

# Interacting in Flow: An Analysis of Rapport-Based Behavior as Optimal Experience

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## Abstract

Theorists have long noted the nebulousness of dyadic rapport and its nonverbal correlates. In response to Tickle-Degnen's call for a more theoretically complete analysis of the rapport construct, we empirically evaluated her adaptation of Csíkszentmihályi's optimal experience model with the hope of better conceptualizing rapport's behavioral manifestations. Dyads ( $N_{\text{dyad}} = 50$ ) engaged in two interdependent tasks and completed a battery of post-task measures gauging their mood and experiences of rapport. To complement self-report measures, we coded rapport-based behavior using both subjective (thin-slice judgments) and objective (Motion Energy Analysis) methodologies. According to Tickle-Degnen's model, dyadic exchanges with moderate levels of expressivity and interpersonal coordination should yield the highest levels of rapport. Although data from our objective coding did not trend in this manner, subjective measurements of coordinated expressivity matched the paradigm's prediction. To our knowledge, this is the first study to empirically support Tickle-Degnen's hypothesis and a novel step toward clarifying the rapport construct.

## Keywords

rapport, dyad, optimal experience, synchrony, Motion Energy Analysis

After decades of investigation, the construct of rapport remains a nebulous one, still evoking the image of “cornmeal mush” (DePaulo & Bell, 1990, p. 305). In particular, the nonverbal behavior indicative of rapport remains ill-defined and inconsistent (Tickle-Degnen, 2006). Although researchers have already isolated rapport into three, interrelated components—mutual attentiveness, positivity, and behavioral coordination (Tickle-Degnen & Rosenthal, 1990)—those components do not always generate or signal rapport (DePaulo & Bell, 1990; Patterson, 1990). Not only are these components observed in distinctly low-rapport circumstances (Cappella, 1996; DePaulo & Bell, 1990), but the ways in which they correlate with rapport seem to vary across contexts (Tickle-Degnen, 2006).

Continued work is thus needed to clarify the relationship between rapport and its behavioral correlates. Recognizing this need, Tickle-Degnen (2006) cited the optimal experience model of flow theory (Csíkszentmihályi, 1990; Csíkszentmihályi & LeFevre, 1989) as relevant to a more theoretically cogent examination of rapport. In this model, Csíkszentmihályi (1990) originally proposed that a person is most likely to experience “flow” when a task is moderately difficult. If a person finds the task too easy or too challenging, suboptimal experiences result. Tickle-Degnen (2006) conceptualized rapport, like flow, as a kind of optimal experience. As such, she theorized that rapport and its behavioral

correlates could similarly fit into an optimal experience model, where moderate (i.e., “optimal”) levels of behavior would be indicative of high dyadic rapport.

The current study furthers Tickle-Degnen's work by empirically evaluating her published model. Specifically, we examined the relationship between rapport and two of its behavioral correlates—namely, nonverbal expressivity and coordination—during dyadic interactions. Ultimately, empirically evaluating Tickle-Degnen's (2006) optimal experience model may be a crucial first step in distinguishing the “something more” (DePaulo & Bell, 1990, p. 305) that characterizes the rapport construct.

## Dyadic Rapport as Affect and Action

To begin, a two-component conceptualization of dyadic rapport—one that couples affect with behavior—is most relevant to our analysis. Tickle-Degnen and Rosenthal's (1990) three-component model of rapport classically recognized its affective

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and behavioral nature: Feelings of positivity are characterized by displays of affectionate touch, forward leaning, smiling, and other affectionate gestures (Anderson, Guerrero, & Jones, 2006; Hendrick, 1990); mutual attention is conveyed through eye contact and posture sharing (Norton & Pettegrew, 1979); and sensations of “balance” or “harmony” (Tickle-Degnen & Rosenthal, 1990) manifest through coordinated movement between partners. Indeed, to understand rapport as affect alone is to overlook how it is established, built, and maintained.

In fact, various dual-system models—including Patterson’s (1995) parallel process model, Chartrand and Bargh’s (1999) perception–action system, and Tickle-Degnen’s (2006) signal–perception–action–signal loop—suggest a link between dyadic action and social perception. Behavioral coordination during a dyadic interaction elicits shared perceptions between interactants (Chartrand & Bargh, 1999), and more generally, nonverbal signaling works to convey information between an actor and a perceiver (Tickle-Degnen, 2006). Thus, dyadic action is intrinsic to the formation and maintenance of rapport, as it creates a bidirectional expressway for information sharing and rapport development (Dijksterhuis & Bargh, 2001; Grahe & Bernieri, 1999; Tickle-Degnen, 2006).

### **Nonverbal Expressivity as the Groundwork of Interpersonal Behavior**

This dyadic action can be fundamentally understood as nonverbal expressivity, which refers to the clarity by which an individual nonverbally communicates his or her emotions (Boone & Buck, 2003). Expressivity requires “expressiveness,” which more generally refers to the behavioral activity used to convey an affective state. Tickle-Degnen (2006) asserts that such activity is integral to dyadic rapport development. Expressiveness allows for the communication of emotions and attitudes from an actor to a perceiver, and in turn, the perceiver possesses more information from which to reciprocate appropriately and build rapport.

Much research concludes that the nonverbal expression of emotion remains a crucial ingredient in dyadic interactions. Expressivity is positively associated with ratings of relational quality and rapport (Fridlund & Russell, 2006; Grahe & Bernieri, 2002; Riggio & Riggio, 2002). Furthermore, related studies have even experimentally suppressed participants’ capacity for expressivity. Butler and colleagues (2003; Butler, Lee, & Gross, 2007) discovered that directing dyad members to restrain their nonverbal behavior led to negative perceptions of the interaction. Although the social importance of expressivity may vary across cultures (e.g., Butler et al., 2007), it does seem to be a critical variable in the rapport equation.

### **Interpersonal Coordination and Rapport Development**

Theory and research further suggest that the coordination of nonverbal action is important for rapport development. In fact,

Tickle-Degnen (2006) asserts that expressivity is the “raw action material” required for coordination (p. 387). Said differently, when there is no expressivity during an interaction, there is no behavior available for coordination. Coordination can refer to both behavior matching and interactional synchrony (Burgoon, Stern, & Dillman, 1995; Grammer, Kruck, & Magnusson, 1998). Behavior-matching is the nearly simultaneous mirroring of gestures, facial expressions, or other behaviors between dyad members (Tickle-Degnen, 2006). Interactional synchrony occurs on a global level, as when dyads interact with a certain rhythm or smoothness (Bernieri & Rosenthal, 1991; Tickle-Degnen, 2006).

Evidence at both the behavioral and affective levels supports coordination’s relevance to positive social outcomes, including rapport (Cappella & Schreiber, 2006). Emotional contagion or “yoking” represents a good example of affective coordination (Cappella & Schreiber, 2006; Hatfield, Cacioppo, & Rapson, 1993), as proximate individuals sometimes synchronize their own moods and emotions to reflect another’s emotional state. At the behavioral level, some suggest that synchrony and posture mimicry might contribute to this kind of emotional convergence (Hatfield et al., 1993). Such an explanation makes sense when noting that interactional synchrony is recognized by both observers (Bernieri et al., 1996; Cappella, 1997; Lakens & Stel, 2011) and interactants (Bernieri et al., 1996; Grahe & Bernieri, 2002; Grahe & Sherman, 2007; Vacharkulksemsuk & Fredrickson, 2012) as a characteristic of high-rapport interactions. Humans may even have an innate preference for synchronized interaction (Argyle, 1990; Harrist & Waugh, 2002; Tronick, 1989, 1990), suggesting that behavioral coordination is also integral to establishing and maintaining rapport.

### **Dyadic Rapport Within the Optimal Experience Model**

Tickle-Degnen (2006) argued that dyadic rapport—in both its affective and behavioral nature—represents an optimal experience similar to a kind of “flow state” (Csikszentmihályi, 1990). An individual enters “flow” when she or he becomes unconditionally absorbed by a task at hand. While in flow, a person’s anxieties often diminish and a feeling of ease results. A body of research suggests that individuals are most likely to enter flow when they engage in an activity with a difficulty that matches their skill level within that domain. If they participate in a task that is either too difficult or too easy for their perceived skill level, suboptimal consequences such as anxiety or boredom can emerge (Csikszentmihályi, 1990; Csikszentmihályi & LeFevre, 1989; Mesurado & Richaud de Minzi, 2013; Nakamura, 1988). This difficulty/skill balance was first identified by Nakamura (1988), and Csikszentmihályi (1990) later integrated this phenomenon into his optimal experience theory.

Tickle-Degnen (2006) believed that a similar kind of optimal balance is also pertinent to the rapport ecosystem. She

reworked optimal experience theory into a model that extended its relevance to interpersonal behavior patterns during rapport development. According to Tickle-Degnen's (2006) model, optimal experiences are those where dyads feel and act in calm, yet attentive ways; suboptimal experiences foster overactive or underactive levels of action and affect (Tickle-Degnen, 2006). More specifically, when an actor's expressivity is overactive, information is lost between an actor and a perceiver. When expressivity is underactive, there is a shortage of nonverbal information passed between partners. Frantic behavior also makes coordination between dyad members more challenging, and conversely, a lack of behavior means that there is less behavior to coordinate. Hence, moderate levels of expressivity should promote the most rapport development.

Some research supports this postulation. Boone and Buck (2003) discovered that especially high levels of expressivity hindered the formation of trust in unacquainted dyads. They also concluded that expressivity necessitates a moderate degree of expressiveness (Boone & Buck, 2003). In addition, a longitudinal examination of practitioner–client interactions found that an intermediate—as opposed to high—frequency of attentive or positive behavior was linked to the most favorable rapport ratings (Tickle-Degnen & Gavett, 2003). The relationship between expressivity and rapport levels could thus be a nonlinear one, where chaotic (overactive) or subdued (underactive) action yields the lowest rapport because it disrupts the patterned responsiveness of interactions. Interpersonal coordination may also behave in a similar way. When coordination is gauged on a looseness-to-tightness spectrum (Bernieri & Rosenthal, 1991; Burgoon et al., 1995), moderate levels should be most conducive to rapport-building. Indeed, research validates this relationship between moderate coordination and more positive interactional outcomes (Cappella, 1996; Jaffe, Beatrice, Stanley, Crown, & Jasnow, 2001; Tickle-Degnen & Gavett, 2003).

## The Current Study

The current study extends this prior work by empirically evaluating Tickle-Degnen's optimal experience model. Using a subset of data (Study 2; Nelson, Grahe, Ramseyer, & Serier, 2014) published in a public data repository, we examined associations between dyads' sensations of rapport and their displays of expressivity/coordination across two interdependent tasks. In addition, research assistants coded all the nonverbal behavior present in these dyadic interaction using both subjective (thin-slice judgments; Ambady & Rosenthal, 1992) and objective (Motion Energy Analysis [MEA]; Ramseyer & Tschacher, 2006, 2011) methodologies. Thus, the resulting data span multiple modes of analysis. Tickle-Degnen's model suggests that dyadic exchanges with moderate or "optimal" levels of expressivity and coordination should be associated with the highest sensations of rapport. As such, we hypothesized that this pattern would arise in our

data, and we further anticipated that it would be supported across both subjective and objective coding.

## Method

### Protocol/Data History

The data in question were first collected in response to a proposal submitted to an undergraduate research initiative (Collective Undergraduate Research Project; Grahe, 2010). In the fall of 2011, Dr. Fabian Ramseyer (e.g., Ramseyer & Horowitz, 2010) shared a collection of materials and procedural information with this research initiative. His proposal outlined a methodological replication of Ramseyer and Horowitz (2010) that would further investigate the nature of behavioral synchrony during cooperative interactions. Since his submission, several student teams have conducted conceptual replications of this design while also including novel manipulations of their own. A copy of this base protocol is shared on our Open Science Framework (OSF) project page (<https://osf.io/bn3th/wiki/home/>), as are PDF copies of both pre-task (<https://osf.io/76rt9/>) and post-task (<https://osf.io/b8agm/>) questionnaires. The resulting data have also been made publicly available via the *Journal of Open Psychology Data* (Nelson, Grahe, & Ramseyer, 2014).

The current study is one such extension from this base protocol. As a result, not all employed measures are pertinent to the present research question, so we only detail those relevant to our optimal experience hypothesis. Those interested in the full battery of measures may visit our OSF project page.

### Participants

Undergraduate students ( $N_{\text{dyad}} = 50$ ) from a small, liberal arts university in the Pacific Northwest region of the United States enrolled in this study. Dropout tendencies and university demographics contributed to an imbalanced number of participants across the different dyad makeup conditions; specifically, we tested more female–female pairings ( $n = 27$ ) than male–male ( $n = 10$ ) and mixed-sex dyads ( $n = 13$ ). Due to the relatively small student population of the university, researchers accounted for possible familiarity between participants by using two self-report questions. We treated all participants according to APA ethical guidelines.

### Procedure

To assign a task order to each dyad, we generated a list of randomized numbers where each value corresponded to a given task sequence. According to this randomization procedure, 28 dyads were assigned a menu task first, whereas 22 dyads were assigned a close-calls task first. Participants entered the lab upon arrival and chose which side of the table to sit on; thereafter, participants could not switch their

seating arrangements. After reviewing informed consent and video consent forms, participants turned to the nearby computers and completed pre-task assessments while the researcher remained in the room. Upon completion, we again asked participants to sit at the central table. An experimenter then read one of the two dyadic task prompts aloud, answering any questions accordingly. Afterward, the experimenter turned on a video camera and began a stopwatch before leaving the room. Following the 6-min task, participants returned to their separate computers and answered the posttest measures. Researchers repeated these procedures (excluding the initial pretest) for the second of the two dyadic tasks.

## Materials

**Pre-task measures.** Prior to their first dyadic interaction, participants completed a battery of personality measures.

**Interpersonal difficulties.** We used the short-form Inventory of Interpersonal Problems (IIP-32; Horowitz, Alden, Wiggins, & Pincus, 2000), a 32-item measure of interpersonal behavior in which participants rate how much certain social problems affect them (e.g., “It is hard for me to socialize with other people”). Ratings were made on a 5-point Likert-type scale ranging from 1 (*not at all*) to 5 (*extremely*). Because we did not have any hypotheses specific to the eight IIP subscales (i.e., Domineering, Vindictive, Cold, Socially Inhibited, Nonassertive, Overly Accommodating, Self-sacrificing, Intrusive), we computed a mean score of interpersonal difficulties across the full 32 items ( $\alpha = .84$ ).

**Empathy.** Next, we used a modified version of the Interpersonal Reactivity Index (IRI; Davis, 1980) to assess participants’ levels of empathy. Specifically, we retained three of the original four IRI subscales, which allowed us to measure empathetic concern (e.g., “I am often quite touched by things I see happen”), perspective taking (e.g., “I try to look at everyone’s side of a disagreement before I make a decision”), and fantasy (“After seeing a play or a movie, I have felt as though I were one of the characters”). Answers ranged on a 5-point Likert-type scale from 1 (*does not describe me well*) to 5 (*describes me very well*). Again, we compiled all items into a single empathy construct, yielding a mean empathy score for each participant ( $\alpha = .86$ ).

**Dyadic tasks.** In accordance with Ramseyer’s proposal, researchers used both a dyadic “menu task” and a “close calls” experience (adapted from Chovil, 1991) as opportunities for rapport-building. Beginning with the former, the menu task asked participants to create an imaginary five-course dinner menu comprised of foods they both disliked. The task was entirely verbal, so participants did not create hard copies of their agreed-upon menu. In the “close calls” prompt, researchers instructed each member of the dyad to disclose past “near-miss” or potentially dangerous situations

that they had either experienced themselves or heard about from peers. Dyads had 6 min to complete each task, and we did not predict outcomes to differ across the tasks. For complete copies of these prompts (Interactions 1 and 2), see our OSF page (<https://osf.io/a6kis/>).

**Interactant familiarity.** We did assess the extent to which each dyad member might know his or her partner. Specifically, participants reported how long they had known their partner on a Likert-type scale from 1 (*we’ve not known each other before*) to 6 (*for more than 3 years*). They also reported how well they knew their partner on a Likert-type scale from 1 (*first time I’ve seen him or her*) to 6 (*we are close friends*).

**Post-task measures.** After each task, both participants completed a battery of measures related to the preceding interaction.

**Interpersonal closeness.** We used the Inclusion of Others in Self (Aron, Aron, & Smollan, 1992) pictorial-based measure to gauge perceptions of interpersonal closeness between interactants. By using a series of inter-lapping circles to represent different levels of “closeness,” this measure instructed participants to choose the set of circles that “best describes their relationship.” Participants responded on a scale from 1 (*no overlap between the circles*) to 9 (*nearly complete overlap of the circles*), with higher levels of overlap designating more closeness.

**Mood.** The Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) asked participants to recall the degree to which they encountered certain moods (for instance, feeling “interested” or “hostile”) during the preceding interaction ( $\alpha = .89$ ). Answers ranged on a Likert-type scale from 1 (*not at all*) to 5 (*extremely*), with higher scores indicating more positive moods.

**Rapport.** We used the Post-Interaction/Rapport Questionnaire (IRQ; Bernieri, Davis, Rosenthal, & Knee, 1994) as our primary gauge of dyadic rapport during each interaction. This measure asked participants to rate the presence of certain rapport-based characteristics during the preceding task ( $\alpha = .95$ ). Participants rated their experience based on 18 different qualifiers (e.g., “coordination” or “intensity”), answering on a Likert-type scale ranging from 1 (*not at all*) to 9 (*extremely*).

## Behavioral Coding

We assessed displays of interpersonal behavior during each dyadic interaction using both subjective (i.e., thin-slice coding) and objective (i.e., MEA) methodologies. We provide an overview of both methodologies below.

**Thin-slice coding.** The behavioral cues present during interpersonal exchanges exist on objective and subjective levels (Grahe

& Bernieri, 2002). Objective cues consist of quantifiable actions determined by time (for example, the duration of eye contact between interactants) or quantity (the number of smiles made by each of them). In contrast, subjective cues require the observer to speculate about an actor's or dyad's psychological state. Even so, such speculation is often derived from objective behavior, as when a friend makes inferences about a couple's rapport based on concrete instances of smiling and touch.

Based on these cues, humans intuitively make judgments about interactions and their outcomes (Ambady, 2010; DePaulo & Friedman, 1998). Research consistently finds observer judgments to be accurate and in line with interactants' own perceptions of an interaction (e.g., Ambady & Rosenthal, 1992). Moreover, quick judgments of interpersonal behavior—even when made at random times during an interaction—are no less accurate than longer judgments (Ambady, Bernieri, & Richeson, 2000; Ambady & Rosenthal, 1992). These so-called “thin-slice” judgments, operationally understood as impressions formed after 5 min or less, are reliable across contexts (Ambady & Rosenthal, 1992). In some cases, these thin-slice judgments are even more accurate than those made after a longer period of time (Patterson & Stockbridge, 1998). Accordingly, we isolated 30-s slices from each videotaped interaction for our coding purposes. To reduce the risk of sampling artifact and potential bias, experimenters selected the first 30 s from the second minute of each interaction for coding purposes.

Three research assistants unaware of study hypotheses then coded each selection. Before coding began, these coders attended multiple training sessions held by the second author, and during each session, they practiced using a coding scheme specifically created for the purposes of this study (see the appendix). Notably, our coding scheme focused on the primary behavioral correlates of rapport as noted by Tickle-Degnen (2006), and the scheme used language directly taken from her optimal experience model. Overall, ratings were made on a 7-point Likert-type scale. A centered “0” value represented optimal experience, and each pole of the scale (“-3” on one side and “+3” on the other) represented the extremes of suboptimal experience.

In particular, coders used this scale to assess behavioral displays of “Activity/Expressivity” and “Coordination/Synchrony.” Activity/Expressivity is the “raw behavioral material” necessary for the development of interpersonal coordination (Tickle-Degnen, 2006, p. 385). During suboptimal interactions, interactants can feel “bored” or “anxious,” and their expressivity reflects these feelings; when interactants are engaged in an optimal experience, however, they demonstrate “calm and energized” action (Tickle-Degnen, 2006). We used these same characterizations of suboptimal and optimal expressivity in our own coding scheme (see the appendix). Based on this scheme, coders rated the Activity/Expressivity of each dyad member separately, and these scores were averaged to yield a single Activity/Expressivity score for each dyad.

We also borrowed Tickle-Degnen's (2006) conceptualization of suboptimal and optimal coordination for our coding scheme. Coordination/Synchrony referred to how harmonious or in sync the dyad appeared while interacting. Suboptimal coordination was characterized by an “emptiness” of behavior at one pole and as “disordered” behavior at the other pole; smooth, synchronous displays denoted optimal experience (Tickle-Degnen, 2006). Because group judgments are often more reliable than single-coder assessments (Ambady et al., 2000), each coder separately evaluated all of the interactions for Activity/Expressivity as well as Coordination/Synchrony. Inter-rater reliability scores suggested consistent coding for both Activity/Expressivity ( $\alpha = .93$ ) and Coordination/Synchrony ( $\alpha = .72$ ) variables.

*Motion Energy Analysis.* Subjective evaluations of movement, however, may be confounded by the observer's inability to separate judgments of synchrony alone from gestalt perceptions of rapport-building. In consequence, technological advancements now allow for more objective techniques of synchrony measurement that can gauge interpersonal motion exclusively. Grammer, Honda, Juette, and Schmitt (1999) first began using automatic movie analysis (AMA) to examine nonverbal courtship behavior as a way to clarify the “fuzziness” of interactional movement. AMA reads digitized video footage of a given interaction. This video footage is recorded with a completely static camera in front of a stable background with stable light conditions. Motion energy is then detected by subtracting the image of one video frame from the previous frame. The amount of change (i.e., the frame-difference) serves as a quantifiable indicator of movement. These differences paint a singular, overall picture of motion across any given amount of time. Not only is the process less subjective than manual video-coding, but it is both efficient and highly reliable (Grammer et al., 1999).

We used a similar program—MEA (Ramseyer, 2016; Ramseyer & Tschacher, 2011)—to objectively evaluate synchronous behavior during each dyadic task. Like AMA, MEA is based on the frame-differencing method. In frame differencing, pixels from digital videos are converted into their grayscale format, ranging from 0 (*true black*) to 255 (*true white*). Pixel hue changes between two subsequent video frames, which are caused by a participant's movement, are then calculated and conceptualized as motion energy (ME; Kupper, Ramseyer, Hoffmann, Kalbermatten, & Tschacher, 2010). These calculations of ME are bounded by pre-determined “maps” or drawn-out regions of a participant's body. In other words, if near-simultaneous motion is detected in adjacent regions (for example, an upper body region) for both dyad members, it is conceptualized as synchronous movement. Because ME calculations are bounded by these regions, shared movement does not need to occur between the same body parts across interactants (e.g., each person's right arm) to register as synchrony. Furthermore, because MEA algorithm reacts to pixel alterations, only the dynamic aspects of

movement are assessed. Thus, dyadic posture sharing or “static” synchrony is not evaluated using this technique. For a comprehensive overview of the MEA technique, we direct readers to Ramseyer and Tschacher (2011).

In the current study, we isolated our analyses to the upper body region of each interactant, which extended from their waist to the top of their head. Although it is theoretically possible to do more acute analyses, smaller “maps” are prone to conflation from stray movements from other body parts (Ramseyer & Tschacher, 2014). In addition, because MEA maps are static and drawn over the video footage after it is recorded, body parts (e.g., a head) can easily cross the boundaries of smaller maps due to participant movement. Although we did use specific lower body and head maps, this upper body region constituted the largest MEA map and the most reliable area for analysis.

Time series of raw movement quantification from MEA was then used to compute lagged cross-correlations of upper body ME between partners. These cross-correlations represent the degree of covariation of ME across partners. Because of the non-stationarity of movement behavior, cross-correlations are calculated in separate windows of 30 s. Each window provides a variety of cross-correlations between the upper body regions of both partners for different time lags. Instantaneous (or “zero-lagged”) synchrony is represented by ME changes that occur across the same subsequent frames for both partners. However, because synchrony can also be directional (with one partner leading the movement and the other partner following), the cross-correlations are shifted in time to also detect synchrony that occurs with a short time delay (or “lag”). We allowed for lags of up to 5 s. Accordingly, if one partner’s ME is matched by the other partner within this 5-s allowance, it also registers as synchrony. Because analyses were completed at a frame rate of 10 frames/second, this allows for the calculation of 50 negative-lagged correlations (0 to –5 s), 50 positive-lagged correlations (0 to +5 s), and one zero-lagged correlation for each 30-s window. These multiple cross-correlations were then standardized using Fisher’s *Z*, and their absolute values were averaged to yield a single synchrony score for each dyad. This global synchrony score served as our objective measure of nonverbal synchrony across each interaction.

## Results

### Data Preparation

Although our protocol yielded a robust assortment of data, the scope of this article only allowed for analyses pertinent to Tickle-Degnen’s model. In accordance with Kenny and colleagues’ (2006) principle of dyad nonindependence, we averaged interactant rapport ratings (as measured by the IRQ) into mean dyad scores; likewise, evaluations of interpersonal behavior were collapsed into dyadic averages. Because suboptimal behavior represented both positive and negative

ratings in our coding scheme, researchers squared all scores and thus translated the scale into a linear format; scores now ranged from 0 to 9. Although we could have also linearized scores by taking their absolute value, doing so would have undervalued ratings of suboptimal experiences. Instead, we squared these values to increase variability and to emphasize these suboptimal encounters. To also prevent future misinterpretation of correlational analyses, we reversed the scale’s direction so that higher values represented more optimal action. We then averaged evaluations of both behavioral measures across the three coders, resulting in a single “Activity” and “Coordination” score for each interaction. In addition, because “Activity” and “Coordination” ratings were highly related,  $r(50) = .91, p < .001$ , researchers decided to combine both variables and create an aggregate measure of coordinated expressivity. Further commentary on the lack of discriminate validity between “Activity” and “Coordination” ratings is available in the “Discussion” section.

Researchers also conducted a series of control analyses to help identify potential confounds. A series of *t* tests revealed no differences in our dependent variables between the menu task and close-calls task; similarly, task sequence had no effect on these same dependent variables (e.g., all tests had a  $p > .05$ ). As such, we averaged all dependent variables across both tasks to yield a single set of scores for each dyad. After collapsing across tasks, we predictably discovered that individual scores on all dependent variables were positively correlated between dyad members (e.g., all tests had a  $p < .05$ ).

### Tests of the Optimal Experience Model

Researchers used a Pearson correlation matrix to evaluate the association between our dependent measures and behavioral data (see Table 1, which also includes means and standard deviations for these variables). First, with regard to objective synchrony, MEA-generated scores did not share any significant association with self-reported rapport levels. This finding runs counter to our hypothesis. The only significant relationship between objective synchrony displays and all posttest measures occurred with feelings of interpersonal closeness,  $r(50) = .28, p = .048$ . Specifically, as dyads synchronized, they reported higher levels of closeness. Data resulting from our coders’ thin-slice judgments, however, did support Tickle-Degnen’s predictions. We discovered a strong positive relationship between dyadic rapport and our composite measure of coordinated expressivity,  $r(50) = .46, p = .001$ . As displays of coordinated expressivity approached optimal levels, dyads’ self-reported experience of rapport also increased.

In addition, we conducted a hierarchical linear regression to see whether this relationship retained significance after accounting for the variance explained by other study variables. Our model consisted of four steps, with dyadic rapport (as measured by the IRQ) entered as our dependent variable. In Step 1, we included our pre-task measures of interpersonal difficulties (as measured by the IIP) and

**Table 1.** Correlation Matrix of Outcome Measures.

	M	SD	1	2	3	4	5
1. Dyadic rapport	6.69	0.83		.366**	.628***	.186	.459**
2. Interpersonal closeness	3.19	1.73			.585**	.281*	.169
3. Mood	3.57	0.35				.095	.246
4. Synchrony	0.11	0.02					.055
5. Coordinated expressivity	7.71	1.83					

Note. Variables represent scores averaged across both dyadic tasks.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Table 2.** Hierarchical Linear Regression Model Assessing Predictors of Dyadic Rapport.

Predictor	Step 1		Step 2		Step 3		Step 4	
	B(SE)	$\beta$	B(SE)	$\beta$	B(SE)	$\beta$	B(SE)	$\beta$
Pre-task measures								
Interpersonal difficulties	-.37(0.33)	-.15	-.31(0.32)	-.12	-.24(0.28)	-.10	-.04(0.26)	-.02
Empathy	0.75(0.26)	.39**	0.75(0.25)	.38**	0.58(0.23)	.30*	0.63(0.20)	.32**
Dyad familiarity								
Length of relationship			-.53(0.54)	-.30	-.24(0.47)	-.13	-.17(0.43)	-.09
Quality of relationship			0.38(0.20)	.57	0.12(0.20)	.19	0.14(0.18)	.21
Post-task measures								
Interpersonal closeness					-.03(0.08)	-.06	-.06(0.07)	-.12
Mood					1.33(0.33)	.56**	1.13(0.31)	.48**
Interpersonal movement								
Synchrony							5.35(4.59)	.13
Coordinated expressivity							0.16(0.05)	.35**
$R^2$	.18		.29		.49		.61	
$F$	5.16**		4.59**		6.89***		7.89***	
$\Delta R^2$	.18*		.11*		.20**		.12**	

Note. Variables represent scores averaged across both dyadic tasks.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

empathy (as measured by the IRI). In Step 2, we added both measures of partner familiarity. In Step 3, we included post-task measures of interpersonal closeness (as measured by the IOS) and mood (as measured by the PANAS). In our final step, we included MEA-generated synchrony and subjective ratings of coordinated expressivity. Please see Table 2 for a depiction of this model and associated results.

The final model reached significance and explained a large portion of variance in rapport levels,  $R^2 = .61$ ,  $F(8, 49) = 7.89$ ,  $p < .001$ . After accounting for the other variables, coordinated expressivity still emerged as a significant predictor of dyadic rapport,  $b = .16$ ,  $p < .001$ . Moreover, this final step explained an additional 12% of the variance in rapport levels primarily due to the coordinated expressivity variable,  $\Delta R^2 = .12$ ,  $\Delta F(2, 41) = 6.06$ ,  $p = .005$ . Taken together, results from this analysis further supported our hypothesis.

## Discussion

This investigation empirically evaluates Tickle-Degnen's (2006) adapted optimal experience model, which uniquely

extends Csikszentmihalyi's (1990) original framework to the rapport ecosystem. Her model acknowledges that rapport development depends on the nature—and not simply the presence—of particular behavioral displays. Moreover, it recognizes that the association between coordinated expressivity and dyadic rapport might be a nonlinear one. Analyses involving the subjective judgments of interpersonal behavior suggest that as an interaction becomes plagued by lethargic or disorderly (i.e., suboptimal) behavior, a decrement in rapport levels is also observed. Conversely, interactions marked by coordinated, well-balanced (i.e., optimal) behavior are associated with higher rapport ratings. Objective measurements of behavioral coordination did not, however, demonstrate this pattern.

Indeed, only the subjectively coded behavior of our dyads supported our hypotheses, and this qualification warrants further discussion. One possible reason for this discrepancy between objective and subjective measures is already known: MEA-calculated synchrony and subjectively coded coordination are theoretically distinct measurements. Not only did our data support their independence,  $r(50) = .055$ ,  $p > .05$ , but

past literature has operationalized these constructs differently. Because MEA relies on frame differencing to detect synchronous behavior, Ramseyer and Tschacher (2011) concede that its output is limited to evaluations of dynamic synchrony; static coordination, as in the mirroring of specific postures or gestures, is thus overlooked. In contrast, coders' ratings of interpersonal coordination provided a more holistic measure of synchrony, as they plainly coded how coordinated the dyads appeared. Whereas MEA is microanalytical in scope and thereby generates synchrony scores piecemeal (Bernieri & Rosenthal, 1991), thin-slice judgments encompass both posture mimicry and displays of coordinated movement.

A second but related explanation for conflicting results could be due to the gestalt nature of coordination itself. Most basically, MEA is a measure of movement dynamics. It has the capacity to measure the amount, duration, speed, and complexity of movements between people. Microanalytical measures such as MEA do not, however, capture all channels of communication in the behavior stream (Delaherche et al., 2012), and thus, its scope is limited. MEA cannot account for any psychological content beyond what is communicated by gross body movements, and our current setup yielded low-resolution videos where more psychologically informative motion (i.e., facial expressions) could not be assessed. Alternatively, accurate observer judgments appear to be intuitive (Ambady, 2010) and a product of human development (DePaulo & Friedman, 1998), suggesting that computerized measures might not yet be capable of reliably reproducing the human evaluation process. It could also explain why the thin-slice judgment method is considered the "gestalt approach" in relevant literature (Bernieri & Rosenthal, 1991). MEA's objective nature means it has the ability to record pure motion untainted by accompanying psychological information. Nevertheless, with this objectivity comes a rigidity that—unlike human judgments—might fail to capture both behavior *and* affect. Furthermore, it is possible that our measure of rapport, which was based on the averages of dyads' self-reports, may reduce the association between affect and synchrony previously found in a larger sample based on comparable dyads (Tschacher, Rees, & Ramseyer, 2014).

Also, the apparent lack of discriminant validity between "Activity/Expressivity" and "Coordination/Synchrony" ratings deserves further mention. A distinction between both variables is evident at the positive pole of the coding scheme (i.e., the positive extreme of the Activity/Expressivity spectrum represents frenzied movement, and in turn, disharmonious displays of frenzied movement on the Coordination/Synchrony spectrum) but not at the negative one. Coders may have interpreted "bored" interpersonal activity as an emptiness of activity; however, this emptiness should have been marked as suboptimal coordination. In this way, coders still gauged coordination on a looseness-to-tightness scale (Bernieri & Rosenthal, 1991); however, their judgments pertain more to the organization and intensity of the movement than to its synchronicity.

Finally, we acknowledge that our composite measure of coordinated expressivity may appear to approximate Tickle-Degnen and Rosenthal's (1990) component of dyadic positivity. We cite three pieces of evidence to differentiate our measure of coordinated expressivity from positivity. First, our task prompts were not designed to foster positive affect between dyad members; in fact, these prompts were deliberately meant to elicit challenges for the dyad. For example, the menu task forced dyads to brainstorm foods that they both disliked, which presumably led to some disagreements. Furthermore, the close-calls task asked participant to recall anxiety-inducing events from their lives. Second, we did not find a significant correlation between PANAS scores and ratings of coordinated expressivity. If coordinated expressivity was simply a proxy for feelings of positivity, we would expect a strong positive correlation between these variables. And third, although we acknowledge that coders may have been unable to separate their assessments of behavior from affect, they were instructed to focus on behavior exclusively when viewing the interactions.

## Conclusion

To our knowledge, this is the first data-based validation of Tickle-Degnen's model. Although these conclusions may fall short of clearing the murkiness surrounding rapport and its nonverbal indicators, they are still in conversation with Tickle-Degnen's call for the construct's reconceptualization. Identifying rapport as optimal experience, however, demands that future work explores the association between rapport's affective nature and behavioral elements within different contexts (e.g., task demands, environment of interaction, and/or presence of distractors).

Reclassifying rapport as optimal experience also alludes to the potential overlap between rapport and flow states. Although both constructs remain theoretically distinct, this overlap is significant in that it urges developments associated with one state to inform the other. For example, Csíkszentmihályi's (1990) original understanding of optimal experience maintained that people most often reach flow state when managing perceived challenges in a domain that they are sufficiently skilled in. Future research could then explore whether active interdependent tasks of an optimal difficulty prime rapport development. Investigations into the behavioral indicators of flow could also build upon work exploring rapport's nonverbal correlates. In sum, borrowing Csíkszentmihályi's (1990) model not only strengthens our theoretical grasp on rapport, but in return, it may lend itself to advancements in flow theory.

Last, we contend that these recommendations are well suited for data-sharing initiatives, and likewise, that open science platforms provide an ample opportunity for collaborations committed to refining the rapport construct. Many open science projects, such as the Open Science

Collaboration’s (2015) Reproducibility Project and the Collaborative Replications and Education Project (Grahe et al., 2016), focus on close replications alone. In contrast, this study utilized methodological replication as a means to additionally tackle novel theoretical questions. We invite interested theorists to do the same, using four conceptually related studies and data sets recently published by Nelson et al. (2014) in *The Journal of Open Psychology Data*.

These data, as well as a summary of each study, is available here: <http://openpsychologydata.metajnl.com/article/view/jopd.ae/13>.

We again encourage potential collaborators to visit our project profile via the OSF (<https://osf.io/dyntp/>) for further study information and access to materials. Ultimately, it is our hope that future investigations make use of similar avenues to advance studies of the dyadic experience.

## Appendix

### Coding Scheme Used for Subjective Behavioral Judgments

<b>BEHAVIOR</b>						
<i>Coordination/Synchrony</i>						
High scores represent much behavior, but not “in sync”. Low scores represent no interaction, but this interaction can have low levels of interpersonal activity.						
-3.	-2.	-1.	0.	1.	2.	3.
Emptiness (-3)	Harmony, flow, Synchronous (0)				Disorder (3)	
<i>Activity/Expressivity</i>						
Rate individuals as described above. High scores represent frenzied behavior and low scores represent “bored” behavior.						
-3.	-2.	-1.	0.	1.	2.	3.
Negative: bored (-3)Calm and Energized (0)			Anxious (3)			

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