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DATA PAPER

# Psychological Data from an Exploration of the Rapport / Synchrony Interplay Using Motion Energy Analysis

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These data result from an investigation examining the interplay between dyadic rapport and consequential behavior-mirroring. Participants responded to a variety of interpersonally-focused pretest measures prior to their engagement in videotaped interdependent tasks (coded for interactional synchrony using Motion Energy Analysis [17,18]). A post-task evaluation of rapport and other related constructs followed each exchange. Four studies shared these same dependent measures, but asked distinct questions: Study 1 ($N_{dyad}$ = 38) explored the influence of perceived responsibility and gender-specificity of the task; Study 2 ($N_{dyad}$ = 51) focused on dyad sex-makeup; Studies 3 ($N_{dyad}$ = 41) and 4 ($N_{dyad}$ = 63) examined cognitive load impacts on the interactions. Versions of the data are structured with both individual and dyad as the unit of analysis. Our data possess strong reuse potential for theorists interested in dyadic processes and are especially pertinent to questions about dyad agreement and interpersonal perception / behavior association relationships.

**Keywords:** rapport; interpersonal closeness; synchrony; coordination; mimicry; motion energy analysis; dyadic interaction

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## (1) Overview

### Context

#### *Collection dates*

From September 2011 to May 2013.

### Background

The synchronization of physical movements between organisms is critical to exercising one's influence on peers, initiating social learning, establishing group solidarity, and even facilitating pro-social behaviour [1,2,3,4]. Indeed, this behavioural synchrony maintains a distinct social importance, as it functions like a "social glue" that helps to solidify relationships between both humans and animals. Tickle-Degnen and Rosenthal [5] further posited that this coordination is a visible manifestation of dyadic rapport development, and subsequent research supports their prediction [6,7]. Because situational conditions impact rapport-development between partners [8], it is plausible that subsequent displays of synchrony might be concurrently affected; accordingly, our investigation sought to explore how contextual and participant characteristics influence this rapport / synchrony interplay.

Grahe and Sherman [8] proposed that altering perceptions of dyadic responsibility during a mutual task affected communication between both dyad members; unsurprisingly, these subsequent changes to communication efforts might then influence self-reported feelings of rapport [9,10]. More specifically, Dunbar's [9] dyadic power theory posits that as an individual's perception of responsibility increases, their likelihood of communicating using dominant behavior is subsequently heightened. Dominant communication displays hinder rapport-building, and thus Study 1 examined how perceptions of authority and the gender-specificity of an interdependent task (as gender scripts magnify self perceptions of social power [11]) influenced rapport development and nonverbal coordination.

As mentioned above, gender socialization encourages men and women to rely on different nonverbal communication tendencies [12,13], and these tendencies may encourage or impede rapport development. For example, physical manifestations of positivity and attentiveness (two elements of Tickle-Degnen and Rosenthal's [5] theorized rapport construct) are more often observed in female same-sex dyads than in male-male pairings [14]. Women also appear more sensitive to rapport-facilitating actions when making judgments about dyadic exchanges [15]. Study 2 sought to determine if a dyad's sex makeup

influenced the interplay between rapport and behavioral synchrony.

Cognitive load amplifies perceptions of task difficulty [16] and mental effort [27], which, in turn, might hinder one's ability to generate and sense rapport. In addition, Bernieri, Gillis, Davis & Grahe [17] discovered that tasks encouraging self-disclosure between interaction partners contributed to increased levels of rapport. Therefore, Study 3 examined the effects of cognitive load and task type on rapport-building and consequential synchrony.

Dyadic tasks requiring partner reliance tend to yield higher rapport-ratings between the dyad members [8], as these tasks encourage responsiveness between interactants and allow them to focus on a shared goal [18]. Likewise, these tasks encourage dyad members to move more, which increases the likelihood that they will coordinate their movements above chance levels [19]. Study 4 builds off of the cognitive load manipulation in Study 3 while also investigating the influence of task interdependence on the rapport / synchrony relationship.

## (2) Methods

### Sample

Undergraduate students from a small, liberal arts university in the Pacific Northwestern United States participated in these studies. A majority of our participants were Caucasian, between the ages of 18-22, and female (~70%), which accounted for a female-heavy sample in all four of our studies. Participants self-selected the date and time in which they would complete the study using an online experiment sign-up system published by Sona Systems Ltd. Participant reimbursement came in the form of research familiarization credits needed to pass an introductory psychology course or to receive additional credit for other psychology modules.

### Materials

Ramseyer & Horowitz (in preparation) first employed this combination of measures and materials in their investigation of behavioral synchrony within cooperative interactions; our research is largely a methodological replication of Ramseyer's work. Dr. Ramseyer shared this methodology with an undergraduate research initiative [30] and students adapted his procedure to include novel manipulations of their choosing. Researchers converted PDFs of his measures into a "live" format using Google Forms. Participants completed both pre-test and post-test batteries on laboratory computers separate of their interaction partner. In case questions arose, researchers remained in the room during the completion of these forms.

#### *Computerized pretest*

IIP - Inventory of Interpersonal Problems [20]

- 32 item, self-report measure
- Individuals rated how much certain social problems affect them (e.g. "It is hard for me to socialize with other people" and "I open up to people too much")
- Answers ranged on a Likert scale from 1 ("Not at all") to 5 ("Extremely")
- Reliability scores: Study 1 ($\alpha$ = .87), Study 2 ($\alpha$ = .84), Study 3 ($\alpha$ = .89), Study 4 ($\alpha$ = .87)

IRI - Interpersonal Reactivity Index [21]

- 21 item, self-report measure
- A blending of three different sub-scales (namely, measures of empathetic concern, perspective-taking, and fantasy) that gauged participants' levels of empathy (e.g. "I daydream and fantasize, with some regularity, about things that might happen to me)
- Answers ranged on a Likert scale from 1 ("Does NOT describe me well") to 5 ("Describes me VERY well")
- Reliability scores: Study 1 ($\alpha$ = .84), Study 2 ($\alpha$ = .86), Study 3 ($\alpha$ = .82), Study 4 ($\alpha$ = .87)

IGB - Interpersonal Goals and Boundaries

- 15 item, self-report measure
- A measure of interpersonal behavior where participants rated how accurately a given statement (for example, "I am very sensitive to other people's feelings") described him or her.
- Answers ranged on a Likert scale from 1 ("Not at all") to 8 ("Extremely")
- Reliability scores: Study 1 ($\alpha$ = .85), Study 2 ($\alpha$ = .89), Study 3 ($\alpha$ = .89), Study 4 ($\alpha$ = .83)

#### *Computerized post-test*

Measure of Familiarity

- 2 items, self-report measure
- Because these data were collected on an intimate college campus, we accounted for previous interactions between dyad members.
- A length of relationship question relied on five-point Likert scale from 1 ("We've not known each other before") to 5 ("For more than 3 years"). A quality of relationship question ranged on a Likert scale from 1 ("First time I've seen her / him") to 6 ("We are close friends")

IOS - Inclusion of Others in Self [22]

- A pictorial-based measure that gauges perceptions of interpersonal closeness between people. Using a series of inter-lapping circles to represent these different levels of "closeness", this measure instructs participants to choose the set of circles that "best describes their relationship" with their interaction partner.

PANAS - The Positive and Negative Affect Scale [23]

- 20 item, self-report measure
- This measure asked participants to recall the degree to which they encountered certain moods (for instance,

feeling "interested" or "hostile") during the preceding interaction.
- Participants answered on a Likert scale ranging from 1 ("Very slightly or not at all") to 5 ("Extremely")
- Reliability scores: Study 1 ($\alpha$ = .75), Study 2 ($\alpha$ = .89), Study 3 ($\alpha$ = .78), Study 4 ($\alpha$ = .77)

IRQ - The Post-Interaction/Rapport Questionnaire [24]

- 18 item, self-report measure
- Participants rated the degree to which certain rapport-based characteristics were present during the dyadic task. We used this measure as our primary gauge of rapport.
- Answers ranged on a LIkert scale from 1 ("Not at all") to 9 ("Extremely")
- Reliability scores: Study 1 ($\alpha$ = .84), Study 2 ($\alpha$ = .95), Study 3 ($\alpha$ = .90), Study 4 ($\alpha$ = .90)

FIQ - Future Interaction Questionnaire [25]

- 15 item, self-report measure
- Participants reported the likelihood that they would "befriend" or "spend more time" with their partner outside of the interaction.
- Participants responded on a LIkert scale from 1 ("Not at all") to 9 ("Very much")
- Reliability scores: Study 1 ($\alpha$ = .89), Study 2 ($\alpha$ = .96), Study 3 ($\alpha$ = .92), Study 4 ($\alpha$ = .95)

*Paas' Cognitive Load Questionnaire [31]

- 4 item, self-report measure
- Assessed excursion of mental effort and perceived task difficulty after participants completed the dyadic puzzle task (e.g. "Please indicate your perceived amount of mental effort while engaging in the task").
- Answers ranged on a Likert scale from 1 to 9

*Cognitive Load Scenario - Number Sequence Memorization [32]

- Prior to the dyadic task, participants had 25 seconds to memorize a randomly generated list of eight digits
- Attempted recall (in writing) of this sequence occurred after the task had concluded
- Researchers recorded how many of the digits the participant correctly identified, and this number was synthesized into a cognitive load score (see data).

*These measures only apply to Studies 3 and 4

### *Dyadic tasks*

Each of these six-minute tasks provided a stage for dyadic interaction. Researchers read the following prompt(s) to dyads seated at a central table. Once finished reading, researchers encouraged participants to clarify any confusion or questions about the task at hand. Experimenters then turned on a video-camera near the interaction space (videos of these interactions would later be analyzed for behavioral synchrony) and left the room before participants began completing the task.

**Interaction 1: Menu Task:** "You and your interaction partner are asked to compile a five-course menu for a special dinner. Please discuss different variants of combinations of foods and drinks both of you dislike. The menu may consist of the following items: soup, starters/appetizers, main course including side dishes, cheeses, desserts, drinks. You have six minutes to complete the task."

**Interaction 2: Close-Call Experience:** "Please describe a close call or "near-miss" situation that you had either experienced yourself, witnessed or heard about and tell each other your reactions."Close-call" and "near-miss" refer to situations where you or somebody else was very close to an accident/bad luck or other danger (e.g. sliding with your bicycle on a slippery patch). Each of you should describe at least one such situation to the other. You have a total of six minutes to discuss close-call experiences"

### *Motion energy analysis*

Dr. Ramseyer, in addition to the procedure listed above, also provided our lab with an automated, objective method of coding for synchronous behavior between interactants. A majority of previous research has depended upon subjective, third-person assessments to code for movement coordination. Although this method appears to be accurate [26] and reliable across judges [27], technological advancements now allow for more objective techniques of synchrony measurement. Accordingly, we employed a software program, Motion Energy Analysis [28,29], to evaluate behavioral synchrony concurrent with each dyadic task. The MEA converts pixels from digital videos of the interactions into their grayscale format, ranging from 0 (true black) to 255 (true white). Each frame is then isolated and pixel hue-change between frames is calculated and conceptualized as motion-energy (ME). Examination of ME can be bounded by pre-determined "maps" or drawn-out regions of a participant's body; synchrony scores were calculated by time-lagged (± 5 seconds) cross-correlations in windows with a pre-defined duration (30 seconds). Absolute values of the resulting correlation coefficients were then standardized with Fisher's Z and a global synchrony score was obtained by averaging all correlation coefficients.

## Procedures

Experimenters collected data at a psychology lab on campus. Our experimental set-up is best illustrated by **figure 1** (faces obscured for anonymity).

Participants interacted at a central table with a blue screen (to reduce potential confounds to MEA coding) hanging behind them. The taped line intersecting the table reminded participants not to cross into their partner's half of the interaction space (again, to prevent map interference with MEA coding).

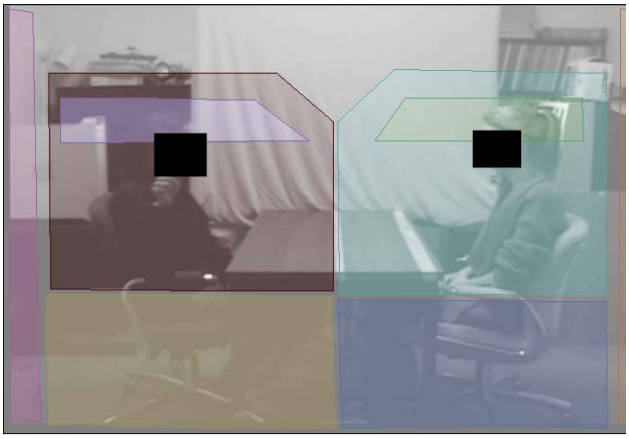

**Fig. 1:** Experimental set-up.

***Study 1: ($N_{participant}$ = 76; $N_{female}$ = 52, $N_{male}$ = 24)***
Using a 2 (Gender Specificity of Task: Masculine vs. Feminine) X 2 (Partition of Responsibility: Equal or Individual) between-subjects design, we manipulated the gendered nature of a cooperative task as well as participants' perceptions of responsibility while completing this task. Upon entering the lab, participants filled out informed consent and video consent forms before completing the above-noted pretest battery. Next, researchers asked participants to complete the "Menu Task", yet the prompt was altered in order to manipulate the gender-specificity of the task. Experimenters instructed each dyad to construct this menu for either an imaginary baby shower (feminised task) or a Super Bowl party (masculinised task). Using the script included above, researchers also assigned responsibility "for your dyad's performance on the task" to one or both members of the pairing. After finishing the six-minute task, participants answered the post-test measures and were debriefed. Most dyads finished the interaction and both sets of measures within 30 minutes; researchers assigned conditions using a randomised number sequence created prior to data collection.

***Study 2: ($N_{participant}$ = 102; $N_{female}$ = 69, $N_{male}$ = 33)***
Researchers explored how different dyad sex constructions affected the rapport / synchrony relationship using a 2 (Task: Menu vs. Close Calls) X 3 (Dyad Sex Makeup: Female-female, female-male, male-male) within-subjects design. As in Study 1, participants completed both consent forms and the standard pretest battery prior to any dyadic engagement. Experimenters then instructed dyads to participate in one of two dyadic tasks: the "Menu Task" or the "Close-Call Experience"; task type was determined by a randomised number sequence created for condition assignment purposes. Again, researchers read the prompt aloud, answered any questions voiced by participants, switched the adjacent camcorder onto "Record" mode, and left the room. Afterwards, interactants individually completed the study's post-test. This process was then repeated with a second dyadic task (whichever prompt was not used initially) and corresponding post-test before debriefing. Data collection for a single dyad generally lasted about 45 minutes.

***Study 3: ($N_{participant}$ = 82; $N_{female}$ = 58, $N_{male}$ = 24)***
In a 2 (Task: Goal-Oriented vs. Self-Disclosure) X 2 (Cognitive Load: High vs. Low) between-subjects design, experimenters examined the effects of task type and cognitive load on participants' ratings of rapport and consequential synchrony. Upon participants' completion of consent forms and the standard pretest, researchers presented individuals in the "high" cognitive load condition with a printed string of eight randomised numbers [28]; these numbers were to be memorised and reported back to experimenters after the completion of the dyadic task. Participants then engaged in either the "Menu Task" or "Close-Call Experience" as determined by a condition assignment sheet. Upon finishing the task, dyad members presented with the number sequence were asked to recall (in writing) the correct digit order. Afterwards, the participants completed the conventional post-test battery along with Paas' Cognitive Load Scale. This experimental procedure took 30-40 minutes.

***Study 4: ($N_{participant}$ = 126; $N_{female}$ = 95, $N_{male}$ = 31)***
Employing a procedure similar to Grahe's and Sherman [8] ecological assessment of rapport development, researchers measured the impact of partner interdependence and cognitive load on the rapport / synchrony interplay using a 3 (Partner Interdependence: None vs. Partial vs. Full) X 2 (Cognitive Load: Absent vs. Present) between-subjects design. Participants initially completed the same pretest as in the other three studies. They then engaged in an interdependent puzzle task, where one partner was assigned the role of "the worker", meaning he or she was responsible for physically completing the puzzle, and the other was deemed "the instructor", whose duty was to verbalize instructions to the worker. We manipulated partner interdependence by using either a mirror (in the "partial" interdependence condition), which forced the worker to rely more heavily on the instructor's commands, or with a visual shield apparatus (in the "full" interdependence condition) so that the worker couldn't view the puzzle at all. As in Study 3, those in the "high" cognitive load condition were asked to memorize and recall an eight-digit number sequence [28]. The standard array of post-test measures, including Paas' Cognitive Load Scale, followed this interaction.

## Quality control

Researchers parsed these data in a collaborative lab setting, allowing for others to double-check processes and provide immediate feedback. Moreover, we reviewed all interaction videos to assess their quality and usability before processing. Flawed videos (defined as any interactants behavior that might confound MEA analysis; for example, leaving the chair) are marked as "not ideal" in all four datasets.

## Ethical issues

**Ethical Concerns:** (1) The experiments were approved by the Human Participants Review Board at Pacific Lutheran University; (2) Participants were treated according to current APA ethical guidelines; (3) Participants completed

both informed consent and video consent forms prior to engaging in the experiment.

**Anonymity**: Data associated with the pretest / post-test batteries maintained anonymity. Researchers assigned participants individualized ID codes that linked their response to their dyad number, participant number, and order of dyadic tasks. Additionally, these ID codes are not linked to any personal information that could reveal the identity of the participant.

**Confidentiality**: Video footage resulting from the dyadic interactions remained confidential. Videos were marked by their dyad number and stored on a password-protected computer. Although researchers watched the participant's interactions during the coding process, they did not have access to any personal information belonging to the dyad members.

## (3) Dataset description

### Object Name

- JOPD - Data - Study 1 FINAL
- JOPD - Data - Study 2 FINAL
- JOPD - Data - Study 3 FINAL
- JOPD - Data - Study 4 FINAL
- JOPD - Variable Information - Study 1 FINAL
- JOPD - Variable Information - Study 2 FINAL
- JOPD - Variable Information - Study 3 FINAL
- JOPD - Variable Information - Study 4 FINAL
- JOPD - Data - Study 1 RAW
- JOPD - Data - Study 2 RAW
- JOPD - Data - Study 3 RAW
- JOPD - Data - Study 4 RAW
- JOPD - Variable Information - Study 1 RAW
- JOPD - Variable Information - Study 2 RAW
- JOPD - Variable Information - Study 3 RAW
- JOPD - Variable Information - Study 4 RAW

### Data type

Primary Data - all "RAW" files are comprised of output directly exported from our digitized pre- and post-test. These data are itemized and have not yet been reverse-coded. Accordingly, we have provided "Variable Information" sheets to guide potential reverse-coding and the computation of subscale means.

Processed Data - all "FINAL" data sets are consolidated into subscale means. Individualized and dyadic formats of this data are available within each Excel file. Please review the included "Variable Information" documents for variable descriptions.

### Format names and versions

Microsoft Excel

### Creation dates

- Start date: 10 October 2011
- End date: 11 December 2013

### Dataset creators

- McKenna Corlis, Western Michigan University, USA
- Jon Grahe, Pacific Lutheran University, USA
- Markelle Lance, Pacific Lutheran University, USA
- Andrew Nelson, Pacific Lutheran University, USA
- Fabian Ramseyer, University of Bern, Switzerland
- Kelsey Serier, Pacific Lutheran University, USA
- Tanzy Caulkins, Pacific Lutheran University, USA

### Language

English

### License

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### Embargo

Not applicable.

### Repository location

https://osf.io/dyntp/

### Publication date

24 January 2014

## (4) Reuse potential

Researchers interested in the dynamics of dyadic processes would find these data especially useful. Because our data include information about both participants' interpersonal tendencies and the dyadic exchanges themselves, theorists could determine if certain personality characteristics prime or impede rapport development. Moreover, these data are pertinent to investigations about dyad agreement and might help in exploring possible associations between participant perceptions and resulting behaviour.

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### Author contributions

Prepared the data: Andrew Nelson. Collected the data: Kelsey Serier. Analyzed the data: Fabian Ramseyer. Drafted the manuscript: Andrew Nelson. Reviewed the manuscript: Jon Grahe.

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