship behaviors such as accommodation and derogation of alternatives. The current findings point to the need for more detailed cognitive analyses of the ways in which high levels of commitment change the way people interpret, process, store, and retrieve information about the self in relation to the current partner. In addition to examining specific operationalizations of cognitive interdependence (such as the prevalence of plural pronoun use), future research might examine how people form attributions and organize memories of social events vis-à-vis the partner. Wegner's work on transactive memory and Aron's reaction time research on inclusion of other in the self are excellent examples of this kind of work (Wegner et al., 1991; Aron et al., 1991).

The methodological strengths of the current work should also be noted. This research used a varied set of measurement techniques, including spontaneous thoughts, a graphical measure, and traditional pencil-and-paper self-report to examine the association between commitment and cognitive interdependence. Study 2 revealed that these measures exhibit good test–retest reliability. By using a variety of techniques, ranging from highly covert to relatively overt, this work provides convincing evidence of the existence of commitment-inspired cognitive restructuring. Moreover, in light of the fact that the single-item, pictorial IOS Scale exhibited significant links with commitment, the three bases of dependence, and the other two cognitive interdependence measures, the current work provides further evidence in support of the validity and utility of the IOS instrument. As proposed by the authors of this instrument, the IOS Scale indeed appears to tap the interconnectedness of self and other (Aron et al., 1992).

Conclusions

The results of the present work demonstrate that strong commitment is associated with cognitive interdependence, including tendencies to think about the relationship in a pluralistic manner, to perceive a high degree of overlap in mental representations of self and partner, and to regard the relationship as a relatively central component of that which is important in one's life. These results are congruent with an interdependence analysis of commitment processes, which represents internal events such as emotions and cognitions as part of the process of adaptation to existing circumstances of interdependence. To date, little research has been conducted on the cognitive concomitants of interdependence theory concepts. We believe that the present findings demonstrate the utility of an interdependence analysis of key processes in close relationships while providing a useful integration of the close relationships and social cognition literatures.

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