Momentary Patterns of Covariation between Specific Affects and Interpersonal Behavior: Linking Relationship Science and Personality Assessment

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Abstract

Relationships are among the most salient factors affecting happiness and wellbeing for individuals and families. Relationship science has identified the study of dyadic behavioral patterns between couple members during conflict as an important window in to relational functioning with both short-term and long-term consequences. Several methods have been developed for the momentary assessment of behavior during interpersonal transactions. Among these, the most popular is the Specific Affect Coding System (SPAFF), which organizes social behavior into a set of discrete behavioral constructs. This study examines the interpersonal meaning of the SPAFF codes through the lens of interpersonal theory, which uses the fundamental dimensions of Dominance and Affiliation to organize interpersonal behavior. A sample of 67 couples completed a conflict task, which was video recorded and coded using SPAFF and a method for rating momentary interpersonal behavior, the Continuous Assessment of Interpersonal Dynamics (CAID). Actor partner interdependence models in a multilevel structural equation modeling framework were used to study the covariation of SPAFF codes and CAID ratings. Results showed that a number of SPAFF codes had clear interpersonal signatures, but many did not. Additionally, actor and partner effects for the same codes were strongly consistent with interpersonal theory's principle of complementarity. Thus, findings reveal points of convergence and divergence in the two systems and provide support for central tenets of interpersonal theory. Future directions based on these initial findings are discussed.

Keywords: Specific Affect Coding System; Interpersonal Circumplex; Continuous Assessment of Interpersonal Dynamics; Dyadic Interaction; Multilevel Structural Equation Modeling

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Relationships are among the most salient factors affecting happiness and wellbeing for individuals and families (Ainsworth, 1985; Stack & Eshleman, 1998; Bowlby, 1958; Ryan & Deci, 2000). The quality and stability of intimate relationships have been linked with a number of key outcomes, including physical and mental health (Fincham & Beach, 2010; Gottman, 1998; Huston, 2000; Levinger & Huston, 1990), personal wellbeing and life satisfaction (Proulx, Helms, & Buehler, 2007), and individual productivity (Dollahite & Rommel, 1993). Because relationships influence so much of our lives, research on their processes and outcomes is paramount (Baucom, Shoham, Mueser, Daiuto, & Stickle, 1998).

Several methods have been developed to assess relationship processes and outcomes. Self-report questionnaires dominated until the 1970's, when researchers developed and began using systematic observational methods to view couples' functioning through a behavioral lens (Gottman, 1998). Psychotherapy researchers (Gurman & Jacobson, 1995), practicing psychotherapists (Geiss & O'Leary, 1981), and couples' researchers (Storaasli & Markman, 1990) all agree that the manner in which couples communicate is the common link to relationship functioning. Bradbury and colleagues (2000) emphasize that, "a complete portrayal of variability in marital quality requires analysis of interpersonal exchanges within marriage" (p. 975). Therefore, linking patterns of behavior to important outcomes has become a central goal of relationship science. For instance, much research has focused on using behavioral patterns to distinguish between satisfied and dissatisfied couples (e.g., Margolin & Wampold, 1981).

Most observational studies of couples involve a conflict task. Despite the positive implications of intimate relationships for mental health and wellbeing, conflict inevitably occurs in close relationships (Brehm, Miller, Perlman & Campbell, 2002). Conflict is of particular

interest because the manner in which it is resolved has implications for relationship stability and functioning, as well as personal wellbeing (e.g., Canary & Cupach, 1988; Gottman, 1998). On the one hand, an ineffective approach to conflict resolution can lead to negative escalation and low relationship satisfaction (Bradbury & Fincham, 1990). On the other hand, an effective approach to conflict resolution can lead to improved intimacy and high relationship satisfaction (Canary & Cupach, 1988). Because couples' communication skills and approaches to conflict resolution are so important to relationship outcomes, observational coding systems have been especially geared toward the study of conflict processes.

Relationship Science and the SPAFF Coding System

The most widely used and well-validated tool for observational assessment in relationship science is the Specific Affect coding system (SPAFF; Gottman & Krokoff, 1989; Gottman et al., 1995; Carrere & Gottman, 1999; Johansen & Cano, 2007; Heyman, 2001; Bradley et al., 2014). SPAFF uses more than a dozen mutually exclusive categories (i.e., codes) to capture the function or communicative meaning of a given behavior. Although many SPAFF codes fall squarely within established systems of affect and emotion (e.g., *Anger*, *Sadness*, and *Disgust*), others (e.g., *Affection*, *Belligerence*, and *Validation*) are fundamentally interpersonal.

One of the major challenges of SPAFF and similar observational coding systems is that individual codes are often highly specific, capturing subtle differences between implicitly related behaviors. For example, although there may be meaningful differences between *Criticism* and *Contempt*, these codes are likely more similar than *Criticism* and *Affection* or *Belligerence* and *Stonewalling*. Without quantifying these similarities and differences, and by requiring categories to be mutually exclusive, it is difficult to tell whether an association between a code and an outcome is due to the code's unique or shared variability. Another challenge is that codes are often difficult to compare across studies and to link with any broader literature. Indeed, very few

theories of relationship functioning make reference to individual codes or even behaviors. Thus, testing theories using observational methods requires making assumptions about how specific codes are associated with broader theory-based constructs. Unfortunately, these assumptions are often left untested.

These challenges can be addressed by viewing the SPAFF codes through the lens of an integrative framework that identifies the fundamental constructs with which such codes are associated. Ideally, such a framework would also provide links to a broader literature and make concrete behavioral predictions that could be tested with observational methods. In the current study, we argue that Interpersonal Theory is well-suited to be such an integrative framework.

Personality Assessment and the Interpersonal Circumplex

Interpersonal theorists (e.g., Leary, 1957; Pincus & Ansell, 2013; Sullivan, 1953) conceptualize personality as "the relatively enduring pattern of recurrent interpersonal situations that characterize a human life" (Sullivan, 1953, pp. 110–111). From this perspective, the most important expressions of personality occur in social interactions. This approach to personality uses a two-dimensional model called the interpersonal circumplex (IPC; Leary, 1957; Wiggins, 1979; see Figure 1) to describe and measure interpersonal functioning (Horowitz, 2004; Wiggins, 2003). The major dimensions of the IPC are dominance versus submissiveness on the vertical axis, and affiliation versus disaffiliation on the horizontal axis. Interpersonal theory asserts that, "all forms of social behavior can in turn be viewed as combinations of the four poles" (Fournier, Moskowitz, & Zuroff, 2011; p. 58).

The IPC organizes not only the *static* relations among the interpersonal variables (i.e., the ordering around the circle), but also the *dynamic* relations of transactions based on the interpersonal bids and pulls of one behavior for another (Horowitz, 2004; Kiesler, 1996; Pincus & Ansell, 2013). Although the space defined by the dimensions of dominance and affiliation can

be flexibly used to chart any specific patterning of interpersonal behavior, interpersonal theory has established probabilistic patterns of social transaction termed *interpersonal complementarity* (Carson, 1969; Kiesler, 1983). Complementarity refers to the match or mismatch of individuals' interpersonal behaviors and the tendency to adjust behaviors in response to others' behavior (Dermody et al., 2016; Sadler, Ethier, &Woody, 2011). Specifically, complementary behaviors are those that are similar on the affiliation dimension and opposite on the dominance dimension (Carson, 1969; Sadler et al., 2011). That is, one person's affiliation pulls for another person's affiliation (and vice versa), and one person's dominance invites the other's submissiveness (and vice versa; Carson, 1969; Kiesler, 1983; Sadler et al., 2011).

The IPC has long served as a "key conceptual map" (Kiesler, 196, p. 172) in personality and clinical psychology for the identification of dispositional interpersonal styles among diverse populations (Lorr, Bishop, & McNair, 1965; Pincus & Wright, 2011). It has a long history of use as an integrative framework, uniting models of traits, motives, cognition, behavior, and psychopathology (Hopwood, Wright, Ansell, & Pincus, 2013; Locke, 2011). Furthermore, interpersonal theory links to the broader literature of personality science and makes testable hypotheses based on interpersonal complementarity. The IPC is thus well-suited to serve as an ecumenical structure through which to view the SPAFF behavioral categories. However, to do so requires a means of measuring dominance and affiliation using observational methods on a comparable time-scale.

Continuous Assessment of Interpersonal Dynamics (CAID)

Capturing the momentary give-and-take of interpersonal interactions on the time-scale that such dynamic processes occur has traditionally been challenging. To address this issue, Sadler and colleagues (2009) developed a novel observational method to assess interpersonal behavior at the moment-to-moment time-scale. The method, called Continuous Assessment of

Interpersonal Dynamics (CAID), uses a computer joystick to "monitor interpersonal behavior as positions in the plane defined by the orthogonal axes of dominance and affiliation" (Lizdek et al., 2012; p. 514). This allows observers to rate changes in dominance by moving the joystick forward or backward, and changes in affiliation by moving the joystick left or right (Lizdek et al., 2012). Observers thus rate the nature of behavior using the direction of movement (e.g., cold-dominant), and the intensity of behavior using the distance from the plane's origin. Using software developed for this purpose (the Dual Axis Rating and Media Annotation [DARMA] program described below), the joystick measurements can be synchronized with video playback, visualized in an IPC graph, and recorded multiple times per second.

CAID enables the empirical examination of the key tenets of interpersonal theory, as well as their integration with the broader personality and clinical literature. In the clinical context, CAID has recently been used to link affiliation and dominance with outcomes during psychotherapy (Sadler, Woody, McDonald, Lizdek, & Little, 2015; Thomas et al., 2014). It has also informed a number of findings linking complementarity with particular relationship outcomes (e.g., Markey, Lowmaster, & Eichler, 2010). According to interpersonal theory, complementarity should be linked with increased relationship satisfaction and positive outcomes (Kiesler, 1996; Sadler et al., 2011), and a number of empirical findings offer support for this tenet (e.g., Markey and Markey, 2007). The emerging literature using CAID suggests that it is a promising and novel approach to observing couples' behavior, and may serve as a complement to methods like SPAFF.

The Current Study: Integrating SPAFF and the IPC

The current study argues that deeper understanding and greater applicability for SPAFF can be achieved by viewing it through the integrative lens of interpersonal theory. Specifically, we explore the association between individual SPAFF codes and the broader dimensions of

dominance and affiliation. The advent of a new observational assessment system grounded in interpersonal theory (i.e., CAID) has made this bridging work possible. CAID has shown promise for studying complex dyadic processes (e.g., Klahr et al., 2013; Markey et al., 2010; Sadler et al., 2015; Thomas et al., 2014) and interprets behavior in terms of dominance and affiliation rather than specific affective states. Using this new technology, we compared the momentary behavioral codes collected using SPAFF with those collected using CAID. By mapping the associations between these two coding systems, we facilitate the integration of their underlying theoretical frameworks and reveal a more detailed and nuanced picture of behavior as it manifests in the interpersonal context.

We made *a priori* predictions about how each SPAFF category would be associated with concurrent ratings of the individual's CAID *Dominance* and *Affiliation* (i.e., actor effects). These predictions were based on comparison of each category's description to descriptions of different portions of the IPC. We also made *a priori* predictions about how each SPAFF category would be associated with concurrent ratings of an individual's significant others' *Dominance* and *Affiliation* (i.e., partner effects). These predictions were based on interpersonal complementarity. See Table 1 for descriptions of each SPAFF category and for predictions regarding actor and partner effects.

Method

Participants

Romantic couples were recruited via flyers posted in psychiatric treatment clinics. The parent study from which these data are drawn was designed to investigate the role of personality disorders in the functioning of romantic couples. Couples were eligible if the length of their relationship was ≥ 1 month, and couple members had regular contact with each other. The larger study used a stratified design, such that target participants (identified patients) were screened by

phone for both borderline and general personality disorder using the McLean Screening Instrument for Borderline Personality Disorder (Zanarini, Vujanovic, Parachini, Boulanger, Frankenburg, & Hennen, 2003) and the Inventory of Interpersonal Problems Personality Disorder Scales (Pilkonis, Kim, Proietti, & Barkham, 1996) respectively. Participants reflected a spectrum that ranged from a positive screen for BPD to a positive screen for any other personality disorder to few or no symptoms of personality disorder. Patients were excluded if they met criteria for a lifetime diagnosis of bipolar disorder or psychosis.

The sample consisted of 67 couples, with the majority in cohabitating relationships (*n* = 47, 71.6%). Couples had been intimately involved for an average of 56.80 months (*SD* = 51.71). Fifty couples (82.0%) were in an opposite-sex relationship and eleven (18.0%) were in a same-sex relationship. Approximately half of participants reported an annual household income of < $25,000 (49.3%, *n* = 33). Patients were predominantly female (*n* = 52, 77.6%) and significant others were predominantly male (*n* = 44, 65.7%). Patients were, on average, 30.25 years old (*SD* = 5.79) and significant others were, on average, 31.34 years old (*SD* = 7.53). The majority of participants were White (*n* = 102, 76.1%) or Black/African American (*n* = 20, 14.9%) and the remainder was Asian American (*n* = 3, 2.2%) or more than one race (*n* = 6, 6.7%). Over half of the participants met the diagnostic threshold for one personality disorder (*n* = 71, 52.2%; *Mdn* = 1; *Range* = 0-5), with the most frequent diagnoses being obsessive-compulsive (*n* = 29, 43.3%), borderline (*n* = 22, 32.8%), and antisocial (*n* = 20, 29.9%) personality disorders.

Procedure

After both couple members provided consent and completed procedures not relevant to the current study, couples engaged in a conflict task.

Conflict discussion. Clinical interviewers facilitated the conflict discussions by first asking couples to fill out an "Areas of Disagreement" form. Couple members individually rated

their relationship for problem areas commonly reported by couples (e.g., sex, childcare, household chores, and finances). Couple members ranked the degree to which each problem area was an issue in the relationship and the length of time it had existed. The interviewer then used the forms to identify suitable topics for the discussion. Interviewers further facilitated the discussion by administering the "Play-by-Play" interview, which is designed to prepare couples for the discussion. Couple members were asked initially to share their views regarding each discussion topic while their significant other was instructed not to respond. Interviewers helped each couple member identify thoughts, feelings, and the change/resolution each wanted to see related to each issue. After couple members shared their views on the topics, couples were instructed to begin the discussion and the interviewer exited the room. The discussion was monitored via live video stream from an adjoining room. Discussions lasted 10 minutes and were videotaped. After the discussion, the interviewer facilitated de-escalation by attempting to normalize the discussion and by allowing each couple member to share his or her feelings. After the conflict discussion was concluded, the couples discussed an upcoming "fun event" that they were planning together. The fun-event discussion lasted approximately 5 minutes and was intended to promote further de-escalation.

Measures

Specific Affect Coding System (SPAFF, Gottman & Krokoff, 1989). The SPAFF was used to code patterns of affect and communication exhibited by each couple member during discussions. Coding was performed by trained research assistants who were blind to all other data collected (i.e., psychiatric interviews and self-report questionnaires). SPAFF combines facial expressions (based on the Facial Action Coding System; Ekman & Friesen, 1978), vocal tone, and speech content to characterize the communication patterns being displayed. SPAFF codes are mutually exclusive and were coded using video analysis software that records

keystrokes associated with each code (NOLDUS Observer XT, Noldus Information Technology, Netherlands). Observers first viewed a discussion without coding and then view it two more times—once to code the patient's behavior and a second time to code the significant other's behavior—by indicating on the keyboard, second by second, each time a new code was seen. The SPAFF system includes 6 codes for *Positive Affects* (*Affection, Enthusiasm, Humor, Interest, Validation, Tense Humor*), 12 codes for *Negative Affects* (*Anger, Belligerence, Contempt, Criticism, Defensiveness, Disgust, Domineering, Fear/Tension, Sadness, Stonewalling, Threats, Whining*), and 1 *Neutral* code. Due to low base rates for some codes (i.e., < 0.13%), only the following 12 specific codes were included in the current study: *Neutral, Interest, Affection, Validation, Defensiveness, Contempt, Criticism, Domineering, Sadness, Stonewalling, Tension,* and *Tense Humor*. Beyond the basic binary codes, an additional metric was implemented that combined the codes into quasi-dimensional scores ranging from negative to positive (Gottman et al., 1999), which we termed Valence. Due to the time-intensive nature of micro-analytic categorical coding, it was not feasible to collect SPAFF codes from multiple observers for each stimulus (i.e., video). Instead, a single observer coded each stimulus and a random subset of stimuli (i.e., 15%) was selected to be coded by an additional observer for the analysis of inter-observer reliability. Using the free marginal kappa coefficient (Brennan & Prediger, 1981), reliability averaged .73 with a ±1 sec window and .65 with no window. This coefficient represents the amount of agreement between observers while adjusting for chance agreement, which is estimated assuming that all categories are equally likely to be chosen at random. Using Altman's (1991) reliability benchmarking system, kappa scores between .60 and .80 can be considered "good."

Continuous Assessment of Interpersonal Dynamics (CAID, Sadler et al., 2009). The CAID approach was used to rate interpersonal behavior along the two dimensions of the IPC,

Dominance and *Affiliation*. CAID measurements are fully dimensional (ranging here from -100 to 100) and are rated continuously, sampled here at a rate of twice per second. CAID *Dominance* and *Affiliation* ratings are made concurrently using a computer joystick while watching the conflict interaction task on a computer monitor. Custom software, the Dual Axis Rating and Media Annotation package (available for free download at https://darma.codeplex.com; Girard & Wright, 2016), presented both the videotaped interaction task and a diagram of the IPC as depicted in Figure 1. An indicator displayed during the coding process provides visual feedback on current ratings. Although participants were facing each other during the conflict task, they were videotaped by two separate cameras and placed on the left or right in the playback screen.

Observers were instructed to make ratings by moving the joystick in a relatively continuous manner in accordance with the target person's statements, verbal tone, and nonverbal behaviors, which constituted any change in dominance or warmth. Examples of dominant behaviors included directing the conversation, speaking forcefully, and telling the other what to do, whereas examples of submissive behaviors included following the other person's lead, acquiescing to the other's demands, and expressing helplessness. Examples of warm behaviors included moving closer to the other person, seeking eye contact, and smiling, and verbal communications such as laughing, praising, supporting, or complimenting the other person. In contrast, examples of cold behaviors included looking away, turning away, not responding when addressed, and verbal communications such as mean and sarcastic comments, and an absence of reciprocated warmth. However, *Dominance* and *Warmth* were coded simultaneously as many behaviors reflect blends of the two dimensions. When no discernible changes in interpersonal behavior were displayed, raters were instructed to maintain their most recent joystick position until the target displayed a meaningful behavior unless the absence of behavior was itself

interpersonally meaningful (e.g., failure to respond to the other).

Six undergraduate research assistants trained in the CAID method rated each couple member in each video. This group of research assistants was independent of the group that provided the SPAFF codes. Videos were viewed three times, once without rating, and then once again for each person in the couple. Videos were presented in blocked randomized order so that order of video and whether left or right interaction couple member was rated first differed across observer within a block. Observers did not rate each couple member consecutively in a dyad, but rather coded one couple member from each video before coding the second couple member. Reliabilities of each coded time-series, of which there were four per video (i.e., two interpersonal dimensions each for two couple members), were calculated each week and reviewed in weekly observer meetings. As argued by Girard and Cohn (in press), such meetings can combat observer "drift" (i.e., error due to fatigue, forgetting, apathy, or the accumulation of bad habits) by analyzing and standardizing the criteria that observers use to assign measurements to items. A small number of videos (~5%) were re-rated due to very low reliability. We adopted an a priori rule to drop the one observer with the lowest agreement for each time-series (calculated using a leave-one-out procedure), and then the ratings from the remaining five observers were averaged on a moment-by-moment basis. Thus, final time-series were a composite contributed to by five observers. Reliability was assessed using intraclass correlations (McGraw & Wong, 1996), which permit the inclusion or exclusion of between-rater variance as part of the error variance. The descriptive statistics and reliabilities for CAID ratings are summarized in Table 2.

Data Analyses

To establish the associations between momentary SPAFF codes and CAID ratings, we employed Actor-Partner Interdependence Models (APIMs) in a multilevel structural equation modeling framework (MSEM; Heck, 1999; Muthén, 1991, 1994). MSEM is a flexible approach

that integrates multilevel modeling's capability to accommodate nested data structures with structural equation modeling's ability to estimate complex associations among multivariate outcomes. Accordingly, the parameters of the APIM models were derived from the half-second by half-second associations among coding systems (Level 1) nested within dyads (Level 2). Predictors in the Level 1 APIMs were the binary SPAFF codes and the dimensional Valence ratings, whereas outcomes were the CAID ratings (See Figure 2). Separate models were estimated for each predictor and each outcome.

In APIMs, both couple members contribute to both the Actor effects and the Partner effects. In the multilevel APIMs used here, Actor effects are the association between an individual's rating on the *predictor* at a given time-point and that same individual's rating on the *outcome* at the same time point. Coefficients for Actor effects reflect the contemporaneous within-person association between SPAFF and CAID ratings. Here Partner effects are the association between an individual's rating on the *predictor* at a given time point, and the other couple member's *outcome* at the same time-point. Coefficients for the Partner effects reflect the association between an individual's SPAFF code and their significant other's CAID ratings. Actor and Partner effects for both couple members are estimated simultaneously, such that Actor and Partner effects are each estimated adjusting for other effect. The SPAFF ratings are binary; therefore, the Actor and Partner effects reflect the difference in CAID dimensional values between the SPAFF codes when present versus all other codes. Because our interest was in the association between these two systems, we treated patients and their significant others as indistinguishable in the APIM models and estimated Actor and Partner effects as equivalent in each couple member (Kashy, Kenny, & Cook, 2006). This approach has the effect of generating an average association across all participants. The tenability of the indistinguishable partners assumption was tested by comparing models with couple members treated as distinguishable to

the indistinguishable models using the Bayesian Information Criterion (BIC).

Furthermore, we modeled all Actor and Partner effects as random across dyads, although our focus is on the fixed effect. Although not depicted in Figure 2, in the between-person structure, we allowed random intercepts for the CAID outcomes and each of the random paths for the Actor and Partner effects to covary freely. Finally, we tested gender as a Level 2 predictor of CAID intercepts and as a moderator of associations between SPAFF and CAID. All MSEMs were estimated in Mplus version 7.31 (Muthén & Muthén, 2012). SPAFF was sampled at one code per second and CAID at twice per second. To align them, we transformed the SPAFF codes to half-second codes. This resulted in a within-person sample size of 160,000 observations, or 80,000 dyadic-observations for the APIM models.

Results

Results of the APIM models are summarized in Table 2 and plotted in Figure 3. For Actor effects, SPAFF codes of *Valence, Affection, Validation, and Tense Humor* were positively associated with CAID affiliative behavior. SPAFF *Defensiveness*, *Contempt*, and *Domineering* were negatively associated with CAID affiliative behavior. These effects were consistent with initial predictions. However, counter to predictions, SPAFF *Interest, Criticism*, *Sadness,* and *Stonewalling* were unassociated with CAID affiliative behavior, and *Tension* was positively associated with affiliative behavior. With CAID *Dominance*, SPAFF *Validation, Tense Humor, Stonewalling,* and *Valence* were positively associated, and *Defensiveness* negatively associated, all as predicted. In contrast to predictions, SPAFF *Interest, Contempt*, and *Sadness* exhibited no association, *Domineering* exhibited a negative association, and *Neutral* and *Tension* exhibited positive associations with CAID dominant behavior.

In terms of Partner effects, CAID affiliative behavior was positively associated with SPAFF *Affection, Interest, Validation, Tense Humor*, and *Valence*, and negatively associated

with SPAFF *Defensiveness, Contempt, Criticism, Domineering,* and *Stonewalling,* in line with predictions. Unexpectedly, SPAFF *Neutral* and *Tension* codes were positively associated and *Sadness* unassociated with CAID affiliative behavior. Additionally, as expected, CAID *Dominance* was positively associated with SPAFF *Defensiveness* and negatively associated with *Validation*. However, the remaining predictions for CAID *Dominance* Partner effects did not emerge as expected.

Analyses of the effect of gender (coded female = 0; male = 1) showed that men had higher CAID *Dominance* on average ($\beta = 8.31$, $SE = 2.62$, $p = .002$), but no differences were found on CAID *Affiliation* ($\beta = -2.75$, $SE = 2.00$, $p = .168$). Also, gender did not moderate any of the associations between SPAFF and CAID codes.

Discussion

The current study is the first to examine the behavioral codes of the SPAFF through the integrative lens offered by interpersonal theory, using the CAID observational rating system. SPAFF identifies specific behavioral constructs, whereas CAID maps behaviors onto the general dimensions of the IPC. By linking SPAFF to the broader dimensions of dominance and affiliation, this study provides a bridge from specific interpersonal behaviors to a theoretically rich framework for better understanding such behaviors. Here we examined how the two systems align in their descriptions of social interactions in a sample of romantic couples engaged in a conflict task. We found confirmation of many predictions about projections of SPAFF codes onto the IPC. At the same time, there was unexpected interpersonal complexity for several codes. The findings also reinforced the importance of the complementarity principle. We consider each of these results in turn.

Actor Effects

We first consider the actor effects, which offer the most direct evaluation of the match

between the two coding systems. When interpreting these results, it is important to attend to the relative size of the observed effects. By using *SDs* of approximately 20 for both CAID *Dominance* and *Affiliation*, pooled across all participants, the effects can be transformed into approximate Cohen's *d*s. In terms of the associations between SPAFF behaviors and CAID *Affiliation* ratings, the results largely confirmed our hypotheses about the interpersonal signature of the SPAFF behaviors. SPAFF *Valence, Affection, Validation,* and *Tense Humor* were all significantly and positively associated with CAID *Affiliation*. SPAFF *Defensiveness, Contempt,* and *Domineering* were all significantly and negatively associated with CAID *Affiliation*. However, with the exception of *Affection, Tense Humor*, and *Defensiveness*, these were effects of modest size. We found *Interest, Criticism, Sadness*, and *Stonewalling* not to be associated with CAID *Affiliation*. In contrast to predicted effects, *Tension* was significantly positively associated with CAID *Affiliation*, albeit with modest effect size.

In terms of associations with CAID *Dominance*, SPAFF *Valence, Validation, Stonewalling,* and *Tense Humor* were each found to be positively associated, and *Defensiveness* negatively associated, as hypothesized. The effects for *Validation* and *Stonewalling* were moderate and large, respectively, whereas the remaining effects were more modest. SPAFF *Interest, Contempt,* and *Sadness* were not significantly associated with CAID *Dominance*, and although *Neutral* was associated, this finding is best discounted due to the small effect size. Unexpectedly, however, we found that *Affection, Criticism,* and *Domineering* were negatively associated with *Dominance*, when we expected them to be positively associated, and the opposite was the case for *Tension* (i.e., significant positive association).

Given that we found variability in support for our hypotheses, our results require elaboration. On the whole, these observational findings mirror factor-analytic results of self-report data (Yik & Russell, 2004) and provide convergent support for the idea that *Dominance*

and *Affiliation*, particularly in combination, are affectively positive (e.g., *Valence, Affection, Validation, Tense Humor*). Although we did not predict any association between SPAFF *Affection* and CAID *Dominance*, it appears that this behavior expresses caring and concern in a relatively submissive way. Perhaps this submissiveness reflects the vulnerability inherent to offering *Affection* during a conflict task. In contrast, *Validation* involves an individual taking the lead, assertively affirming their significant other's experience or behavior. Thus, the interpersonal nature of these two specific codes is distinct, despite the shared goal of expressing warmth and acceptance: *Affection* invites closeness, whereas *Validation* pledges support. *Tension* was unexpectedly slightly affiliative given that it serves to communicate negative affect. However, this may be explained by the fact that the negative affect communicated by *Tension* is largely fear-based (e.g., worry, anxiety, and dread). In line with this explanation, previous research on displays of negative affect found that facial expressions of fear and sadness were perceived as more affiliative than facial expressions of anger and disgust (Hess, Blairy, & Kleck, 2000; Knutson, 1996). Accordingly, *Tense Humor* exhibited the same, but magnified, pattern of effects that is consistent with the introduction of humor into the situation. Although we expected *Interest* to be interpersonally affiliative, this effect was not significant, possibly due to the rarity of this behavior.

Naturally, not all behaviors were so positive. *Defensiveness, Contempt*, and *Domineering* all serve to increase interpersonal distance, which helps to explain their links with deleterious relationship outcomes such as separation and dissatisfaction (Gottman, 1998). As predicted, *Defensiveness* was associated with interpersonal submissiveness. This shows that actors ward off perceived attacks by assuming a submissive role (perhaps that of a maligned victim). However, contrary to our predictions, both *Domineering* and *Criticism* were negatively associated with CAID *Dominance*. The *Domineering* finding is quite surprising. First, it is

worth noting the modest nature of the effect. *Domineering* does not strongly covary with CAID *Dominance,* indicating that this behavior, despite its theoretical similarity with CAID *Dominance*, may not be strongly linked with the interpersonal displays of dominance. When considering the weak, but still significantly negative association between *Domineering* and CAID *Dominance,* we suggest that this code may best capture a distal "function" or "goal" of the behavior that is not captured by the momentary CAID *Dominance* ratings, which focus more on proximal behavior. Accordingly, it may be that *Domineering* behavior is more likely to be emitted by individuals in a one-down/submissive position, which is reflected in the CAID *Dominance* ratings. In other words, it may be that SPAFF *Domineering* is sensitive to the underling purpose of the behavior in ways that CAID is not, resulting in this paradoxical association. Thus, SPAFF *Domineering* will capture reactive but unsuccessful bids for assertiveness that the CAID does not. This interpretation is speculative, and future work should explore this relationship in more detail. Similar comments can be made about the *Criticism* effects. Taken together, however, *Defensiveness, Criticism,* and *Domineering* share an interpersonal signature, which may serve a common purpose of protecting the individual from real or perceived attacks. The contextual aspects of the partner effects, considered below, may be revealing in this respect.

The majority of SPAFF codes lacked or exhibited modest associations with both CAID dimensions. Codes for *Neutral* (d = .05), *Interest* (d = .06), *Defensiveness* (d = .18), *Contempt* (d = .10), *Domineering* (d = .13), *Sadness* (d = .11), *Tension* (d = .16), and *Valence* (d = .09), although in some cases significant for one or both CAID dimensions, all fell below the heuristic for a small effect size of d = .20 (calculated based on the hypotenuse of the effect in both interpersonal dimensions divided by the hypotenuse of the CAID dimensions standard deviations). For comparison, the effects for Affection (d = .35), Validation (d = .28), Criticism (d = .28), Stonewalling (d = .76), and Tense Humor (d = .33), were also generally modest.

What accounts for these generally modest effects? One possibility is that SPAFF codes capture non-interpersonal behavior. An alternative perspective, which has implications for future research, is that this lack of specific associations indicates that these SPAFF codes are interpersonally heterogeneous or complex. That is, they can be expressed interpersonally in divergent ways. Take, for instance, *Criticism*. It may be that *Criticism* is interpersonally heterogeneous in its expression, such that at times it is overtly hostile, but at other times, it is offered as a caring entreaty. In a similar vein, contemptuous behavior may be rated as dominant when it aggressively belittles or humiliates, and it may be rated as submissive when it passive-aggressively undermines and communicates disrespect. Similarly, sadness may be rated as dominant when it actively communicates pessimism and resignation, and it may be rated as submissive when it communicates loss and hopelessness. An important implication of these behaviors that lack interpersonal specificity is that these may be areas in which the two coding systems might augment each other in predicting target outcomes.

Partner Effects

In addition to investigating the direct associations between the SPAFF codes and CAID ratings, we were also interested in understanding the context in which the behaviors occurred. By exploring the interpersonal antecedents and consequences of behaviors, we can understand their functionality, contingency, and the processes to which they contribute (Bakeman & Quera, 2011). We began this endeavor here by studying concurrent associations of SPAFF codes with the significant other's CAID ratings. We based our partner effect predictions on the principles of complementary (i.e., that behaviors would be met with a similar level of *Affiliation* and an opposite level of *Dominance*).

Although the actor effects did not always confirm our predictions about the interpersonal signature of different SPAFF codes, the partner effects nearly always supported interpersonal

complementarity. Interestingly, the partner effects were often stronger than the corresponding actor effects, which highlight the importance of interpersonal context in studying an individual's behavior.

Beginning with the SPAFF aggregate scale *Valence* (which was associated with dominance and warmth in actor effects), consistent with complementarity it was associated with predicted submissiveness and warmth from the significant other. Full complementarity was also found for the following individual SPAFF codes: *Affection, Validation, Defensiveness, Domineering,* and *Tension*. Similarity in CAID *Affiliation* was found for *Contempt* and oppositeness on CAID *Dominance* was found for *Neutral, Criticism,* and *Stonewalling* associations. Indeed, not a single significant effect contradicted the complementarity principle.

We found that many of the more negative SPAFF behaviors were associated with submissive actor effects and dominant partner effects. Although *Defensiveness*, *Criticism*, and *Domineering* were each associated with actor submissiveness, these behaviors occurred in the context of strong (in effect size) *Dominance* from the significant other. We believe these findings underscore the significance of the context in which interpersonal exchanges unfold. It is possible that when individuals perceive negative behaviors from their significant others (e.g., *Defensiveness, Criticism, Domineering*), they respond by going on the offensive, displaying dominant and often aggressive behavior. Alternatively, it may be that each of these more negative behaviors reflects a maladaptive attempt at self-protection in the face of a controlling other. Either alternative is plausible from an interpersonal theory perspective, and suggests the need for future research that incorporates temporal precedence and sequences of behaviors in the analyses.

One of the major findings from this study is the strong evidence for complementarity. All of the results for partner effects support complementarity, confirming that the interpersonal

behavior of couple members has a strong mutual influence. Complementarity adds a contextual element to the SPAFF codes where each behavior, associated with its own interpersonal signature, corresponds with a specific interpersonal display from the significant other. These strong findings of complementarity demonstrate the value of using CAID and the theoretical postulates of interpersonal theory in combination with SPAFF. By integrating the two methods, we are able to observe how SPAFF behaviors manifest themselves in particular dyadic interpersonal patterns. As interpersonal complementarity has generally been linked with positive relationship outcomes (Kiesler, 1996; Sadler et al., 2011), the CAID method could offer new insights for understanding the behavioral determinants of relationship satisfaction and outcomes. That complementarity was also observed in the patterns of associations with SPAFF negative behaviors suggests the possibility that complementarity may not be uniformly positive to the extent that it serves to maintain negative interaction patterns (e.g., Demand-Withdraw patterns in relationships; Sullaway & Christensen, 1983). In this way, some findings in relationship science may serve to qualify the predictions of interpersonal theory.

Implications for Clinical Research and Practice

The SPAFF coding system has garnered considerable support and use in the relationship research context, but has seen relatively modest use in clinical research and practice. In contrast, interpersonal theory and associated measures based on the IPC have their roots in clinical theories of personality, but until recently efficient systems of continuously rating interpersonal behavior were not available, and (with notable exceptions) dyadic research using the IPC was relatively infrequent. Our hope is that CAID contributes to the wider use of the IPC and interpersonal theory in relationship research, and that clinical researchers interested in interpersonal phenomena will begin to unpack, and examine in fine-grained detail, many longstanding hypotheses about interpersonal behavior in clinical contexts. One major

implication for both relationship and clinical research is that the CAID and IPC do not appear to be isomorphic, and therefore researchers should consider whether the constructs from each system are of interest. If so, both should be used, and tested for incremental predictive power.

Formal coding systems, like SPAFF, have generally not been used in applied settings. This is due primarily to the time-consuming nature of the coding. However, as noted above, rating systems like CAID are much more efficient and may hold promise for applied work. In fact, Hopwood and colleagues (Hopwood et al., in press; Hopwood, Wright, & Pincus, in press) have already demonstrated the utility of CAID in clinical settings for understanding the behaviors of an individual patient, his or her practitioner, and their mutual influence. As an extension of the trained observer approach, Hopwood, Wright, and Pincus (in press) show how a relatively naïve coder (i.e., the patient), can be given instruction on how to use the method to code their own therapy sessions, thereby assessing for potential perceptual/interpretive differences between the clinician and the patient. This approach also serves the dual purpose of facilitating the patient's awareness of their own behavior as perceived by others. Although relatively more time-consuming when compared with a self-report measure, the CAID offers access to clinical assessment modalities and information that are difficult to otherwise ascertain.

Limitations and Future Directions

Several limitations to our study should be acknowledged and addressed with future research. First, our sample was selected for a study of personality pathology, and therefore maladaptive personality features were enriched in this group of participants. Additionally, over half the sample was in current psychiatric treatment. This may have influenced our results because one of the hallmarks of personality pathology is the non-normative expression of emotions and interpersonal behavior. To the extent that individuals in our sample were idiosyncratic or abnormal in their interpersonal displays associated with specific affects, then our

results may not be informative for broader or psychologically healthier samples. However, there is evidence to suggest that our results might be reasonably generalizable. Notably, we tested whether the effects differed across the recruited patients and their significant others when establishing the indistinguishable dyad APIM models, and we found no differences across the two couple members on effects. Nevertheless, our sample may be limited in its generalizability, and sample-specific features may have affected the study in unanticipated ways, such as the rates and pattern of observed behaviors.

Indeed, the second limitation we note is that several of the SPAFF behaviors (e.g., *Anger*, *Disgust*) occurred rarely, which led to problems in estimation of the respective APIM models and ultimately omission from our analyses. As a result, we were unable to examine how the CAID ratings covaried with several SPAFF behaviors. Several other behaviors (e.g., *Interest, Affection, Contempt*) occurred with relative infrequency, raising questions about the robustness of the results for those low base rate codes. One possibility is that this reflects limited engagement in the task by the participants. In fact, the problem of low base rate codes in the SPAFF has presented itself in a number of studies within the relationships literature (e.g., Fitness & Fletcher, 1990), suggesting that this has been a recurrent difficulty when analyzing certain behavioral codes from the SPAFF. Finally, this study was limited to the observation of a conflict task. It is possible that there are nuances to different types of interactions (e.g., cooperative, problem solving) that may affect the associations between the SPAFF and CAID ratings. A remaining question is whether our sample characteristics (i.e., clinical sample), the nature of the task (i.e., conflict), or both contributed to any of the unexpected results. The current study cannot adjudicate between these possibilities. Therefore it is important that future research should replicate the study while including non-patient or community samples and varying the nature of the task. Potential rich sources of data for this purpose would be archival video-

recorded interactions that have already been coded with SPAFF and that could be re-coded with CAID.

Additionally, we limited our study to patterns of covariation, but future work should study whether and how SPAFF and CAID ratings increment each other in predicting important relational outcomes. This work could include using basic summary indices (e.g., average levels of behavior) as well as more complex dynamic indices (e.g., dyadic complementarity ratings) to predict outcomes. Moderation should also be considered, such that interpersonal behavior may change the meaning of SPAFF codes. For instance, affiliative *Criticism* may serve to motivate positive change, whereas hostile *Criticism* may lead to negative interaction patterns. Many fruitful avenues are open when considering the combination of these two systems.

Conclusions

Relationship scientists have developed a number of observational coding methods for assessing how dyadic processes occur during interactions, of which the SPAFF is the most frequently used. The current study sought to empirically link the behaviors described by the SPAFF to their underlying interpersonal dimensions to further the assessment of behavior as it occurs moment-to-moment during social interactions. By mapping the associations between the SPAFF and CAID approaches, we found that there was considerable conceptual overlap between SPAFF codes and the propaedeutic interpersonal domains of dominance versus submissiveness and affiliation versus disaffiliation. Further, SPAFF behaviors elicit identifiable, complementary behavior from couple members. However, the results of this study also demonstrate that SPAFF behaviors and CAID dimensions are not isomorphic, and suggest that the integration of these two systems may reveal a more richly detailed and nuanced description of interpersonal behavior. Future research is needed that compares the incremental predictive validity of these two systems with respect to significant relationship outcomes.

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Table 1. Descriptions of SPAFF Behaviors and Predictions of Associations with IPC

		Actor Effects		Partner Effects	
SPAFF Code	Description	Dominance	Affiliation	Dominance	Affiliation
Affection	To express genuine caring and concern and offers comfort and facilitate closeness and bonding.	Unassociated	Positive	Unassociated	Positive
Defensiveness	To deflect responsibility or blame, communicating innocent victimhood or righteous indignation, implying that the bad thing being discussed is not the speaker's fault.	Negative	Negative	Positive	Negative
Contempt	To belittle, hurt, or humiliate. Such behavior deliberately and forthrightly communicates an icy lack of respect, often cruelty.	Positive	Negative	Negative	Negative
Neutral	"Dividing line" between positive and negative SPAFF codes. It is relatively nonaffective and is associated with the exchange of unvalenced information.	Unassociated	Unassociated	Unassociated	Unassociated
Criticism	To attack someone's character or personality in a way that is not obviously insulting, but suggests that the partner's personality is defective, often accompanied by blame.	Positive	Negative	Negative	Negative
Interest	To communicate genuine interest in one's partner through active elaboration or clarification seeking.	Positive	Positive	Negative	Positive
Domineering	To exert and demonstrate control over one's partner or a conversation, and attempting to impose compliance on the receiver's responses or behaviors.	Positive	Negative	Negative	Negative
Validation	To communicate sincere understanding and acceptance of one's partner or of one's partner's views and opinions.	Positive	Positive	Negative	Positive
Sadness	To communicate loss, resignation, helplessness, pessimism, hopelessness, or a plaintive or poignant quiescence.	Negative	Negative	Positive	Negative
Stonewalling	To communicate an unwillingness to listen or respond to the receiver.	Positive	Negative	Negative	Negative
Tension	To communicate, usually involuntarily, fear, worry, anxiety, nervous anticipation, or dread.	Negative	Negative	Positive	Negative
Tense Humor	To share in mutual amusement and joy following a mutually recognized moment of absurdity or fun.	Positive	Positive	Negative	Positive

Note. Descriptions of SPAFF codes adapted from Coan & Gottman (2007).

Table 2. Descriptive statistics and reliability of Continuous Assessment of Interpersonal Dynamics (CAID) scores

	Dominance	Affiliation
Descriptive Statistics		
Mean	5.50	0.74
Standard Deviation	21.03	20.36
Minimum	-62.69	-82.42
Maximum	78.35	92.15
Skew	-0.33	-0.60
Kurtosis	-0.17	0.48
Reliability	Mean (Range)	Mean (Range)
ICC - Absolute	.79 (.26 – .97)	.62 (.14 – .94)
ICC - Consistency	.86 (.62 – .97)	.75 (.22 – .95)

Note. Between-Person N = 67, Within-Person N = 160,000. ICC = intraclass correlation. ICCs reflect two-way mixed effects for average of measures (ICC[3,k]). Absolute ICC incorporates agreement on the level and relative patterning of rated behavior, whereas Consistency only incorporates relative patterning.

Table 3. Associations of SPAFF and Continuous Assessment of Interpersonal Dynamics (CAID) Codes from Multilevel-SEM APIM Models

		Actor Effects†							Partner Effects						
		Dominance			Affiliation				Dominance			Affiliation			
	%	Estimate	*SE*	*p*	Estimate	*SE*	*p*	d	Estimate	*SE*	*p*	Estimate	*SE*	*p*	d
Neutral	63.49%	**1.33**	**0.68**	**0.049**	0.29	0.43	0.504	0.05	**-3.83**	**0.62**	**< .001**	**1.06**	**0.39**	**0.006**	0.14
Interest	0.08%	-1.61	1.06	0.130	0.88	1.03	0.391	0.06	**1.81**	**0.77**	**0.019**	**3.59**	**0.79**	**< .001**	0.14
Affection	0.47%	**-8.22**	**2.11**	**< .001**	**5.93**	**2.45**	**0.015**	0.35	**6.01**	**1.80**	**0.001**	**18.91**	**1.78**	**< .001**	0.68
Validation	2.87%	**8.19**	**0.65**	**< .001**	**1.18**	**0.49**	**0.016**	0.28	**-8.10**	**0.69**	**< .001**	**4.46**	**0.43**	**< .001**	0.32
Defensiveness	8.85%	**-3.85**	**1.14**	**0.001**	**-3.46**	**0.78**	**< .001**	0.18	**9.99**	**0.89**	**< .001**	**-3.59**	**0.86**	**< .001**	0.36
Contempt	0.40%	1.29	1.70	0.447	**-2.61**	**1.20**	**0.029**	0.10	**5.10**	**1.57**	**0.001**	**-4.44**	**1.99**	**0.025**	0.23
Criticism	1.85%	**-8.00**	**1.35**	**< .001**	-1.31	1.16	0.255	0.28	**13.79**	**1.31**	**< .001**	**-7.43**	**1.09**	**< .001**	0.54
Domineering	5.33%	**-3.05**	**1.14**	**0.007**	**-2.10**	**1.02**	**0.039**	0.13	**11.88**	**0.89**	**< .001**	**-5.89**	**0.98**	**< .001**	0.45
Sadness	0.60%	-1.71	4.05	0.673	2.80	2.60	0.280	0.11	0.41	5.36	0.938	-3.78	2.66	0.156	0.13
Stonewalling†	0.35%	**22.20**	**9.02**	**0.014**	-0.35	3.09	0.909	0.76	**-20.62**	**6.98**	**0.003**	**-13.37**	**4.47**	**0.003**	0.84
Tension	14.15%	**4.38**	**0.68**	**< .001**	**1.62**	**0.53**	**0.002**	0.16	**-5.05**	**0.70**	**< .001**	**2.25**	**0.52**	**< .001**	0.19
Tense Humor	0.59%	**2.78**	**0.87**	**0.001**	**9.27**	**1.11**	**< .001**	0.33	1.47	0.75	0.050	**7.35**	**1.01**	**< .001**	0.26
Valence	--	**2.39**	**0.29**	**< .001**	**0.97**	**0.20**	**< .001**	0.09	**-3.49**	**0.29**	**< .001**	**2.07**	**0.18**	**< .001**	0.14

Note. Dyad *N*=67 Couples; Time-point *N* = 80,000 half-second time-points. % = Percent of total time-points with that SPAFF code. All coefficients are unstandardized regression parameters. Values of the outcomes (Dominance and Affiliation codes) could range from -100 to 100; all predictors, with the exception of Valence, were binary and coded 0 = absent, 1 = present. d = Cohen's d, calculated from the hypotenuse of both effects (i.e., the vector length of projection into the interpersonal plane).
†All actor and partner effects were estimated by treating both partners as indistinguishable. This was supported in every model except for Stonewalling, which had a highly discrepant % of codes across participants, and required one actor effect to be fixed to 0.0 for estimation. Thus, the reported effect reflects the pathway as estimated in half the sample.

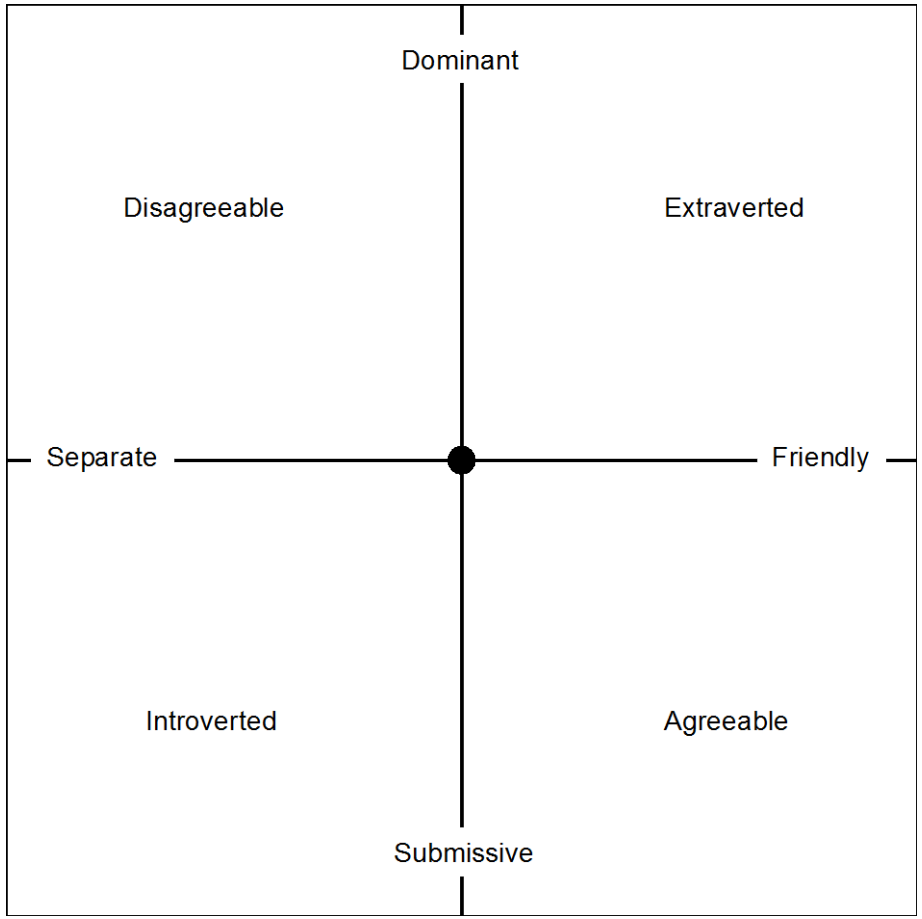

Figure 1. Diagram of the interpersonal circumplex (IPC) model. The model as presented here is identical to the momentary interpersonal coding space presented to individuals as part of the Dual Axis Rating and Media Annotation (DARMA; https://darma.codeplex.com) software program.

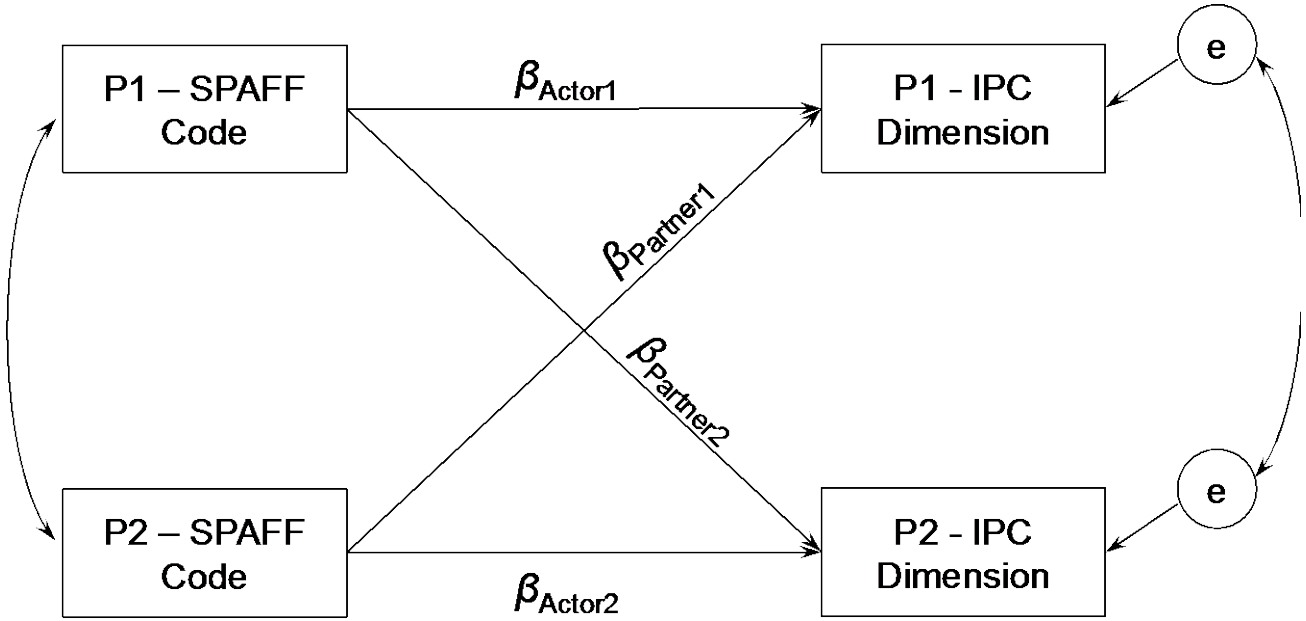

Figure 2. Diagram of within-person portion of multilevel structural equation models relating SPAFF and momentary IPC codes. The diagram represents an Actor Partner Interdependence Model (APIM) for indistinguishable dyads. P1 = Participant 1 in a dyad, and P2 = Participant 2 in a dyad. Coefficients for actor effects (β_{Actor1} and β_{Actor2}) and partner effects ($\beta_{Partner1}$ and $\beta_{Partner2}$) were constrained to be equivalent across dyad members, treating participants as interchangeable.

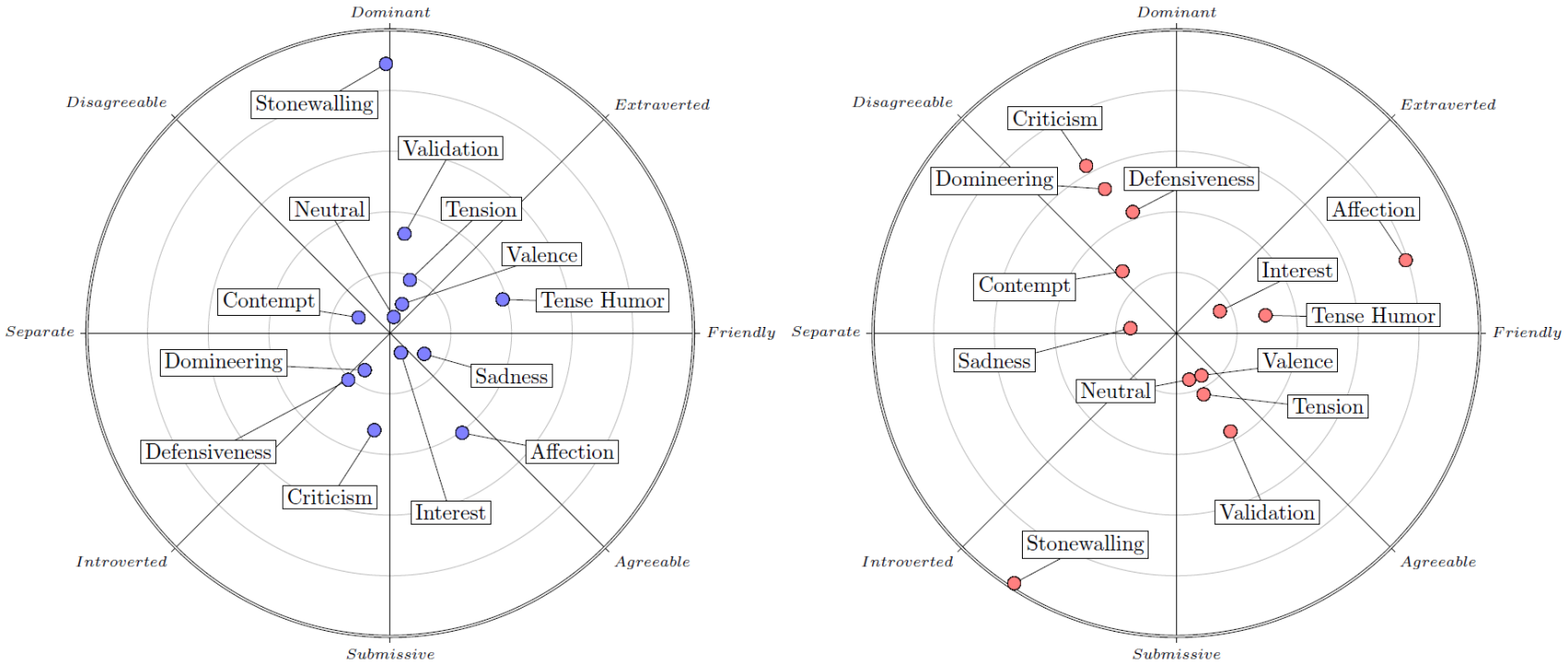

Figure 3. Polar projection plots of Specific Affect coding system actor (left panel, blue) and partner (right panel, red) effects in interpersonal circumplex space.